MIL-F-19004A(SH)
18 April 1983
SUPERSEDING
MIL-F-19004(SHIPS)
30 August 1955
(See 6.10)

MILITARY SPECIFICATION

FANS, CENTRIFUGAL, FIXED AND PORTABLE VENTILATION, NAVAL SHIPBOARD

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

1. SCOPE

1.1 Scope. This specification covers centrifugal fans, fixed and portable, for use in Naval shipboard heating, ventilating, and air conditioning systems.

1.2 Classification. Fans covered by this specification shall be of the following types, as specified (see 6.2.1).

Type CC - Centrifugal, fixed, motor driven (high-impact - shock)
Type O - Centrifugal, portable, air turbine driven
Type X-CC - Centrifugal, fixed, motor driven (service C motor)

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

FF-B-171 - Bearings, Ball, Annular, (General Purpose).
FF-N-836 - Nut: Square, Hexagon, Cap, Slotted, Castle, Knurled, Welding and Single Ball Seat.
FF-S-85 - Screw, Cap, Slotted and Hexagon Head.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

FSC 4140

FF-S-86 - Screw, Cap, Socket-Head.
FF-S-92 - Screw, Machine: Slotted, Cross-Recessed or Hexagon Head.
FF-S-200 - Setscrews: Hexagon Socket and Spline Socket, Headless.
FF-W-84 - Washers, Lock (Spring).
FF-W-92 - Washer, Flat (Plain).
QQ-A-225/7 - Aluminum Alloy Bar, Rod, and Wire; Rolled, Drawn, or Cold Finished, 5052.
QQ-A-250/7 - Aluminum Alloy, 5086, Plate and Sheet.
QQ-A-250/8 - Aluminum Alloy 5052, Plate and Sheet.
QQ-A-250/11 - Aluminum Alloy 6061, Plate and Sheet.
QQ-A-430 - Aluminum Alloy Rod and Wire; For Rivets and Cold Heading.
QQ-A-596 - Aluminum Alloy Permanent and Semipermanent Mold Castings.
QQ-A-601 - Aluminum Alloy Sand Castings.
TT-E-489 - Enamel, Alkyd, Gloss (For Exterior and Interior Surfaces).
TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.
TT-V-119 - Varnish, Spar, Phenolic-Resin.

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MIL-P-116 - Preservation, Methods of.
MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
MIL-S-1222 - Studs, Bolts, Hex Cap Screws, and Nuts.
MIL-C-16173 - Corrosion Preventive Compound, Solvent Cutback, Cold-Application.
MIL-E-16298 - Electric Machines Having Rotating Parts and Associated Repair Parts: Packaging of.
MIL-M-17059 - Motor, 60-Cycle, Alternating-Current, Fractional H.P. (Shipboard Use).
MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral-Horsepower, Shipboard Use.
MIL-B-17931 - Bearings, Ball, Annular, for Quiet Operation.
DOD-G-24508 - Grease, High Performance, Multi-Purpose (Metric).
MIL-I-45208 - Inspection System Requirements.

STANDARDS

MILITARY

MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
MIL-STD-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels in Ships of the United States Navy.

2.1.2 Other Government drawings. The following other Government drawings forms a part of this specification to the extent specified herein.

DRAWINGS

NAVSHIPS 803-921740 - Portable Ventilating Set, Air Turbine Driven.
NAVSEA 803-5001058 - Centrifugal Fans.

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AIR MOVING AND CONDITIONING ASSOCIATION (AMCA)

210 - Test Code for Air Moving Devices.
300 - Test Code for Sound Rating.

(Application for copies should be addressed to the Air Moving and Conditioning Association, 30 West University Drive, Arlington Heights, IL 60004.)

AMERICAN SOCIETY FOR TESTING AND MATERIAL (ASTM)

A 153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware. (DoD adopted)
A 386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products. (DoD adopted)
B 633 - Electrodeposited Coatings of Zinc on Iron and Steel. (DoD adopted)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Qualification. Fans furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

3.2 Material.

3.2.1 General. Commercial materials shall be permitted for fan parts, except castings. When not identified by Government specifications, steel and aluminum materials other than castings, shall be identified by American Iron and Steel Institute number or range of numbers (for example, AISI 1008 - 1020) or by Aluminum Association number (for example, 5052). Chemical or mechanical analysis shall be required only for castings.

3.2.2 Fabricated parts. Parts fabricated of steel plate, including casings for most fans, shall be of low carbon or medium carbon steel having a surface smoothness suitable for electroplating.

3.2.3 Aluminum alloy. Aluminum alloys shall conform to the requirements of table I (Federal Specifications for comparable alloys are enclosed in parentheses and listed for guidance, except as noted in 3.2.1).

TABLE I. Aluminum alloy materials.

Material	Commercial alloy	Applicable document
Plate and sheet	5086-H32 1/ 5052-H32 6061-T4 or T6	(QQ-A-250/7) (QQ-A-250/8) (QQ-A-250/11), T4, or T6
Bars, shapes, rod, wire, and rivets	5052-H32	(QQ-A-225/7) (QQ-A-430, Alloy 5052)
Sand castings	———	QQ-A-601, Alloys 356-0, or T6, A712.0, D712.0 or 713.0
Permanent mold castings	———	QQ-A-596, Alloy 356-T6

1/ Preferred for welded assemblies.

3.2.4 Cast iron. Cast iron shall not be used in any part of the fans, including the meters.

3.2.5 Hardware. Hardware shall conform to commercial standards. The following specifications are listed for guidance: cap screws, FF-S-85 or FF-S-86, as applicable; slotted-head machine screws, FF-S-92; hexagon-socket, headless set screws, FF-S-200; bolts, MIL-S-1222; nuts, FF-N-836; lockwashers, FF-W-84; and plain washers, FF-W-92. Except in specific applications requiring special hardware, these fittings shall be of carbon steel, electroplated with zinc to a minimum thickness of 0.0002 inch; ASTM B 633, SC 1 is listed for guidance. In general, the use of an adequate number of commercial threaded fittings is preferred to fewer fittings of medium or high tensile strength because replacements are readily available in case of loss.

3.2.6 Dissimilar metals.

3.2.6.1 Fasteners. Copper or brass fasteners shall be insulated from aluminum or aluminum alloys. Absorbent material shall not be used in contact with aluminum or aluminum alloys.

3.2.6.2 Surface contact. Both contact surfaces of aluminum or aluminum alloy with similar or dissimilar metals shall be painted with one coat of zinc chromate primer in accordance with TT-P-645 and two coats of aluminum paint before assembly.

3.2.6.3 Tapped holes. Tapped holes in aluminum shall be avoided unless there is no practicable alternative. If the thread is stressed or if withdrawal of the screw is necessary for maintenance, the thread shall be fitted with a corrosion-resistant steel insert. Otherwise, inserts may be omitted, in which case the thread of the screw shall be coated upon assembly with a mixture of 50 percent zinc dust and 50 percent petrolatum.

3.2.7 Nonmagnetic construction. If specified (see 6.2.1), fan units of nonmagnetic construction shall conform to the requirements of 3.2.7.1 through 3.2.7.3.

3.2.7.1 Fan parts. Fan parts, including scroll, inlet cone, flanges, vanes, impeller, motor support base, nuts, washers, and fasteners shall be constructed of nonmagnetic material.

3.2.7.2 Motors. Motors (all frame sizes) shall be constructed of a minimum practicable quantity of ferromagnetic material, preferably limiting its use to magnetic circuits.

3.2.7.3 Permeability. Nonmagnetic material shall be considered as that which has a permeability of less than 2.0 in the final condition.

