NOTICE OF CANCELLATION

INCH-POUND

MIL-P-17552F(YD)
NOTICE 1
19 June 1997

MILITARY SPECIFICATION

PUMP UNITS, CENTRIFUGAL, WATER, HORIZONTAL; GENERAL SERVICE AND BOILER-FEED: ELECTRIC-MOTOR- OR STEAM-TURBINE-DRIVEN

Military Specification MIL-P-17552F(YD), dated 25 November 1991, is hereby canceled. Future acquisition of this material should refer to Commercial Item Description A-A-50562.

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

Custodian:
Navy - YD1

Preparing Activity:
Navy-YD1

(Project 4320-0009)

AMSC N/A

FSC 4320

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* INCH-POUND *

MIL-P-17552F(YD)
25 November 1991
SUPERSEDING
MIL-P-17552E(YD)
27 April 1985

MILITARY SPECIFICATION

PUMP UNITS, CENTRIFUGAL, WATER, HORIZONTAL; GENERAL SERVICE AND BOILER-FEED: ELECTRIC-MOTOR- OR STEAM-TURBINE-DRIVEN

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

1. SCOPE

1.1 Scope. This specification covers two types of horizontally mounted, electric-motor- or steam-turbine-driven, general service and boiler-feed centrifugal water pump units, with capacities ranging from 5 gallons per minute (gpm) to 15,000 gpm for total dynamic heads ranging from 10 to 2,500 feet.

* 1.2 Classification. The pumps are of the following types, styles, and classes, as specified (see 6.2):

TYPES

Type I - General service.
Type II - Boiler-feed.

STYLES

Style 1 - Axially split casing.
Style 2 - End suction (on base plate).
Style 3 - End suction (close coupled).
Style 4 - Radially split casing.

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Beneficial comments (recommendations, additions, deletions) and any pertinent
*data which may be of use in improving this document should be addressed to: *
*Commanding Officer (Code 156), Naval Construction Battalion Center, Port *
*Hueneme, CA 93043-5000, by using the self-addressed Standardization *
*Document Improvement Proposal (DD Form 1426) appearing at the end of this *
*document or by letter. *
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AMSC N/A FSC 4320

CLASSES

Class 1 - Single-stage.
Class 2 - Multi-stage.

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

FF-B-171 - Bearings, Ball, Annular (General Purpose).
FF-B-185 - Bearings, Roller, Cylindrical; and Bearings, Roller Self-Aligning.

MILITARY

MIL-P-10603 - Pumps and Pumping Units, Centrifugal, Power-Driven, for Water; Packaging of.

STANDARD

MILITARY

MIL-STD-209 - Slinging and Tiedown Provisions for Lifting and Tying Down Military Equipment.

(Unless otherwise indicated, copies of federal and military specifications and standards are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 Other Government publications. The following other Government publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DEPARTMENT OF LABOR
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION

Title 29, CFR, Part 1910.95 - Occupational Noise Exposure.
Title 29, CFR, Part 1910.219 - Mechanical Power-Transmission Apparatus.

(Application for copies should be addressed to the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

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

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME B 1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
ASME B 1.20.1 - Pipe Threads, General Purpose (Inch).
ASME B 1.20.3 - Dryseal Pipe Threads (Inch).
ASME B 15.1 - Safety Standard for Mechanical Power Transmission Apparatus.
ASME B 16.1 - Cast Iron Pipe Flanges and Flanged Fittings.
ASME B 16.5 - Pipe Flanges and Flanged Fittings.
ASME B 16.24 - Bronze Pipe Flanges and Flanged Fittings, Class 150 and 300.
ASME B 73.1M - Horizontal, End Suction Centrifugal Pumps for Chemical Process.

(Application for copies should be addressed to the American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.)

ASTM

ASTM A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

HYDRAULIC INSTITUTE

Standards of Hydraulic Institute.

(Application for copies should be addressed to the Hydraulic Institute, 712 Lakewood Center North, 14600 Detroit Ave., Cleveland, OH 44107.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 1 - General Standards for Industrial Controls and Systems.
NEMA MG 1 - Motors and Generators.
NEMA SM 23 - Steam Turbines for Mechanical Drive Service.

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street, N.W., Washington, DC 20037.)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE J404 - Chemical Compositions of SAE Alloy Steels.
SAE J534 - Lubrication Fittings.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096.)

