MIL-A-23798B(SHIPS)
29 May 1973
SUPERSEDING
MIL-A-23798A(SHIPS)
14 September 1965
(See 6.4)

MILITARY SPECIFICATION

AIR CONDITIONER, FAN-COIL ASSEMBLY

1. SCOPE

1.1 Scope. This specification covers prefabricated fan-coil assemblies, consisting of a fan and motor, air filters, electrostatic precipitator, coil bypass, thermal and acoustical insulation, and a chilled water coil for use in conjunction with a chilled water system for air conditioning spaces on Naval Ships.

1.2 Classification. The fan-coil assemblies shall be of the following types, sizes and capacities as specified (see 6.2):

Type I - Three section unit consisting of a cooling coil section, the fan-motor section and the electrostatic precipitator - power pack section.
Type II - Three section unit consisting of a cooling coil section, fan-motor section and the air distribution plenum section.
Type III - Two section unit consisting of a cooling coil section and the fan-motor section.

Size	Capacity
21	31,300 British thermal units per hour (BTU/HR).
22	51,200 BTU/HR
23	77,600 BTU/HR
24	99,800 BTU/HR
25	151,300 BTU/HR

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

FF-B-171 - Bearings, Ball, Annular (General Purpose).
QQ-E-450 - Electrodes, Welding, Covered: Mild Steel.
TT-P-645 - Primer, Paint, Zinc-Chromate, Alkyd Type.
TT-P-664 - Primer Coating, Synthetic, Rust-Inhibiting, Lacquer-Resisting.

MILITARY

MIL-S-901 - Shock Tests, H. I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements For.
MIL-D-1000 - Drawings, Engineering and Associated Lists.
MIL-D-1000/2 - Drawings, Engineering and Associated Lists.
MIL-M-9868 - Microfilming of Engineering Documents, 35MM, Requirements For.
MIL-C-9877 - Cards, Aperture.
MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
MIL-P-15024/5 - Plates, Identification.
MIL-M-15071 - Manuals, Technical: Equipment and Systems Content Requirements For.
MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 11).
MIL-P-15137 - Provisioning Technical Documentation for Repair Parts For Electrical and Mechanical Equipment (Naval Shipboard Use).
MIL-P-15280- Plastic Material, Unicellular (Sheets and Tubes).
MIL-P-15328 - Primer (Wash), Pretreatment, Blue (Formula No. 117-B for Metals).
MIL-L-15719 - Lubricating Grease (High-temperature, Electric Motor, Ball and Roller Bearings).

MILITARY (Cont'd)

MIL-F-16552 - Filters, Air Environmental Control System, Cleanable, Impingement (High Velocity Type).
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-P-17545 - Primer Coating, Alkyd-red Lead Type, Formula No. 116 and Formula No. 116D.
MIL-F-20042 - Flanges, Pipe, Bronze (Silver Brazing).
MIL-F-22963 - Filter, Air, Electrostatic (Precipitator) With Power Supply For Environmental Control Systems.
MIL-M-38761 - Microfilming and Photographing of Engineering/Technical Data and Related Documents: PCAM Card Preparation, Engineering Data Micro-Reproduction System, General Requirements For, Preparation of.
MIL-I-45208 - Inspection System Requirements.

STANDARDS

MILITARY

MIL-STD-167 - Mechanical Vibrations of Shipboard Equipment.
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.
MIL-STD-804 - Formats and Coding of Aperture, Copy and Tabulating Cards for Engineering Data Micro-Reproduction Systems.
MIL-STD-1399, Section 103 - Interface Standard for Shipboard Systems, Electric Power, Alternating Current.

PUBLICATION

MILITARY

NAVSHIPS 0900-001-7000 - Fabrication and Inspection of Brazed Piping Systems.

(Copies of specifications, standards, drawings and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring 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. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A-164-71 - Electrodeposited Coatings of Zinc on Steel.
A-165-71 - Electrodeposited Coatings of Cadmium on Steel.
A-386-71 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.
B-6-70 - Zinc Metal (Slab Zinc).
B-88-72 - Seamless Copper Water Tube.
D-2092-68 - Preparation of Zinc - Coated Steel Surfaces for Painting.