3.2.8 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and shall be fabricated using materials produced from recovered materials to the maximum extent practicable 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. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.3 Welding and allied processes. Welding and allied processes shall conform to MIL-STD-278, except that only visual inspection of welds shall be required.

3.4 Plating of carbon steel parts. After welding, drilling, and machining operations have been completed, steel assemblies which are not corrosion-resistant shall be plated by one of the following methods, which are listed in preferred order. (ASTM B 633, SC 4; and ASTM A 153 respectively, are listed for guidance.)

Process	Plating thickness (min)	Document no.
Zinc electroplating	0.001 inch	ASTM B 633, SC 4
Zinc hot-dip	0.001 inch	ASTM A 153

3.4.1 Parts which can be disassembled shall be plated separately. Machining of the plating shall be permitted only as necessary for proper mating of parts; when the plating is removed from an area, that area shall be coated immediately with a zinc spray or a commercial repair compound.

3.5 Surface cleaning and painting.

3.5.1 Cleaning of aluminum alloy surfaces. Wherever practicable, cleaning of aluminum alloy shall be done prior to assembly of parts. Cleaning before assembly shall be accomplished by immersing the part in, or swabbing with a cleaner consisting of a diluted water solution of phosphoric acid and organic solvents. The solution temperature shall be approximately 70 degrees Fahrenheit (°F). The solution shall remain in contact with the metal for only 5 minutes. Residual solution shall be removed with clear water, followed by hot water until no trace of acid is detected. As an alternative method, after assembly, parts may be cleaned with a suitable solvent.

3.5.1.1 Sandblasting. Light sandblasting, following the use of the above solvents shall be permissible for producing a good adhering surface for paint, provided care is exercised to control the force and direction of the blast, so as not to distort or damage the material.

3.5.1.2 Welded parts. Welded parts shall have all traces of flux removed before painting. This may be accomplished by brushing the welds while immersed in boiling water. For inaccessible welds, the part may be cleaned by immersion in a cold solution of 10 percent sulfuric acid for 30 minutes, or a 5 percent solution of sulfuric acid held at 150°F for 10 minutes. The acid shall contact both the inside and outside surfaces. The acid treatments shall be followed by a thorough rinse in clean, warm water until no trace of acid is detected. Residual flux may be detected by leaching the surface with distilled water, and adding a few drops of 5 percent silver nitrate solution to the leach. A white precipitate will indicate the presence of flux.

3.5.2 Cleaning of galvanized surfaces. Zinc coated surfaces shall be treated with a cleaner consisting of phosphates, phosphoric acid, solvents and wetting agents to enable the surface to be coated with a thin phosphate coating. Where the galvanized material has not been acquired in the treated condition, the solution shall be applied to the galvanized surface with a large brush and allowed to act for not less than 1 minute. The surface shall then be washed thoroughly with cold water, then hot water, and primer applied when dry. Care shall be taken to minimize handling the surface following coating, and prior to the application of the primer.

3.5.3 Cleaning of miscellaneous metals. Corrosion-resisting steel, nickel copper alloy, and copper and brass surfaces that are to be painted shall be cleaned with a nonflammable solvent. Welds shall be brushed with corrosion-resisting metal wire brushes.

3.5.4 Painting. Exposed surfaces of fan impellers, interior surfaces of fan scrolls, exposed surfaces of all parts in the air stream and exterior surfaces of motors not previously painted, shall be given a coat of zinc-chromate primer in accordance with TT-P-645, followed by a coat of phenolic varnish in accordance with TT-V-119. The exterior of all fan scrolls (except type O fans) and conduit boxes shall be given two coats of zinc-chromate primer. The exterior surface of type O fans shall be given one coat of zinc-chromate primer, followed by a finish coat of red paint in accordance with TT-E-489.

3.6 Vibration. Each fan shall be in static and dynamic balance. This fan shall be balanced as an assembly using a General Motors synchronized unbalance indicator (PSUI) model #101 or any other assembly balancer having an equivalent network. When tested as specified in 4.8.3, the balance and vibration amplitude shall be in accordance with type I and type II of MIL-STD-167-1.

3.7 Identification.

3.7.1 Fan identification code. The size and characteristics of Navy standard fan motor units shall be designated by a code formed by alternate letters and figures arranged in the following sequence:

Symbol sequence	Characteristics	Code	Meaning
1 (letter(s))	Type of fan	See 1.2	---
2 (figure)	Fan size	For size codes, see table IV	Nominal cubic feet per minute (ft^3/min) of standard air in thousands (3/4 = 750 ft^3/min)
3 (letter)	Type of current:		
	CC and X-CC fan	A	Alternating current (a.c.)
	O fan	T	Turbine
4 (figure)	Voltage and phase (frequency of a.c. versus 60 hertz (Hz))	4	440-Volt (V), 3-phase a.c.

Symbol sequence	Characteristics	Code	Meaning
5 (letter)	Motor enclosures:		
		W	Spraytight
		X	Explosion-proof
		S	Submersible - 15 foot
6 (figure)	Maximum ambient temp	6	149°F
7 (letter(s))	Non-magnetic structure of fan and motor	-NM	(This seventh symbol is omitted unless applicable.)
	Rotation, centrifugal fans, (viewed from drive side)	-	
	- clockwise	-CW	
	- counterclockwise	-CCW	
	Non-sparking construction	-NS	
	Acid resisting paint on air handling parts	-AR	

Examples: 1. CC5A4W6CW-NS-WT represents a nominal 5000 ft^3/min centrifugal, non-sparking watertight fan, clockwise rotation, driven by a 440-V, 3-phase, 60 Hz a.c., spraytight, 149°F ambient temperature motor. Navy standard fans with special electrical characteristics shall have shortened fan codes, with electrical characteristics identified by text and preceded by the letter "S".

2. X-CC6A4W6 represents a nominal 6000 ft^3/min centrifugal fan with service C motor, driven by a 440-V, 3-phase, 60 Hz a.c., 149°F ambient temperature motor.

3.7.2 Identifying numbers. A National Stock Number (NSN) and a Component Identification Number (CID No.) will be assigned by the Government after drawing approval. They shall be used in shipping papers and shall appear on each identification plate.

3.7.3 Identification plates. Identification plates for fans having steel casings shall be of 300 series corrosion-resistant steel plate. Identification plates for fans having aluminum casings shall be of aluminum alloy. Identification plates shall be fastened with double backed adhesive. The background of the plate shall be etched and filled with black enamel; characters shall be raised or depressed and unpainted, the serial number shall be depressed into the metal by stamping. The CID No. may also be stamped, if not assigned at the time that plates are ordered. The plate format for type O fans shall be as indicated on Drawing 803-921740; plates for type CC and X-CC fans shall conform to figure 1. Except for type O fans, a duplicate motor identification plate shall be installed on the outside of the fan casing, this plate and the

fan plate being located in line axially with the conduit box or cable entrance. If there is insufficient space on the casing without drilling through the fan race, the motor plate may be located circumferentially adjacent to the fan plate. It shall be acceptable to combine the fan and motor data on a single plate.

3.8 Technical data. The contractor shall prepare technical data and drawings in accordance with the data ordering documents included in the contract or order (see 6.2.2) and as specified in 3.8.1 through 3.8.3.

3.8.1 Drawings. In addition to the drawing content required by the data ordering document included in the contract or order (see 6.2.1 and 6.2.2), the features specified herein shall be included.