(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. REQUIREMENTS

3.1 Description. The pumps covered by this specification shall be horizontally mounted centrifugal pumps and shall be equipped with direct-connected pump drivers. The pump driver shall be an electric motor or a steam turbine, as specified herein. Each pump and its driver, except for close-coupled pumps, shall be connected by means of a flexible shaft coupling and mounted on a common bedplate. Each pump shall be equipped with all connecting lines and accessories required for proper operation. When specified (see 6.2), auxiliary priming devices or systems shall be furnished. Details of the priming devices or systems shall be as specified (see 6.2).

3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.2.1 and 6.4).

3.3 Materials. Materials used shall be free from defects which would adversely affect the performance or maintainability of individual components or of the overall assembly. Materials not specified herein shall be of the same quality used for the intended purpose in commercial practice. Unless otherwise specified herein, all equipment, material, and articles incorporated in the work covered by this specification are to be new and fabricated using materials produced from recovered materials to the maximum extent possible without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. Unless otherwise specified, none of the above shall be interpreted to mean that the use of used or rebuilt products are allowed under this specification.

3.3.1 Selection of material for pump parts. Unless otherwise specified herein, the selection of materials used in the manufacture of the pump shall be in accordance with the Standards of Hydraulic Institute. The manufacturer shall select the materials which shall minimize galvanic corrosion to the greatest extent possible. The following factors, used to determine the selected materials, shall be as specified (see 6.2):

a. Service of application of the pump.
b. Type of liquid to be pumped.
c. Condition of liquid to be pumped.
d. Principal corrosives in liquid to be pumped.

3.3.2 Suction and discharge connections material. Unless otherwise specified (see 6.2), all bronze flanged pumps shall have bronze flanges conforming to ASME B 16.24. The flanges of all cast iron flanged pumps and threaded iron companion flanges bolted to pump intake and discharge connections shall conform to ASME B 16.1. The flanges of alloy-steel flanged pumps shall conform to ASME B 16.5. The class of all flanges shall conform with the applicable ASME standard for service and conditions.

3.3.3 Pump shaft material. Unless otherwise specified (see 6.2), the pump shaft shall be of alloy-steel not less than SAE 4320, in accordance with SAE J404. For operation over 250 degrees Fahrenheit (oF), the pump shaft shall be of corrosion resistant steel not less than ASTM A 276 alloy 300, and shall have physical properties consistent with good commercial practice for its intended use. Pumps designed for use with salt or brackish water and having alloy-steel shafts shall be furnished with bronze sleeves designed to prevent contact of the shaft with water and to eliminate wear in the stuffing boxes (see 3.4.13). Hard-chrome plated or nickel-copper shafts shall require sleeves in the stuffing boxes only. A safety guard of solid or expanded sheet metal in accordance with ASME B 15.1 shall be designed to facilitate easy removal.

3.3.4 Wearing ring material. When casing rings are used without companion impeller rings, they shall be of a softer composition than the impeller, or the wearing part shall be overlaid with a material that is harder than the casing rings.

3.4 Design and construction. The pump shall be designed and constructed to withstand the strains, jars, vibrations, and other conditions associated with shipping, storage, and installation; and shall be complete so that when installed, it can be used for any operation for its intended purpose. The pump and accessories shall be designed and constructed to prevent conditions hazardous to personnel or deleterious to equipment, shall withstand the hard usage encountered in military service or shore establishments, and shall permit easy and ready accessibility for replacement of accessories, maintenance, service, and adjustments in the field. All threaded parts shall be in the inch system and shall conform to ASME B 1.1, ASME B 1.20.1, and ASME B 1.20.3, as applicable.

3.4.1 General service pumps (type I). General service pumps shall be designed and constructed for liquid pumping service with liquid at ambient or elevated temperatures without vapor lock. The net positive suction head (NPSH) required shall be less than the minimum NPSH available by the system when operated under the performance requirements as specified (see 6.2). Impellers shall be of the closed, open, or semi-open type and radial or mixed flow as specified (see 6.2). Unless otherwise specified (see 6.2), general service pumps shall be suitable for suction lifts of not less than 15 feet when pumping 85oF water and shall be driven by electric motors.