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

AMERICAN SOCIETY OF HEATING, REFRIGERATION, AND AIR CONDITIONING ENGINEERS (ASHRAE)

33-64 - Methods of Testing and Rating Forced Circulation Air Cooling and Air Heating.
36-62 - Measurement of Sound Power Radiated From Heating, Refrigerating, and Air Conditioning Equipment.
37-69 - Methods of Testing for Rating Unitary Air Conditioning Equipment.

(Application for copies should be addressed to the American Society of Heating, Refrigerating and Air-Conditioning Engineers, 345 East 47th Street, New York, New York 10017.)

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

3. REQUIREMENTS

3.1 First article sample. Prior to beginning production, a sample shall be examined and tested as specified in 4.3.

3.2 Materials. The materials of construction shall be similar or equal to the applicable specifications specified herein and shall be the same as successfully used in commercial application except cast iron shall not be used in the construction of the fan-coil assembly.

3.2.1 Corrosion protection. Corrosion-resisting steel, galvanized steel, copper and brass referenced herein are considered corrosion-resisting materials. Corrosion-resisting steel when fabricated by any method that tends to reduce corrosion-resisting properties shall be normalized to restore those properties before being assembled in any unit.

3.2.1.1 Corrosion protection methods. Except for the electrical portion of the electrostatic precipitator power supply, ironizer section and collector section, parts fabricated from other than corrosion-resisting materials shall be protected against corrosion after fabrication with chemicals, electrolytic processes, plating or paints. The following methods while not restrictive are considered corrosion protection methods when properly applied.

(a) Hot-dipped galvanized in accordance with ASTM A-386-71 with the spelter conforming to grade 5 of ASTM B-6-70.
(b) Electroplating with zinc in accordance with type LS or ASTM A-164-71 followed by a phosphate treatment conforming to method A of ASTM D-2092-68.
(c) Electroplating with cadmium in accordance with type NS of ASTM A-165-71 followed by a phosphate treatment conforming to method A of ASTM D-2092-68.
(d) Hot phosphoric or chromic acid treatment, or a coating of primer in accordance with MIL-P-15328 followed by two coats of primer conforming to TT-P-664.

3.2.1.2 Fastenings and fittings. All bolts, nuts, studs, screws and such fastenings or fittings, as may be used shall be of corrosion-resisting material, or of a material treated in a manner to render it adequately resistant to corrosion. Self-tapping sheet metal screws shall not be used.

3.2.2 Dissimilar metals. Direct contact of electrolytically dissimilar materials shall be avoided to prevent destructive electrolysis.

3.2.3 Nonmagnetic material. When nonmagnetic fan-coil assemblies are specified, parts normally fabricated of black or galvanized steel shall be fabricated of corrosion-resisting steel which has a permeability of less than 2.0 after fabrication.

3.3 Design and construction.

3.3.1 Reliability and maintainability. The principle of maximum reliability is paramount and no compromise of this principle shall be made with any other basic requirement of design. Where wear or corrosion is unavoidable, the parts subjected to such wear or corrosion or both shall be of the best material for the purpose in order to reduce those detrimental effects to a minimum. It is the intention of this specification to obtain equipment that is capable of continuous operation for at least 175,000 hours except for replaceable parts such as bearings, V-belts, electrostatic precipitator ionizer wires and insulators, electrostatic precipitator collector plates and insulators, and circuit breakers. Replaceable parts other than the V-belts shall be capable of continuous operation for at least 35,000 hours before replacement is necessary, V-belts shall be capable of continuous operation for at least 17,000 hours before replacement is necessary.

3.3.1.1 Human engineering. The designer should take cognizance of the conditions under which the equipment will be maintained and repaired on shipboard, and of the fact that the personnel responsible for maintenance and repair may not be seasoned mechanics. Human engineering should be considered in design to preclude or minimize possibility of failure through improper operation or poor maintenance.

3.3.1.2 Reliability assurance program. The contractor shall establish and maintain an effective reliability assurance program in accordance with 3.3.1.2.1 through 3.3.1.2.5.

3.3.1.2.1 Design reviews. The reliability assurance program shall include provisions for the reliability review and evaluation of design as an integral part of the contractor's engineering design procedures. Design or engineering changes occurring during development or production shall be subjected to comparable review procedures.