3.8.2 Fan assembly drawing. The fan assembly drawing shall include the following:

(a) A longitudinal, sectional view of the fans, showing arrangement of components parts which are identified by piece number flagging. All welds shall be indicated by standard weld symbols. The following additional data shall be shown in this view:
  (1) Keyway dimensions of the impeller hub, impeller hub bore diameter and tolerance expressed in ten thousands of an inch.
  (2) Location on the scroll of fan and motor identification plates.

(b) An end view of the fan, showing the direction of impeller rotation.

(c) If necessary for clarity, separate details of the motor mounting, conduit, and conduit box.

(d) General notes, including the following:
  (1) A statement that the fan conforms to MIL-F-19004 and applicable drawing (indicate 803-5001058 or 803-921740).
  (2) A statement directing reference to a fan certification data sheet for identification of electrical components and specific fan motor test data, center of gravity, and moments of inertia.
  (3) A statement of the permissible tolerance for all untoleranced dimensions.
  (4) Indication of the method of securing the impeller hub in the backplate.
  (5) Statements identifying the plating, welding, and painting of components or assemblies.
  (6) Indication of the method of balancing the fan impeller.
  (7) A statement of the minimum scroll wall thickness.
  (8) Identification of any carbon steel surface which may be machined after plating, and a statement of the treatment of such area prior to painting.
  (9) Any other statements necessary for clarity.
  (10) At the manufacturer's option, statements for manufacturer's use only, so designated.

(e) A LOG-LOG graph, with cubic feet of standard air per minute (ft^3/min) as the abscissa, and total pressure, static pressure, speed in revolutions per minute (r/min), brake horsepower (hp), power input (kilowatt (kW)), or input hp, as ordinates. The graph shall be identified by fan code if it applies to a Navy standard fan, and by the test number and date.

(f) For Navy standard type 0 fans, a detail of the compressed air hose connections, carrying handle, intake bells, transition, and protection screens.

3.8.3 Auxiliary drawings. Drawings of motors used with fans shall conform to the requirements of MIL-M-17059 and MIL-M-17060.

3.9 Type CC and X-CC centrifugal fans.

3.9.1 General. Type CC and X-CC fans shall conform to the requirements specified herein and to those of Drawing 803-5001058. Fans larger than CC 1/4 and X-CC 1/4 shall be of non-overloading type. Fans and motors shall be suitable for operation in horizontal (on ship axis or athwartship) or inclined position. Unless otherwise specified in the contract (see 6.2.1), fans shall be furnished complete with motors and shall be direct-driven units with fan impeller overhung on motor shaft.

3.9.1.1 High impact shock resistance. Design and construction shall be such that type CC fan motor units will pass the shock test of 4.8.6 and test requirements for type A, class 1, MIL-S-901. "Passing the shock test" means that the fan motor unit, following shock test, can pass all other tests specified in 4.8.1, 4.8.2, 4.8.3, and 4.8.7.

3.9.1.2 Standardization considerations. Weights of Navy standard fans shown on Drawing 803-5001058 shall be the maximum weights of fans equipped with polyphase spraytight motors.

3.9.1.3 Rotation. Discharge and rotation of type CC and X-CC fans shall be determined by viewing the fan from the motor end. The rotation shall be designated by the terms "clockwise" and "counterclockwise". Discharge of a fan shall be determined by the direction of the line of discharge and its relation to the motor shaft when the fan is resting on the floor, as shown on figure 2.

3.9.1.4 Installation. Fans shall be so constructed that they may be installed on deck, or suspended from the deck above. Construction and arrangement of the fan assembly shall be such that fan impeller and motor may be removed from the fan scroll without disconnecting the fan from the discharge or intake ducts. Fans shall be of a single inlet type, unless otherwise specified in the contract (see 6.2.1).

3.9.1.5 Stabilization. Fans shall be stable when placed without bolting on a level floor.

3.9.2 Fan scrolls and associated parts.

3.9.2.1 Material. Scrolls, flanges, inlet cone, and vanes (see figure 3) shall be made from steel plate except nonmagnetic construction. The nonmagnetic fans shall be made from aluminum plate.

3.9.2.2 Watertightness. Scrolls shall be of watertight construction. Pressure tests for tightness shall be required as specified (see 4.8.4).

3.9.2.3 Material thickness. Scrolls and flanges of sizes CC 2 and X-CC 2 fans and smaller, when other than of aluminum, shall be not less than 0.078-inch thick, and aluminum alloy scrolls and flanges not less than 0.117-inch thick. Scrolls and flanges of size CC 3 fans and larger when other than of aluminum shall be not less than 0.125-inch thick, and aluminum alloy scrolls and flanges not less than 0.187-inch thick.

3.9.2.4 Fan and motor supports. Fan and motor supports and sub-bases shall be of welded steel plate, structural steel or cast steel.

3.9.2.5 Fan scrolls. Scrolls shall be equipped with vaned inlet sections designed to reduce turbulence and noise. Direction of rotation of the impeller shall be indicated with raised letters on the inlet side of the scroll. Unless otherwise specified in the contract (see 6.2.1), fans shall be assembled for top-horizontal discharge.

3.9.2.6 Scroll interior. Interior of fan scrolls shall be smooth and free from obstructions such as bolt heads and nuts, or ends of bolts extending beyond metal surfaces, which may collect dirt and lint or cause noisy operation of fans. Where removable bolts are used in the fan scroll, they shall have countersunk heads and be inserted from inside the scroll with nuts on the outside. Bolts with standard heads may be inserted from the outside and the fan structure shall be tapped to receive them, in which case the ends shall not project inside the scroll.

3.9.2.7 Motor base. Unless otherwise specified in the contract (see 6.2.1), the motor base shall be so designed that the overhang of the fan impeller will be reduced to a minimum and shall be high enough to accommodate an up-blast discharge fan (see figure 2).

3.9.2.8 Handhole opening. A handhole of sufficient size, with cover and gasket, shall be provided in the scroll of sizes CC 1-1/2 and X-CC 1-1/2 fans and larger for cleaning the impeller. The opening shall be located at the point nearest the fan impeller as shown on Drawing 803-5001058.

3.9.2.9 Flanges. Fan scrolls shall be provided with drilled inlet and outlet flanges for the attachment of ducting. Inlet flanges shall be circular and outlet flanges shall be rectangular in shape. Size and quantity of holes drilled in the inlet and outlet flanges shall be as specified on Drawing 803-5001058.

3.9.2.10 Coating. Built-up sections of steel plate fan scrolls, supports and motor bases shall be galvanized by the hot dip process or made up of galvanized sheets with seams covered by zinc spray, electro-brush plating or hot application of commercially pure zinc. The zinc coating of hot-dipped assemblies and galvanized sheets shall conform to ASTM A 386. Zinc spray coatings shall be not less than 1/32-inch thick. Parts of fans capable of being disassembled shall be galvanized individually.

3.9.3 Fan impellers.

3.9.3.1 Material. The impeller, consisting of hub, inlet plate, back plate and blades shall be of aluminum alloy (see 3.2.3).

3.9.3.2 Strength. Impellers shall have a safety factor of 8, based on the ultimate tensile strength of the material.

3.9.3.3 Design. Fan impellers shall be direct-connected and overhung on the motor shafts. The fan shall be so designed that the overhang will be reduced to a minimum. Fan impellers shall be smooth and free from projecting bolt heads and nuts or other projections which might catch dirt and lint or cause noisy fan operation. Fan blades of sizes larger than CC 1/4 and X-CC 1/4 shall be of airfoil design (see 3.9.1).

3.9.3.4 Balancing. Balancing of the impeller shall be accomplished by removal or addition of metal depending on the impeller thickness and size.