3.4.2 Boiler-feed pumps (type II). Boiler-feed pumps shall be designed and constructed for boiler-feed service with liquids at ambient or elevated temperatures without vapor lock. The NPSH required shall be less than the minimum NPSH available by the system when operated under the performance requirements as specified (see 6.2). Impellers shall be the closed type and shall be radial or mixed flow, as specified (see 6.2). Stuffing boxes shall be of the packing-ring or mechanical seal type (see 3.4.13, 3.4.13.1, and 6.2). Unless otherwise specified (see 6.2), boiler-feed pumps shall be suitable for suction heads of not less than 3 feet at rated capacity.

* 3.4.3 Split casing pumps (styles 1 and 4). Split casing pumps shall have the casing split to enable removal of all rotating parts without disturbing pipe connections or alignment. Each casing half or end cover shall be flanged for bolting and shall be carefully machined or lapped to its mating surface. The casing joint(s) shall be fitted with a suitable gasket(s). The two halves or end covers shall be centered relative to each other by dowel pins, fitted bolts, or registered fits. The casing design shall be provided with facilities for handling and forcing bolts for breaking joints. Shaft bearings shall be mounted on each side of the impeller(s) and the design shall be feasible for use of a portable shaft revolution indicator. The bearing housings shall be integral with the casing, carried on brackets integral with the casing, or supported and held in rigid alignment with the casing by not less than two dowels of ample size and strength. Housings of the latter arrangement shall be securely bolted to the casing, but bolts alone shall not be used to support the housings. Stuffing boxes shall be provided on each side of the casing and shall use the same sizes of packing rings except when mechanical seals are required. Axial thrust shall be balanced out by means of opposed impellers, double suction impellers, balancing chambers, or other design features or devices for providing hydraulic balance. Unless otherwise specified (see 6.2), wearing rings shall be provided for both the casing and the impeller. Impeller wearing rings may be omitted if the contact surfaces of the impeller are overlaid with stellite or similar material for minimizing wear.

3.4.4 End suction (on base plate) pumps (style 2). End suction pumps shall have a vertically split casing bolted to a supporting frame which houses two or more shaft bearings arranged to support the shaft from one side of an overhung impeller and connected to the driver by a coupling with both the driver and the pump mounted on a base plate. The discharge opening shall be bolted thereto after careful machining or lapping. A suitable gasket shall be fitted to prevent leakage. Pumps requiring drivers rated at 7.5 horsepower (hp) or more shall be hydraulically balanced against axial thrust by the use of opposed impellers, balancing chambers or other hydraulic balancing devices. Pumps with drivers rated at less than 7.5 hp may have the axial thrust taken on suitable bearings. Unless otherwise specified (see 6.2), all pumps fitted with enclosed impellers shall be provided with firmly secured wearing rings on each side of the impeller or impellers. When specified (see 6.2), style 2 pumps shall conform to ASME B 73.1.

3.4.5 End suction close-coupled pumps (style 3). Close-coupled pumps shall have the pump and its driver built together as one unit. The casings shall be cast or bolted together, and the pump casing shall house an overhung impeller or impellers. Unless otherwise specified (see 6.2), wearing rings for the casing and impeller or impellers shall be provided. The pump and driver shall share the same mounting, shaft, and bearings. The pump shaft shall be an integral

extension of the driver shaft and the two or more shaft bearings shall be of sufficient size and adequately spaced for proper support and alignment of rotating parts of both the pump and its driver. Motor-driven units shall be provided with integrally cast or securely fastened feet, which shall be machined and level with each other and with the unit. The feet shall be properly spaced to provide adequate support and shall be provided with boltholes of the size specified (see 6.2). Turbine-driven close-coupled pumps shall be provided with suitable bedplates. Unless otherwise specified (see 6.2), turbine-driven close-coupled pumps shall have permanently fixed upper discharge connections.

3.4.6 Single-stage pumps. Single-stage pumps shall have a single impeller that develops the total head of the pump. Single-stage style 2 and 3 pumps shall have the axis of the suction inlet concentric with the eye of the impeller. Unless a multi-position type casing is definitely specified (see 6.2), the casing for style 2 pumps shall be designed for either fixed, top, vertical-up discharge or shall be bolted to the support head in a manner to permit rotating the casing to a minimum of three discharge positions; top horizontal, top vertical, or bottom horizontal. Style 2 pumps with multi-position casings shall be furnished with the casing in the top horizontal discharge position. The support leg for style 2 pumps shall be bolted to the bedplate and shall be located under the support head or under the casing. When a multi-position casing is furnished, the support leg shall be located under the support head. The casing for style 3 pumps shall be designed to permit rotation of the casing to provide not less than four discharge positions 90 degrees apart. Style 3 pumps shall be furnished with the casing positioned for top and vertical discharge.