3.3.1.2.2 Production control and monitoring. The reliability assurance program shall provide an economical and effective system of production control and monitoring to assure that reliability achieved in design is maintained during production (see 4.1.1).

3.3.1.2.3 Subcontractor and vendor reliability. The reliability assurance program shall include provisions to assure subcontractor and vendor selection and performance consistent with the reliability requirements of the contract and applicable portions of this specification.

3.3.1.2.4 Reliability analysis. The contractor shall analyze those factors affecting reliability. The reliability analysis shall include, but shall not be limited to, the following:

(a) List of those parts which experience and judgment show are subject to wear, material deterioration, and service failures.
(b) Specific design features employed to attain the required service life of the parts with due consideration of shipboard environment and resultant conditions. Some suggested design features are choice of materials, compatibility of materials, hardness, surface finishes, fits, clearances, fastenings, equipment protection fail-safe features, reparability and accessibility.
(c) Preventive maintenance and servicing requirements necessary for the achievement of reliable equipment. Any unusual steps or precautions necessary in carrying out maintenance and servicing requirements shall be pointed out.

3.3.1.2.5 Failure reporting, analysis, and feedback. The reliability assurance program shall incorporate a formalized system for recording, collecting, and analyzing all failures that occur during all testing, installation and operation through the tenure of the contract. Analysis shall be fed back to contractor's engineering, management, and production activities on a timely basis. Failure reports received from using activity shall be integrated into this program for trouble analysis and for experience considerations for future design review.

3.3.1.3 Maintainability. The construction of the fan-coil assembly shall be such that:

(a) Fan-motor is removable through the front access for repair.
(b) V-belt can be removed and replaced through the front access.
(c) Fan bearing and motor bearing can be replaced.
(d) Air filter can be removed for servicing without disassembling the unit.
(e) The wiring, terminals and electrical connection of the precipitator power pack (when installed) are accessible for servicing and for test purposes without requiring the removal of a part or assembly from the fan-coil assembly housing.

3.3.2 General design. Each assembly shall consist of a fan and motor, a cooling coil for chilled water and air filters mounted on and enclosed in a metal cabinet. The metal cabinet shall be equipped with an internal bypass air damper, thermal insulation and treated for noise attenuation, and shall be designed for deck mounting. The cabinet shall also incorporate a provision to enable connection to supply and discharge ducts in the upper portion of the assembly and ready for installation and connection to a power source, drainage, and chilled water supply and return.

3.3.2.1 General shipboard design conditions. General shipboard design characteristics shall be as follows:

(a) Operate satisfactorily when permanently inclined 15 degrees from the normal horizontal position in any direction.
(b) Perform in accordance with the requirements herein under a design;
(1) Entering dry bulb (DB) temperatures of 70 degrees Fahrenheit (°F) minimum to 100°F maximum,

(2) Entering wet bulb (WB) temperatures of 57°F minimum to 84°F maximum,
(3) Entering chilled water temperatures of 42°F minimum to 50°F maximum, and
(4) Chilled water flow rates of 2.5 gallons per minute (gpm) per ton (T) of refrigeration (gpm/T) minimum to 3.6 gpm/T maximum.

3.3.2.2 Shock. The fan-coil assembly shall be designed such that it is capable of passing the high impact shock tests specified in MIL-S-901 for grade A, class II equipment.

3.3.2.2.1 Shock mounts. Internal shock and vibration mounts shall be provided in conjunction with the mounting arrangement for the fan and motor assembly.

3.3.2.3 Vibration. The fan-coil assembly shall be designed such that no damage will occur or malfunction be caused either by internally excited vibrations, or by the environmental vibrations specified in MIL-STD-167 for frequencies up to and including 33 hertz (Hz).

3.3.2.4 Noise limitation. The assembly by design and provision of noise treatment shall meet the sound power level indicated herein. The noise level shall be measured as specified in 4.3.4.6. The measured noise level shall be such that the summation of deviations from the specified limit shall be equal to zero or a negative value as shown in table I.

Table I - Noise limitation.