3.9.3.5 Impeller mounting. The impeller shall be keyed on the shaft with two set screws in the hub, one located over the key, and one 120 degrees away, leading rotation.

3.9.4 Electrical equipment for type CC and X-CC fans.

3.9.4.1 Motors. Motors shall be as specified in 3.9.4.1.1 through 3.9.4.2. Motors shall conform to MIL-M-17059 and MIL-M-17060, as applicable and as augmented herein.

3.9.4.1.1 General requirements. Motors shall conform to the following:

Service: Fan type CC - Navy service A.
Fan type X-CC - Navy service C.
Frame and hp: As specified in table II and 3.9.4.1.3.
Design: Squirrel cage induction.
Duty: Continuous.
Voltage and phase: 440-V, 60 Hz, 3-phase.
Enclosure: Explosion-proof, spraytight labyrinth shaft seals both ends (seals with shaft rubbing elements shall not be used).
Insulation: Class F in accordance with MIL-E-917.
Bearing: Ball (see 3.9.4.1.3).
Torque and current class: Table III and 3.9.4.2.
Ambient temperature: 149°F.
Speed class: Constant.
Speed: Nominal speed as shown in table II.

TABLE II. Speed and horsepower of motors, type CC and X-CC fans.

Fan size	No. of winding	Maximum hp	R/min	Power 60 Hz
1/4	1	1/4	1800	440 - 3ø
1/2	1	3/4	1800	440 - 3ø
1	1	1	1800	440 - 3ø
1-1/2	1	1	1800	440 - 3ø
2	1	1-1/2	1800	440 - 3ø
3	2	3	1800/1200	440 - 3ø
4	2	4	1800/1200	440 - 3ø
5	2	5	1800/1200	440 - 3ø
6	2	5	1200/900	440 - 3ø
8	2	7-1/2	1200/900	440 - 3ø
10	2	10	1200/900	440 - 3ø

3.9.4.1.2 Conduit boxes. A watertight conduit box of fabricated steel, cast aluminum, nodular or malleable iron shall be provided on the motor. Leads connected within the box to terminals shall be fitted with solderless connectors.

3.9.4.1.3 Bearings. Motors shall be equipped with ball bearings, conforming to FF-B-171, type 111, class 1, 2 or 7. Bearing sizes shall be as follows:

Fan size type CC or X-CC	Motor frame size	Shaft diameter	Minimum bearing size	
			Drive end	Front end
1/4, 1/2, 1, 1-1/2	56	7/8	305	203
2	182	1-1/8	307	305
3	184	1-1/8	307	305
4, 5	213	1-3/8	308	306
6	254	1-5/8	310	308
8, 10	256	1-5/8	310	308

When special bearings for quiet operations are specified (see 6.2.1), they shall conform to MIL-B-17931.

3.9.4.1.3.1 Grease. Standard motor bearing grease shall be in accordance with DOD-G-24508.

3.9.4.1.3.2 Mounting. The inner ring of the drive end bearing shall be axially positioned against a shaft shoulder and be held by either a locknut and lockwasher or a locknut with nylon insert. The outer ring of the drive end bearing shall be held axially between bearing caps or a housing shoulder and a bearing cap. On the front end, a housing shoulder may be omitted if the bearing is held axially on the shaft; if a housing shoulder is provided, the axial clearance between the bearing and the shoulder shall accommodate thermal linear expansion of the shaft and shall be stated on the applicable drawing. If a loading spring is used with the front bearing, the deflection due to shaft expansion shall be included in the total designed spring deflection.

3.9.4.1.4 Motor shafts. Shaft shoulders shall be provided for axially positioning each bearing and the fan impeller. Shoulder positioning is preferred for the rotor of motors. Keys and keyways shall be provided in way of bearing lockwashers on the rotor, and on the shaft extension, except that rotor keys need not be provided on fractional hp frame motors when there is an interference fit and the shaft is scored axially. If the shaft is not of corrosion-resistant material, the shaft extension shall be coated with corrosion preventive compound, in accordance with MIL-C-16173, grade 1, before mounting of the fan impeller.

3.9.4.1.5 Motor and efficiency. Material shall be cast steel, nodular or malleable iron, or aluminum for Navy service A motors used with fan type CC and X-CC. Minimum efficiency of motors shall be as specified in table III.

3.9.4.1.6 Balancing. The preferred method of balancing motor rotating assemblies is by removal of material from the rotor or from discs provided for this purpose.

3.9.4.1.7 Drains. All spraytight motors shall be provided with not less than four condensate drain holes fitted with 1/8-inch diameter pipe plugs. These holes shall be positioned at 90, 135, 225, and 270 degrees from the conduit centerline.

3.9.4.1.8 Magnet wire. Standard whole sizes of round wire listed in MIL-E-917 shall be used in all motors and shall be shown on applicable drawings for rewinding use.

3.9.4.2 Torque and locked rotor current. Torque and locked rotor current shall be as specified in table III.

TABLE III. Torque and efficiency of motors, type CC and X-CC fans.

Fan size	Locked rotor current	TORQUE			Efficiency percent
		Locked rotor percent minimum	Breakdown as specified	Pullup percent minimum	
1/4	MIL-M-17059 + 10 percent	70	MIL-M-17059	70	79
1/2	MIL-M-17059 + 10 percent	70	MIL-M-17059	70	86
1	MIL-M-17059 + 10 percent	70	MIL-M-17059	70	86
1-1/2	MIL-M-17059 + 10 percent	70	MIL-M-17059	70	86
2	MIL-M-17060 as specified	70	MIL-M-17060	70	87
3	MIL-M-17060 as specified	70	MIL-M-17060	70	85
4	MIL-M-17060 as specified	70	MIL-M-17060	70	85
5	MIL-M-17060 as specified	70	MIL-M-17060	70	86
6	MIL-M-17060 as specified	70	MIL-M-17060	70	86
8	MIL-M-17060 as specified	70	MIL-M-17060	70	88
10	MIL-M-17060 as specified	70	MIL-M-17060	70	88

3.9.4.2.1 Speed-torque characteristics. The speed-torque characteristics shall be coordinated with the combined inertia of the rotating assembly, including fan impeller. It shall be possible to accelerate the fan unit from standstill to high or low speed at 90 percent of rated voltage when the current rating of the controller overload protective device does not exceed the motor rated full load current.

3.9.5 Fan performance.

3.9.5.1 Volume and pressure. The design point for each size of Navy standard centrifugal fans is the volume-pressure point at the maximum total pressure (TP) shown for that size on Drawing 803-5001058. The TP shall rise continually from free delivery to a value at least as high as the stated volume shown in table IV, and throughout this range shall exhibit stable performance. Volume in ft^3/min shall be within 5 percent of the volume on the applicable curve of Drawing 803-5001058, as indicated on system characteristic curves. Total pressure developed by a fan is the pressure at the fan discharge, and the volume is the volume at fan inlet.

TABLE IV. Performance of type CC and X-CC fans.

Fan size	Minimum TP at stated volume	
	ft^3/min	TP (inch H_2O)
1/4	180	1.74
1/2	400	2.5
1	760	2.5
1-1/2	980	2.58
2	1090	3.06
3	1760	4.25
4	2300	5.25
5	2750	5.3
6	4500	4.0
8	4050	5.2
10	6350	5.0

3.9.5.2 Noise level. The noise level shall be in accordance with the values specified in table V plus 3 decibels (dB) tolerance.

TABLE V. Sound power levels in dB re 10^{-12} watt.