3.4.7 Multi-stage pumps. Multi-stage pumps shall have two or more impellers which act in series to develop the total head of the pump. Multi-stage style 2 pumps shall be limited to two stages. Unless otherwise specified (see 6.2), multi-stage style 2 pumps shall be side intake, and shall have permanently fixed, one-position discharge openings.

3.4.8 Pump casing. Unless otherwise specified (see 6.2), the direction of the shaft rotation shall be clockwise when viewed from the driver end. The direction of the shaft rotation shall be suitably indicated in a conspicuous location and shall be readily visible and cast integrally with the casing, unless it is traced with a welding bead, cut into the casing, or inscribed on a firmly attached plate of brass or copper or of the same material as the casing. The casing shall have, when necessary, tapped openings for air venting, priming, and drainage. When specified (see 6.2), the casing shall have openings for suction and discharge gages. Drain openings in the volute, intake, or other passages capable of retaining trapped water shall be located in the low point of such passages when the pump is in a level attitude. A threaded drain plug or petcock of the same material as the pump casing or brass or copper shall be installed in the drain. When the design of the pump is such as to make drains or petcocks inaccessible, short stand pipes of the same material of the pump casing or brass or copper suitable for the service, shall be installed to facilitate the drainage. A petcock of the same material as the pump casing or brass or copper shall be installed for air venting purposes.

3.4.9 Suction and discharge connections. Unless otherwise specified (see 6.2), suction and discharge openings 2.5 inches in diameter or larger shall be flanged, and openings smaller than 2.5 inches in diameter may be threaded. All end suction on base plate (style 2) pumps conforming to ASME B 73.1 shall be flanged. Unless otherwise specified (see 6.2), the pump discharge shall be one size smaller than the suction connections. Suitable reducers shall be furnished with pumps having undersized openings. When specified (see 6.2), discharge and suction connections shall be suitably identified as required to ensure proper connection of the pump in the intended installation. Identification of discharge and suction connections shall be readily visible and cast integrally with the casing unless they are traced by a welding bead, cut into the casing, or inscribed on a firmly attached plate of brass, copper, or of the same material as the pump casing. When specified (see 6.2), a suitable flow straightening device shall be provided with double intake pumps to eliminate any hydraulic imbalance caused by unequal flow to the intakes of the impeller.

3.4.10 Impellers. Impellers shall be cast in one piece and machined to remove sand, scale, gates, risers, wires, chaplets, or other metal that is not part of the casting. The water passages shall be smooth. Impellers shall be dynamically balanced and compensated for axial thrust, except, when the ratio of maximum outside diameter to width of the periphery, including the shrouds, but not the backvane, is six or greater, static balance is substituted. Each impeller shall be accurately fitted and keyed, splined, or threaded on the shaft and locked against lateral movement.

3.4.11 Diffusers. When a diffuser type pump is furnished, the diffuser ring shall be readily replaceable. Diffuser vanes and water passages shall be properly designed, machined, and finished for maximum pump efficiency.

3.4.12 Wearing rings. Unless otherwise specified (see 6.2), readily replaceable, securely locked, wearing rings shall be provided to minimize leakage from the discharge side of the pump, and to protect the casing and impellers from wear. When wearing rings are threaded on the impellers, the threads shall run counter to the direction of rotation.

3.4.13 Stuffing boxes. Stuffings boxes shall be of the packing ring type or mechanical seal type, as specified (see 6.2). Unless otherwise specified (see 6.2), stuffing boxes shall be an integral part of the casing or support head and shall be of adequate depth and proper design to minimize water or air leakage regardless of the conditions of operation. Mechanical seals shall be constructed of materials suitable for the liquid temperatures and pressures as applicable.