Fan size	Octave band center frequency - Hz							
	63	125	250	500	1000	2000	4000	8000
1/4	87	85	88	74	73	69	62	54
1/2	86	87	85	75	72	71	63	56
1	89	87	80	76	75	70	65	62
1-1/2	91	89	82	78	77	72	67	64
2	92	91	85	83	81	80	78	69
3	94	92	92	91	88	84	75	72
4	96	92	92	91	89	85	76	72
5	97	93	93	92	90	86	77	73
6	91	89	88	84	79	76	70	65
8	95	96	91	90	87	86	83	78
10	97	98	93	92	89	88	85	80

3.10 Type O, centrifugal, portable, air turbine driven fans.

3.10.1 General. Type O, air turbine driven, portable ventilating fans shall be in accordance with Drawing 803-921740, and as specified herein. The fans shall be complete with inlet elbow and discharge connection, screens, and fittings as shown on the applicable drawing.

3.10.1.1 Turbine wheel and fan rotor. Turbine wheel and fan rotor shall be mounted on opposite ends of a common shaft supported by two ball bearings mounted in the turbine casing or unit base. Bearings shall conform to type 120 of FF-B-171, and prelubricated with grease in accordance with DOD-G-24508. The complete fan assembly shall be mounted on a base with supporting foot and suitable handle.

3.10.1.2 Stuffing box. If required, a stuffing box shall be provided to prevent leakage of air from the exhaust chamber along the shaft.

3.10.2 Fan impeller. Parts of fan impellers that are not cast shall be die-formed. All parts of fan impellers shall have a safety factor of not less than 8, based on the ultimate tensile strength of the materials involved.

3.10.3 Turbine. The turbine shall be of the velocity compounded type having a reversing chamber. Turbine blades shall be cast into the turbine impeller with a shroud band around the periphery of the buckets or the complete rotor may be machined from one piece of cast aluminum. The compressed air inlet to the turbine shall be a 1/2-inch nominal pipe size (nps) screwed connection, and the exhaust shall be a 1-inch nps screwed connection.

3.10.3.1 Bellmouth intakes. Inlet bell for type O fan is shown on Drawing 803-921740.

3.10.4 Fan performance.

3.10.4.1 Volume and pressure. The design point for this fan shall be the volume-pressure point of 750 ft^3/min at a static pressure of 3 inches H_2O. At 750 ft^3/min, operation shall be stable and the static pressure shall be within the limits of 3 and 3.5 inches H_2O, when tested in accordance with 4.8.1.

3.10.5 Economy. Economy of the fan and turbine at the design point shall be not greater than 60 ft^3/min of free air at 80 pounds per square inch.

3.11 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance and strength.

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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Inspection system. The contractor shall provide and maintain an inspection system acceptable to the Government for supplies and services covered by this specification. The inspection system shall be in accordance with MIL-I-45208.

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

(a) Qualification tests (see 4.3).
(b) Type tests (see 4.4).
(c) Periodic tests (see 4.5).
(d) Routine tests (see 4.6).

4.3 Qualification tests. Qualification tests shall be conducted at a laboratory satisfactory to NAVSEA and shall consist of the tests specified in table VI.

TABLE VI. Test agenda.

Tests	Applicability of test fan type				Requirement paragraph	Test paragraph
	Qualification 1/	Type 2/	Periodic 2/	Routine 3/		
Performance	All	All	All	---	3.9.5 and 3.10.4	4.8.1
Noise - by meter	CC, X-CC	CC, X-CC	CC, X-CC	---	3.9.5.2	4.8.2.2
- by meter	---	---	---	CC, X-CC	---	4.8.2.2
- by ear	---	---	---	CC, X-CC	---	4.8.2.3
Vibration	All	All	All	All	3.6	4.8.3
Casing tightness	---	---	---	CC, X-CC 4/	3.9.2.2	4.8.4
Speed	---	---	---	All	3.9.4.1.1	4.8.5
Shock	CC	CC	---	---	3.9.1.1	4.8.6
Motor heat with fan	CC, X-CC	CC, X-CC	CC, X-CC	---	---	4.8.7

1/ Applies to test specimen of the types indicated.
2/ Applies to test specimen for each design of each size of the types indicated.
3/ Applies to every fan motor unit produced.
4/ Scroll tightness test is required only when specified in the contract.

4.3.1 Samples for qualification. One fan-motor unit of each type CC, X-CC or or O fan for which qualification is desired shall be tested. Only one size of each type shall be required for qualification testing, the choice of size to be determined by the manufacturer. Qualification of the size submitted shall include qualification for all sizes for that type. The motor for a type CC and X-CC fan shall be designed for a 440-V, 60 Hz, 3-phase power source.

4.4 Type tests. Type tests are in-depth tests of fan motor units of any type and size by producers whose product of the type being tested is listed in the Qualified Products List. They shall be conducted prior to production on each new fan motor unit, unless a previous test of a similar unit is considered applicable and is extended by NAVSEA. In general, such extensions will be granted if the fan is similar aerodynamically and the motor is of identical manufacture and of identical frame size, provided that the speed and heating of fractional motors shall be determined by a heat test with the motor installed with the fan. The type O test fan shall be submitted complete with turbine. Type tests shall consist of the tests specified in table VI.

4.5 Periodic tests. Periodic tests shall be required to assure continuing satisfactory operation of identical units. The tests shall be required under any contract for fans of existing design when the invitation is dated four years or more subsequent to the date of the last previous test of a similar unit. Periodic tests shall consist of the tests specified in table VI.

4.6 Routine tests. Routine tests are required on every fan motor unit. These tests are specified in table VI.

4.7 Material inspection.

4.7.1 Casting for type O fan. Test samples of casting shall be inspected for chemical content and mechanical properties in accordance with QQ-A-601. There shall be no requirement for radiography of visually sound castings. Repairs of cast wheels shall not be permitted. Cast casings may be repaired in emergencies by welding or impregnation, subject to radiographic inspection and NAVSEA approval for each casting involved.

4.7.2 Fabricated scroll for CC and X-CC fans. Visual examination for defects shall be required especially at the base of flanges. Cracks in the radius of spun flanges or in the welds of welded flanges may be repaired by welding, after proper preparation, provided that radiographs of the repaired areas are approved by NAVSEA. If a flange defect exists on many fans of the same lot, additional shock tests may be required. Wall thickness shall be measured on at least ten percent of the scrolls (see 3.9.2.3 and 3.9.2.9 for wall thickness and flange construction requirements).

4.7.3 Electrical components. Inspection shall be performed at the source in accordance with the applicable component specification. Acceptable performance shall be confirmed in routine tests (see 4.8.7 for motor heat tests).

4.8 Tests.

4.8.1 Performance. Performance tests shall be conducted in accordance with AMCA 210 for type CC, X-CC and O fans. The air consumption of the air turbine for the type O fan shall be measured with an area meter "Rotometer" or equal installed at the air inlet side of the turbine and have a range of 0 to 100 ft^3/minimum or less with an accuracy of plus or minus 2 percent of the maximum flow rate.

4.8.2 Noise. These tests are defined as meter tests consisting of sound power determinations, and testing by sound meter.

4.8.2.1 Sound power. Sound power shall be computed in accordance with AMCA 300. Sound power levels shall be taken in each octave band (series 2) with fan operating at the design point or minimum volume shown on Drawing 803-5001058, and shall be referenced to a power of 10^{-12} watts. For any production of fans where sound power has not been reported and where previous type tests are extended, this test shall be performed to augment the test results.

4.8.2.2 Noise by sound meter. Fan motor units not required to be tested under 4.8.2.1 shall be tested by a sound meter to check the comparability of its noise level with a fan motor unit of the same size which has been tested and passed the requirements of 4.8.2.1. The room used for this test shall be large with a high ceiling and with a volume of not less than 6000 ft^3. The ambient noise level shall be checked frequently, with the fan shut off and it must be 10 dB or more below the lowest reading observed during the fan test. A minimum of six readings on C response weighting network shall be taken in a circle around the fan, 60 degrees apart and 60 inches away. The average number of readings shall be applied.

4.8.2.3 Noise by ear. Fan motor units shall be operated at maximum speed and free delivery. Any unusual noise heard by the human ear shall be corrected.

4.8.3 Vibration. Fan-motor units except for type O fan-motor units shall be subjected to type I environmental vibration tests as specified in MIL-STD-167-1. The exploratory vibration test specified in MIL-STD-167-1 shall include frequencies from 34 Hz up to and including 50 Hz at the table amplitude specified therein. The vibration test shall be conducted prior to the tests specified in 4.8.1, 4.8.2, 4.8.7, and the correction of damages, which may have occurred during vibration tests shall not be performed prior to these tests. For balance the fan-motor unit shall rest on a level floor with shaft horizontal and without being secured. Amplitude of vibration measurements and vibration instrument mounting shall be in accordance with MIL-STD-167-1, type II. The maximum amplitude of vibration shall be the maximum single reading, and not an average. The frequency at which the maximum amplitude occurs shall be measured. The natural frequency of the fan/motor/bedplate shall not be within plus or minus 10 percent of any exciting frequency generated by the fan and motor.

4.8.4 Scroll tightness. When this test is required, the requirement as well as the test conditions shall be specified in the contract or purchase order (see 6.2.1). If conditions are not specified, the test shall be conducted as follows: Blind flanges (one with air supply and gauge connections) shall be bolted to fan flanges with gasket installed and shaft holes in the drive side plate shall be blanked off. Air at a pressure of 50 percent higher

than the maximum pressure capability of the fan shall be applied to the scroll interior. The pressure drop in 10 minutes shall not exceed 5 percent of the test pressure.

4.8.5 Speed. The fan motor unit shall be operated at each speed at free delivery to determine whether the speed conforms with design speed at rated voltage, as specified in table II.

4.8.6 Shock. Complete type CC fan motor units shall be tested in accordance with applicable paragraphs of MIL-S-901, type A, class I, and as follows: Fans shall have intermediate mounting as shown on figure 4. Assemblies subjected to shock test may be delivered to the Government as production units, provided that the bearings are replaced, all other parts are thoroughly inspected (and replaced, if necessary), and the units perform as required of production units.

4.8.7 Heat. Motor heat shall be measured as specified in the applicable motor specification. In each test, the motor shall be installed with the fan, and a duct shall be attached to the fan discharge. Full load at either high or low speed shall be obtained by means of a terminal throttle on the test duct. As indicated in table VI, the retest of a specific fan motor unit is a periodic test; test frequency shall conform to 4.5 in lieu of the requirement in the motor specification.

4.9 Test reports. The contractor shall prepare reports in accordance with data ordering documents included in the contract or order (see 6.2.2) for the following:

(a) Performance test (see 4.8.1). Performance test with the following unique technical features:
  (1) The figure number of AMCA 210 shall be identified.
  (2) The duct or chamber dimensions and the diameter of nozzle, if used, shall be identified.
  (3) The following values shall be reported in tabular form: ambient barometric pressure, dry bulb and wet bulb temperatures, and air density; voltage and current; motor input, kW or hp; air quantity (ft^3/min); mechanical (total) efficiency; electrical efficiency; sound power.
  (4) A curve sheet shall be included in the report showing motor input, brake hp, fan speed, total and static pressures of standard air at fan discharge as ordinates, and cubic feet of standard air per minute at fan inlet as the abscicca.

(b) Noise test (see 4.8.2.1). Noise test with the report of sound power at specified load in each octave band.

(c) Vibration test (see 4.8.3). Vibration test with the report of incremental frequency range covering 0 to 50 Hz in 5 Hz increments. Balance test with the report of maximum amplitude of vibration at free delivery and frequency at which it occurs.

(d) Shock test (see 4.8.6). Shock test with the following:
  (1) Drawing number identification of the fan and motor.
  (2) Photographs of the fan unit in each test mounting.

(e) Motor heat test (see 4.8.7). Motor heat test including tables of motor heating at maximum fan load for each speed.

(f) Periodic test (see 4.5).

4.10 Inspection of packaging. Sample packages and packs and inspection of the packaging, packing, and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The preparation for delivery requirements specified herein apply only for direct Government acquisitions. For the extent of applicability of the preparation for delivery requirements of required documents listed in section 2, see 6.6.)

5.1 Preservation-packaging of fan motor units. Preservation-packaging shall be level A or C, as specified (see 6.2.1).

5.1.1 Level A. Fan motor units shall be unit protected method II (submethod at manufacturer's option) in accordance with MIL-P-116.

5.1.1.1 Level A alternative. An acceptable method II package for types CC, X-CC and O fan motor units can be provided as follows:

(a) The threaded connections in the conduit box shall be fitted with pipe plugs.
(b) Attach bagged desiccant to the inside of the scroll in accordance with MIL-P-116.
(c) Bolt a rubber disc gasket and a blind gasket of half-inch plywood or steel plate to the face of each of the scroll flanges.
(d) Install a humidity indicator in accordance with MIL-P-116 in one of the blind flanges.
(e) Mark the package: "Method IId Modified Package. Remove Desiccant Prior to Installation."
(f) No application of preservative is required.

5.1.2 Level C. Preservation and packaging shall be sufficient to afford adequate protection from the supply source to the first receiving activity and may conform to the contractor's commercial practice.

5.2 Packing and marking of fan motor units. Packing shall be level A, B, or C, as specified (see 6.2.1). Packing and marking shall conform to MIL-E-16298.

5.2.1 Wirebound wood boxes. Where wirebound boxes are permissible (see MIL-E-16298), they may be used with the package described in 5.1.1.1 subject to the following conditions:

(a) The blind flanges attached to the fan scroll shall be square or rectangular.
(b) The width of the box sides shall match the flanges, and a cleat, beveled 45 degrees on each end, shall be secured to each box side, so that the box can be wrapped around the flanges, with the cleats on the outide of the flanges.

5.3 Detached accessories. Detached accessories for type O fans shall be preserved-packaged level A or C, packed level A, B, or C, and marked as specified (see 6.2.1) in accordance with MIL-E-16298.

5.4 Restriction in use of polystyrene (loose-fill) material.

5.4.1 For domestic shipment and early equipment installation and level C packaging and packing. Unless otherwise approved by the contracting activity (see 6.2.1), use of polystyrene (loose-fill) material for domestic shipment and early equipment installation and level C packaging and packing applications such as cushioning, filler and dunnage is prohibited. When approved, unit packages and containers (interior and exterior) shall be marked and labeled as follows:

"CAUTION

Contents cushioned etc. with polystyrene (loose-fill) material. Not to be taken aboard ship. Remove and discard loose-fill material before shipboard storage. If required, recushion with cellulosic material bound fiber, fiberboard or transparent flexible cellular material".

5.4.2 For level A packaging and level A and B packing. Use of polystyrene (loose-fill) material is prohibited for level A packaging and level A and B packaging applications such as cushioning, filler and dunnage.

6. NOTES

6.1 Intended use. Fan motor units specified herein are intended for ventilation and air conditioning applications only on board ships and craft of the United States Navy. Direction of airflow into and out of the fans is radial. Fans are of nonsparking construction. Fans with motors rated for 149°F ambient temperature are standard, except for type O fan which has an air turbine.