3.4.13.1 Packing-ring type stuffing boxes. The bottom of the stuffing box may be the bushing or the integral bottom type. Boxes shall be packed with a sufficient number of split type packing rings made of fibrous plastic or other materials suitable for the service requirements of the pump. The packing rings shall be held in place by a split type stuffing box gland. Stuffing boxes shall be fitted with split bronze glands on all-bronze or bronze fitted pumps. Unless otherwise specified (see 6.2), stuffing boxes under negative pressure during

starting or any other phase or condition of operation shall be provided with a water seal. The water seal shall consist of a lantern ring or seal cage and any required connections to the pump casing. Except for salt water pumps, the seal shall use, as a sealing medium, pump water of at least first stage discharge pressure. For salt water pumps, fresh water from an external source shall supply the necessary sealing.

3.4.13.2 Stuffing boxes exposed to discharge pressure. Stuffing boxes exposed to discharge pressure shall be subjected to not more than first stage discharge pressure. Reduction shall be accomplished by the stage arrangement of the pump, by the use of pressure breakdown chambers, or by other pressure reducing devices.

3.4.14 Bearings. Bearings shall be the rolling or sliding contact type as appropriate for the pump size. When required, due to high shaft speeds, high temperature of the liquid being pumped, or other ambient conditions, bearings shall be water-cooled from an external source. All bearings used in the pump shall have a bearing life of not less than 19,700 hours as specified in FF-B-171 and FF-B-185, as applicable. When specified by NEMA SM 23, pressure lubrication shall be provided for the turbine on turbine-driven pumps.

* 3.4.14.1 Bearing housings. Bearing housings shall be so located as not to interfere with the repacking and maintenance of the stuffing boxes; shall be readily accessible for dismantling and maintenance of bearings; shall be sealed against grit, water, or other foreign material; and shall be provided with all necessary lubrication fittings, drains, and oil level indicators. Housings for split casing pumps shall be constructed in accordance with 3.4.3. Bearings shall be protected, as required, by rigid liquid deflectors mounted and locked on the shaft between the stuffing box and bearing housing.

3.4.14.2 Radial bearings. Radial bearing shall be either the rolling or sliding contact type. Ball and roller bearings shall be oil or grease lubricated. Sliding-contact bearings shall be the ring-oiled, journal type. All bearings shall be of appropriate design and ample size. Ball bearings shall conform to FF-B-171, and roller bearings shall conform to FF-B-185. Journal bearings shall be split to facilitate removal and refitting; shall be locked against rotation and lateral movement; and shall have their shells and seats machine finished.

3.4.14.3 Thrust bearings. On each pump, one or more suitable thrust bearings or combination radial-and-thrust bearing shall be installed, regardless of whether or not the pump is hydraulically balanced. The thrust bearing(s) shall counteract any unbalanced, hydraulic, or mechanical thrust from either direction. When a sliding contact, pivoted, segmental-type thrust bearing is provided, the design shall be such as to ensure adequate starting and running lubrication at all times.

3.4.15 Bedplates. The pump and its driver, except for motor-driven, close-coupled units, shall be bolted to a common bedplate made of heavy cast iron, cast steel, or fabricated structural steel, as specified (see 6.2). The bedplate shall be designed to provide ample strength and rigidity during shipping and maintain alignment or be readily re-aligned prior to permanent installation and start-up. The mounting surfaces of the bedplate shall be machine finished and made parallel to each other. A minimum of four boltholes

and a sufficient number of grouting holes shall be provided to facilitate installation on a concrete base. The baseplate shall be designed to collect leakage from the pump casing, stuffing box or flange, and shall have a tapped drain connection. The pump and its driver shall be doweled to the bedplate after installation and alignment to facilitate re-alignment after disassembly.

3.4.16 Bolts and studs. Except for electric motor casings, bolts and studs used in the pump pressure casing shall be not less than 3/8-inch in diameter.

3.4.17 Flexible couplings. Except for close-coupled pumps, all pumps requiring more than 250 hp shall be connected to their drivers through a suitable all-metal flexible coupling.

3.4.18 Drivers. Pump drivers shall conform to the following requirements, as applicable.

3.4.18.1 Motors. Electric motors shall have the electrical characteristics as specified (see 6.2). Electric motors shall conform to NEMA MG 1, and shall be rated for continuous duty with starting torque and speed rating suitable for the application. Electric motors shall have a hp rating adequate for operation of the specified pump without exceeding the allowable temperature rise. The hp rating shall not be less than the maximum brake hp requirement of the pump under any condition of operation from shut-off to free delivery and be rated for continuous duty. Motor options shall be as specified (see 6.2).

3.4.18.1.1 Motor starter. Unless otherwise specified (see 6.2), a motor starter shall be furnished with each motor. The starter shall be NEMA standard type, NEMA type 1 enclosure, in accordance with NEMA ICS 1, and equipped with manual start-stop buttons and with thermal overload protection. The starter characteristics shall be based on the manufacturer for the required service.

3.4.18.2 Steam turbines. Steam turbines shall conform to NEMA SM 23. The acquisition documents shall include the information in the Steam Turbine Inquiry Guide of NEMA SM 23, as specified (see 6.2). When provided with steam at the specified inlet temperature and inlet and outlet pressures, each turbine shall develop ample power at the proper speeds to drive the pump efficiently under all normal conditions of pump loading.

3.5 Performance.

3.5.1 Capacity and head. The pump shall be capable of meeting the capacity and head requirements as specified (see 6.2), without exceeding the continuous hp rating of the driver.

3.5.2 Vibration. With the pump operating, the first lateral critical speed causing excessive vibration or resonance frequencies shall occur at not less than 25 percent above the maximum governed speed of the driver.

3.5.3 Hydrostatic pressure. The casing of the pump shall withstand a hydrostatic pressure equal to 1.5 times the discharge pressure or the total dynamic head, whichever is greater.

3.6 Safety. All mechanical and electrical parts that are of such nature or so located as to become a hazard to operating or maintenance personnel shall be enclosed or properly guarded. The pump shall comply with Title 29, CFR, Part 1910.95 for noise, and Title 29, CFR, Part 1910.219 for guarding.

3.7 Lifting and tiedown attachments. The pump shall be equipped with lifting and tiedown attachments conforming to MIL-STD-209, type II or type III. A nonferrous transportation plate shall be provided and mechanically attached to the pump. Transportation plates shall be inscribed with a diagram showing the lifting attachments and lifting slings, the capacity of each attachment, and the required length and size of each sling cable. A silhouette of the item furnished showing the center of gravity shall be provided on the transportation plate. Tiedown attachments may be identified by stenciling or other suitable marking. Tiedown marking shall clearly indicate that the attachments are intended for the tiedown of the pump on the carrier when shipped.

3.8 Interchangeability. All units of the same classification furnished with similar options under a specific contract shall be identical to the extent necessary to ensure interchangeability of component parts, assemblies, accessories, and spare parts.

3.9 Identification plate. An identification plate will be furnished by the contracting officer for each pump. The contractor shall stamp all necessary data in the blank spaces of the plate provided for that purpose, and securely affix a plate to each pump in a conspicuous place with nonferrous screws, rivets, or bolts not less than 1/8-inch in diameter. The applicable nomenclature contained in the contract item description shall be placed in the top blank.

3.10 Instruction plates. The pump shall be equipped with instruction plates suitably located, describing any special or important procedures to be followed in operating and servicing the equipment. Plates shall be of a material which will last and remain legible for the life of the equipment. Plates shall be securely affixed to the equipment with nonferrous screws or bolts of not less than 1/8-inch diameter.

3.11 Cleaning, treatment, and painting. Unless otherwise specified (see 6.2), the pump shall be treated and painted in accordance with the manufacturer’s standard practice. All surfaces of the pump other than corrosion-resisting steel shall be protected against corrosion and present a neat appearance.

3.12 Lubrication. Unless otherwise specified (see 6.2), means for lubrication shall be in accordance with the manufacturer’s standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high-pressure lubricating equipment, 1,000 pounds per square inch or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location. The unit shall be lubricated as specified in section 5.

3.13 Workmanship. The quality of workmanship shall be such as to produce pumps that are in accordance with the requirements of this specification and to ensure proper functioning of all parts of the pump.

3.13.1 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processes shall be done neatly and accurately. All bends shall be made by controlled means to ensure uniformity of size and shape.

3.13.2 Bolted connections. Bolt holes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided in accordance with good commercial practice, and all bolts, nuts, and screws shall be tight.

3.13.3 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of approved shape and uniform size for the same diameter of rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

3.13.4 Castings. All castings shall be sound and free from patching, misplaced coring, warping, or any other defect which reduces the casting's ability to perform its intended function.

3.13.5 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to develop the full strength of the parts connected by the welds. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof and service loadings.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this document where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this document shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in this document shall not relieve the contractor of the responsibility of ensuring that all products or supplies

submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements specified herein and in applicable referenced documents.