6.1.1 Centrifugal fans, type CC and X-CC. Type CC and X-CC fans are high efficiency units intended for systems having a resistance above 0.6 inch H_2O and up to 1.74 inches H_2O for the smallest fans and above 1.0 inch H_2O and up to 5.3 inches H_2O for larger fans. Type CC fans are nonsparking and shockproof. Type X-CC fans are nonsparking with service C motor.

6.1.2 Portable fans, type O. Type O fan, available in a single size (rated at 750 ft /min and 3.0 inches H_2O static pressure), is intended for emergency cooling of equipment and ventilation of nonventilated spaces. It is always used with ventilation hose, which may be attached to the fan inlet or outlet, or both ends. Exterior surfaces of the fan are of aluminum to avoid sparking when bumped against steel bulkhead.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

(a) Title, number and date of this specification.
(b) Type required (see 1.2).

(c) Fan characteristic code in accordance with 3.7, including fan type (see 1.2), size (see 3.9.1) type of motor current, voltage and phase (see table II), and nonmagnetic construction, if applicable (see 3.2.7).
(d) How type CC and X-CC fans will be furnished (see 3.9.1).
(e) If fan is other than single inlet type (see 3.9.1.4).
(f) If fans are to be assembled for top-horizontal discharge (see 3.9.2.5).
(g) If design of motor base is other than specified (see 3.9.2.7).
(h) When special bearings for quiet operation are required (see 3.9.4.1.3).
(i) Level of preservation packaging and packing required (see 5.1 and 5.2).
(j) Special marking, if required (see 5.3).
(k) If use of polystyrene material is permitted (see 5.4.1).
(l) New drawings for approval. In view of the standardization of Navy standard fans, two prints of each new assembly drawing of a Navy standard fan are to be submitted to NAVSEA for approval. The submission should include two prints of the drawing of the motor proposed for use with a fan. Thirty days from the date of receipt should be allowed for drawing approval. Prints are to be submitted to other activities as required in the contract.
(m) Final drawings. After approval comments on new drawings are incorporated or reconciled, final fan and electrical drawings are to be submitted. Distribution of final drawings should include special requirements of the contract.
(n) Submission of previously approved drawings for application approval. Distribution will conform to contract requirements. Submission to NAVSEA is not required unless the latest revision of each drawing has not been submitted to NAVSEA previously.
(o) Approval notation on drawings. The letter granting approval for drawing should be cited in, or adjacent to, the title block. When revisions are made to approved drawings, the revision symbol in the title block and appropriate notation (indicating the changes and followed by "In accordance with NAVSEA letter _____" or "Manufacturer's change") should be made to the revision block.

6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions of DAR 7-104.9 (n)(2) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification is cited in the following paragraphs:

Paragraph no.	Data requirements title	Applicable DID no.	Option
3.8	Drawings, engineering and associated lists	DI-E-7031	Level 3 Design activity designation - contractor Drawing No. - contractor Delivery of hard copy contracting activity
3.8	Imaged aperture/ tabulating cards	DI-E-20477	Microfilming of drawing on aperture cards - type I, class I or type II, class 2
4.9	Inspection and test reports	DI-T-5329	AMCA 210 and AMCA 300
4.9	Reports, test	DI-T-2072	10.1.b
4.9	Reports, vibration test	UDI-T-23762	---
4.9	Reports, equipment shock test	UDI-T-23753	---

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in section 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract (not more than five years old) for identical item acquired to this specification. This does not apply to specific data which may be required for each contract, regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List QPL-19004 whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea

Systems Command, SEA 55Z3, Department of the Navy, Washington, DC 20362, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.4.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.5 Technical manuals. Technical manual NAVSEA 0901-LP-512-000, a reduced size print of each fan and electrical drawings shall be furnished for ship's files, and they provide all necessary data. Prints should be reduced 50 percent, providing legibility is not affected.

6.6 Sub-contracted material and parts. The preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

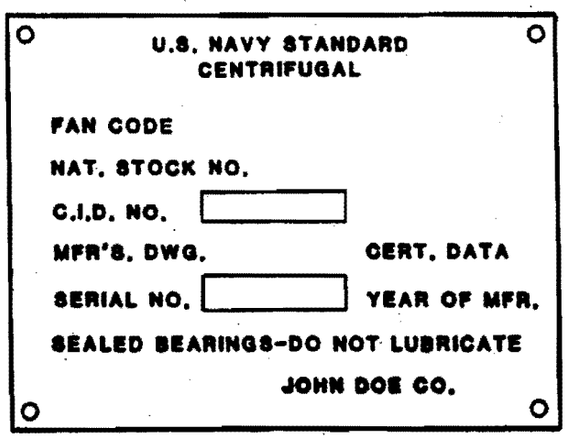
6.7 Standardization. In view of the standardization of Navy standard fans, type CC, X-CC and O, the acquisition of these fans from any source under qualified products list QPL-19004 is considered to indicate compliance with shipboard standardization requirements.

6.8 Non-standard fans. When non-Navy standard fans are permitted in the contract, this specification may be used for construction requirements. Navy standard fan characteristics codes shall not be used.

6.9 Type C. Type C of MIL-F-19004(SHIPS) dated 30 August 1955 has been replaced by types CC and X-CC of MIL-F-19004A(SH).

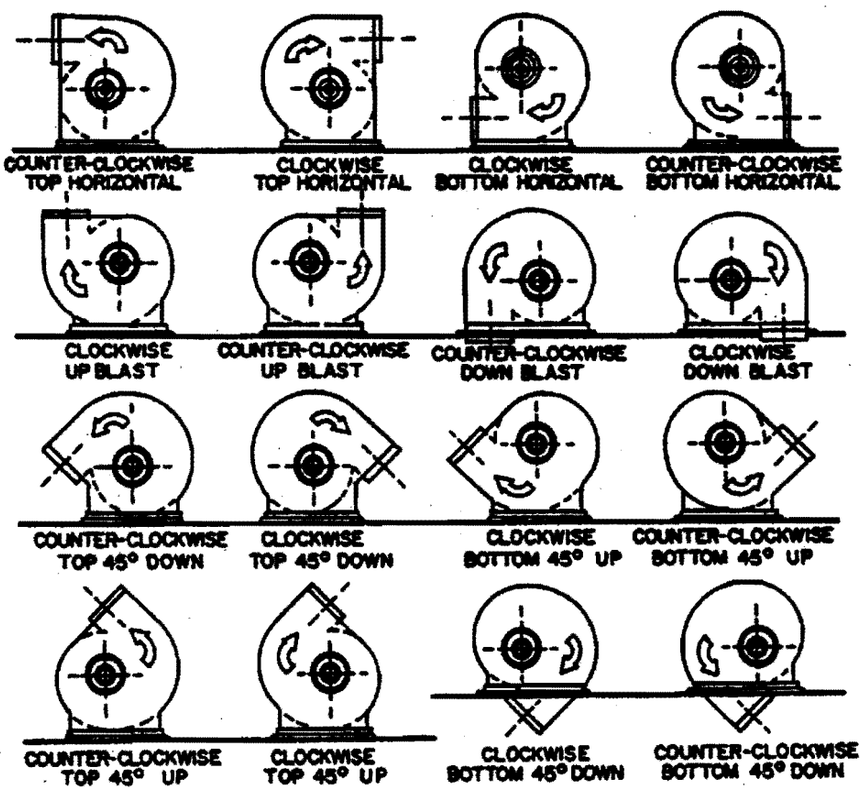
6.10 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Preparing activity:
Navy - SH
(Project 4140-N038)



SH 12098

FIGURE 1. Identification plate, Navy standard centrifugal fan.



DISCHARGE DIAGRAMS

ALL DISCHARGE SHALL BE BASED ON FLOOR MOUNTINGS: IF OTHER MOUNTING IS REQUIRED THE MOUNTING SURFACE SHALL BE INDICATED DIRECTION OF ROTATION (CLOCKWISE OR COUNTER-CLOCKWISE) IS DETERMINED BY VIEWING THE FAN FROM THE MOTOR SIDE.

SH 12099

FIGURE 2. Direction of rotation.

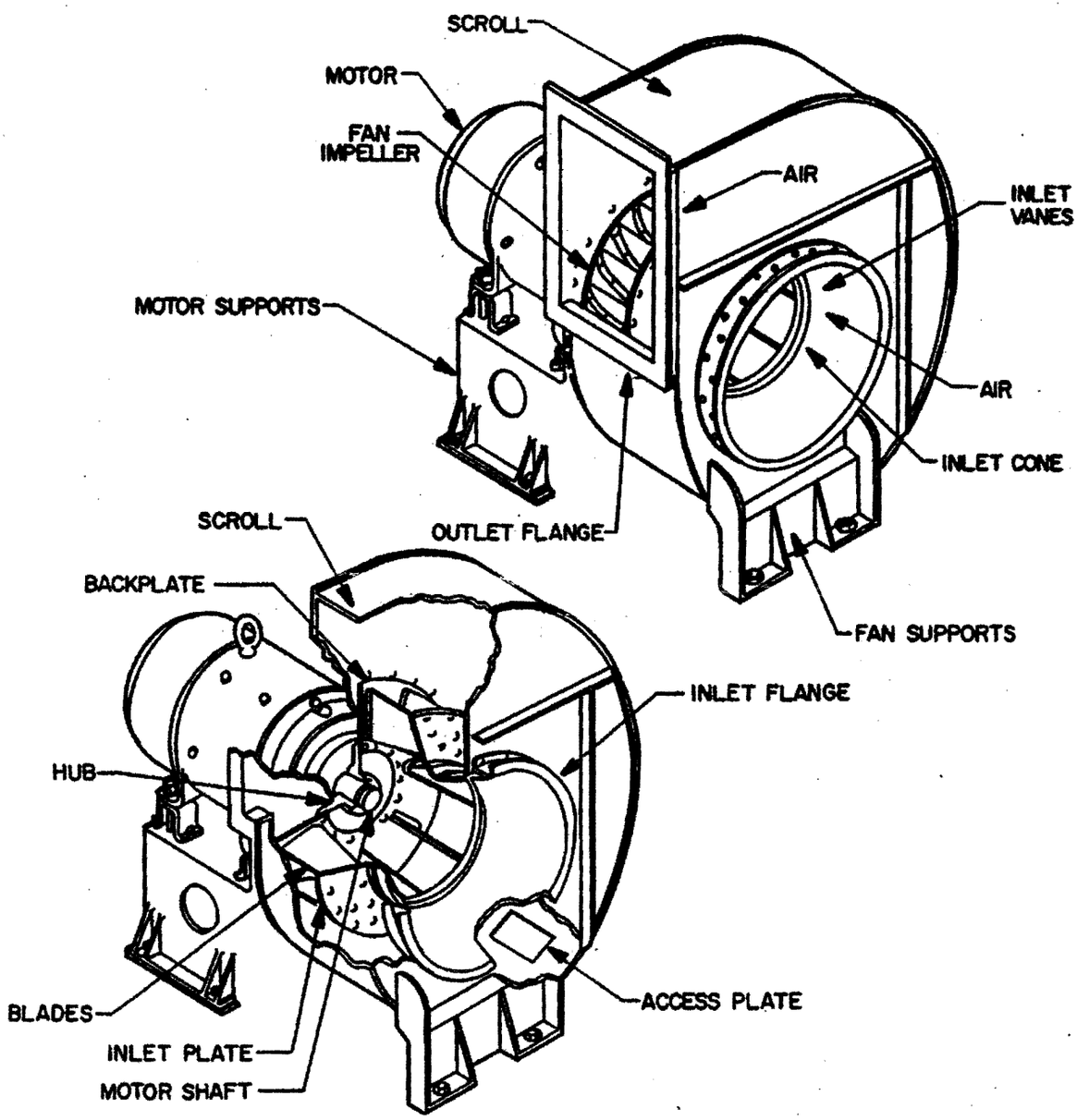
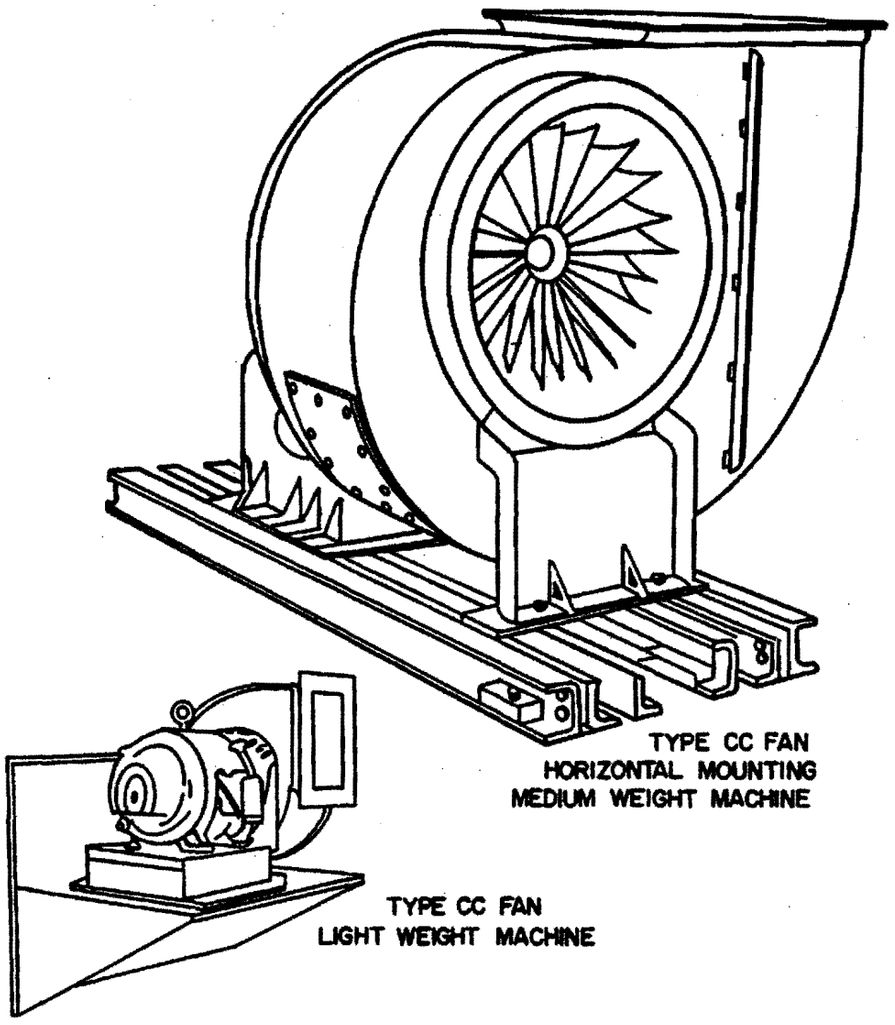


FIGURE 3. Centrifugal fan - type CC.



SH 12101

FIGURE 4. Typical shock test mountings.