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

a. First article inspection (see 4.2.1).
b. Quality conformance inspection (see 4.2.2).

4.2.1 First article inspection. The first article inspection shall be performed on one pump when a first article is required (see 3.2 and 6.2). This inspection shall include the examination of 4.3, the tests of 4.4, and when specified (see 6.2), the packaging inspection of 4.5. The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.3, the test of 4.4.2, and the packaging inspection of 4.5.

4.3 Examination. Each pump shall be examined for compliance with the requirements specified in section 3 of this document. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirement or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

4.4 Tests.

4.4.1 First article tests. Performance tests shall be conducted in accordance with the test standards for centrifugal pumps of the Standards of Hydraulic Institute. The first article shall receive the tests of 4.4.1.1, 4.4.1.2, 4.4.1.3, and 4.4.1.4. Failure to pass any test shall constitute cause for rejection.

4.4.1.1 Operational test. The pump shall be run-in for a period of not less than ten minutes, at operating speed, to satisfy the operability of the pump. Any evidence of failure in alignment of the pump and driver, operability, or evidence or excessive temperature, vibration, or noise shall constitute failure of the operational test.

4.4.1.2 Performance test. The pump shall be tested to meet the capacity and head requirements of 3.5.1. The pump shall be operated continuously for four hours. Capacity, head, smoothness of operation, effectiveness of stuffing box or mechanical seals, and bearing temperatures shall be checked during this test. Failure of the pump to meet any capacity-head requirements shall constitute failure of the test.

4.4.1.3 Vibration test. The pump shall be tested to meet the requirements of 3.5.2. Unless otherwise specified (see 6.2), the vibration limits and test procedures shall be in accordance with the Standards of Hydraulic Institute.

4.4.1.4 Hydrostatic pressure test. All pump casings produced shall be tested to verify compliance with 3.5.3. All pump casings shall be subjected to a hydrostatic pressure equal to 1.5 times the pump discharge pressure or the total dynamic head, whichever is greater, for a period of not less than five minutes. Minor leakage through the mechanical seal shall not be cause for rejection. Any damage or permanent deformation to the pump casing or leakage in the casing or through the casing gasket shall constitute failure of the test.

4.4.2 Quality conformance tests. Each production pump shall be operated and tested as specified in 4.4.1.1 and 4.4.1.4.

4.5 Packaging inspection. The inspection of the preservation, packing, and marking shall be in accordance with the requirements of section 4 of MIL-P-10603. The inspection shall consist of the quality conformance inspection; and, when specified (see 6.2), a preproduction pack shall be furnished for examination and test within the time frame required (see 6.2).

5. PACKAGING

5.1 Preservation, packing, and marking. Preservation, packing, and marking shall be in accordance with the requirements of MIL-P-10603 with the level of preservation and the level of packing as specified (see 6.2).

6. NOTES

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

6.1 Intended use. The pumps covered by this specification are intended to be used for handling general service water or boiler-feed water in stationary power plants, in heating or ventilating systems, or in any similar permanent installation.

* 6.1.1 Selection factors.

a. Fungus resistant varnish conforming to MIL-V-173 should be used to coat electrical components and circuit elements, including terminal and circuit connections, when the unit is to be installed in humid conditions. Components and elements inherently inert to fungi or in hermetically sealed enclosures or current-carrying contact surfaces should not be coated.

b. Electromagnetic interference suppression (EMI), when required, should conform to the EMI suppression requirements and test limits as specified in MIL-STD-461.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type, size, and class of pump required (see 1.2).
c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
d. When auxiliary priming devices or systems are to be furnished and required details of priming devices or systems (see 3.1).
e. When first article is required for inspection and approval (see 3.2 and 4.2.1).
f. Factors to determine material selection of the pump (see 3.3.1):

    (1) Service application of the pump (whether continuous or intermittent).
    (2) Type of liquid to be pumped, if other than water.
    (3) Condition of liquid to be pumped (particulates, viscosity, pH level, etc.).
    (4) Principal corrosives in liquid to be pumped (chemical composition).

g. Material for suction discharge connections, if different (see 3.3.2).
h. Material for pump shaft, if different (see 3.3.3).
i. Performance requirements for type I and type II pumps, as applicable (see 3.4.1, 3.4.2, and 3.5.1):

    (1) Capacity, in gpm.
    (2) Pumping temperature of liquid, in oF.
    (3) Head:

        (a) Discharge: Net head in feet above the centerline of the pump.
        (b) Suction: NPSH, in feet; and NPSH available, in feet.

j. For type I pumps, type of impeller required; minimum suction lift, if different (see 3.4.1).
k. For type II pumps, type of impeller required; type of stuffing boxes required; and minimum suction lift, if different (see 3.4.2).
l. When wearing rings are not required (see 3.4.3, 3.4.4, 3.4.5, and 3.4.12).
m. When style 2 pumps are to conform to ASME B 73.1 (see 3.4.4).
n. Size of boltholes in support feet of style 3 pumps; position of discharge connections for turbine-driven style 3 pumps, if different (see 3.4.5).
o. When a multi-position type casing is required for single-stage, style 2 pumps (see 3.4.6).
p. Position of intake and requirements for discharge openings for multi-stage style 2 pumps, if different (see 3.4.7).

q. Direction of shaft rotation, if different; when pump casing is to have openings for suction and discharge gages (see 3.4.8).
r. Requirements for suction and discharge connections, if different; size of discharge and suction connections, if different; when discharge and suction connections are to identified; when a suitable flow straightening device is to be provided with double intake pumps (see 3.4.9).
s. Type of stuffing box required; when stuffing boxes are not to be an integral part of the casing or support head (see 3.4.13).
t. When packing-ring type stuffing boxes under negative pressure are not to be provided with water seal (see 3.4.13.1).
u. Type of material for bedplate (see 3.4.15).
v. Required electrical characteristics for electric motors; required motor options (see 3.4.18.1).
w. When a motor starter is not to be provided (see 3.4.18.1.1).
x. Required information from the Steam Turbine Inquiry Guide of NEMA SM 23 (see 3.4.18.2).
y. Treatment and painting, if different (see 3.11).
z. Means of lubrication, if different (see 3.12).
aa. When a first article inspection is required; when a preproduction pack inspection is required (see 4.2.1).
bb. Vibration limits and applicable test procedures, if different (see 4.4.1.3).
cc. Time frame required, if a preproduction pack inspection is required (see 4.5).
dd. Level of preservation and level of packing required (see 5.1).

6.3 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD Federal Acquisition Regulations (FAR) Supplement, Part 27, Sub-Part 27.475-1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data should be delivered by the contractor in accordance with the contract or purchase order requirements.

6.4 First article. When a first article inspection is required, the item will be tested and should be a first production item or it may be a standard production item from the contractor's current inventory as specified in 4.2.1. The first article should consist of one unit. The contracting officer should include specific instructions in acquisition documents regarding arrangements for examination, test, and approval of the first article.

* 6.5 Part or identifying number (PIN). The PIN to be used for pumps applied to this specification are created as follows:

	M17552	X	X	X
Specification part number	*	*	*	*
Type code		*	*	*
Style code			*	*
Class code				*

* 6.5.1 Type to code identifier. The type of the pump is identified by a single-digit number as shown in table I.

TABLE I. Type to code identifier.

Type	Code number
Type I	1
Type II	2

* 6.5.2 Style to code identifier. The style of the pump is identified by a single-digit number as shown in table II.

TABLE II. Style to code identifier.

Style	Code number
Style 1	1
Style 2	2
Style 3	3
Style 4	4

* 6.5.3 Class to code identifier. The class of the pump is identified by a single-digit number as shown in table III.

TABLE III. Class to code identifier.

Class	Code number
Class 1	1
Class 2	2

* 6.6 Cross-reference of classification. The classification of pumps in this document differs from the previous revision in the following respect:

MIL-P-17552F	MIL-P-17552E
TYPES	
Type I - General service.	Type I - General service.
Type II - Boiler-feed.	Type II - Boiler-feed.
STYLES	
Style 1 - Axially split casing.	Style 1 - Horizontally split-case.
Style 2 - End suction (on base plate).	Style 2 - End suction (on base plate).
Style 3 - End suction (close coupled).	Style 3 - End suction (close coupled).
Style 4 - Radially split casing.	None.
CLASSES	
Class 1 - Single-stage.	Class 1 - Single stage.
Class 2 - Multi-stage.	Class 2 - Multi-stage.
SIZES	
Deleted.	As specified.

* 6.7 Subject term (key word) listing.

Axially split casing
End suction
Radially split casing
Single-stage
Multi-stage

6.8 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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