Size	Sound power level dB reference 10^{-12} watts								
	Octave band center frequency - Hz	31.5	63	125	250	500	1000	2000	4000	8000
21		83	80	77	74	71	68	65	63	61
22		86	83	80	77	74	71	68	66	64
23		94	91	88	85	82	79	76	74	72
24		95	92	89	86	83	80	77	75	73
25		97	94	91	88	85	82	79	77	75

3.3.3 Capacity rating. The capacity rating of the fan-coil assembly shall be at least equal to that specified in table II, based on 80°F DB temperature and 67°F WB temperature entering the cabinet with 50.6°F WB temperature leaving the coil when the entering water is 45°F. The air flow at the cabinet outlet shall be within plus or minus 5 percent of the rated air flow specified in table II. The water flow through the coil shall be within plus or minus 5 percent of the rated water flow specified in table II.

3.3.3.1 Performance. The performance of the fan-coil assembly for a given air flow at specified DB and WB air temperatures entering the cabinet and a specific water temperature and a flow of 3.6 gpm/T through the cooling coil shall be as specified in tables III through VII, as applicable. Tolerances for air flow and water flow shall be as specified in 3.3.3. The entering water temperature, the entering DB temperature and the entering and leaving WB temperatures shall be within plus or minus 0.5 degrees of that specified in the applicable table.

3.3.4 Type I fan-coil assembly. The type I fan-coil assembly shall be a three-section unit consisting of a cooling coil section which shall be the base of the assembled unit, a fan-motor section and an electrostatic precipitor section. Each section shall be not greater than 25 inches in height, and when assembled together the overall height shall not exceed 75 inches. The overall width and depth of each assembled unit shall not exceed the dimensions specified in table II.

3.3.4.1 Cabinet. The cabinet enclosure of each section shall be constructed of at least 0.074 inch thick steel. The cabinet frame shall be rigid and of adequate strength to support and maintain alignment of the assembled parts. The cooling coil section shall be fitted with at least four reinforced pads, one at each corner of the section, for securing the assembled fan-coil assembly by bolting to a structural foundation.

Table II - Capacity and physical data.

Fan-coil assembly	Cooling coil air and water flow for rated capacity			Maximum dimensions, (inches)						Filters		Fan	Face area square feet[1/]
				Cabinet		Outlets (type II)		Outlets	Inlets				
Sizes	Capacity BTU/HR	Air (SCFM)	Water (gpm)	Width	Depth	Front and top	Ends	Types I and III		Size	No.	Motor HP (max)	Cooling coil
21	31,300	620	9	44	28	36 by 10	14 by 10	9-1/4 by 8-5/8	38 by 6	11AF	3	1-1/2	1.5
22	51,200	1035	16	44	28	36 by 10	14 by 10	10-7/8 by 10-3/8	38 by 6	11AF	3	3	2.5
23	77,600	1540	23	48	32	42 by 10	18 by 10	12-1/2 by 10-3/8	30-3/8 by 12	12AF	3	5	3.7
24	99,800	2065	31	51	37	44 by 12	24 by 10	16-3/4 by 12	40-9/16 by 12	12AF	4	5	4.2
25	151,300	3080	46	56	37	48 by 12	24 by 10	16-3/4 by 13-3/8	39-3/8 by 17-1/2	15AF	2	7-1/2	6.2

1/ Minimum

Table III - Size 21 performance (3.6 gpm/T).

Chilled water °F	Entering air DB °F	Entering air WB °F	SCFM					
			400		620		760	
			MBH[1/]	WB	MBH	WB	MBH	WB
45	70	58.0	10.7	48.0	15.5	48.5	18.4	49.0
		62.0	15.0	48.5	21.5	49.5	25.2	50.0
		64.0	17.5	48.5	25.3	50.0	29.7	50.5
		66.0	20.2	49.0	29.3	50.0	34.3	51.0
	80	62.0	15.6	48.0	22.8	49.0	27.0	49.0
		67.0	21.6	48.5	31.3	50.0	36.7	51.0
		70.0	25.9	49.0	37.8	50.5	44.4	51.5
		72.5	29.8	49.0	43.4	51.0	51.2	51.5
	100	68.5	24.4	48.0	36.1	49.0	40.9	51.0
		76.0	35.5	49.0	51.5	51.5	61.2	52.5
		81.5	45.4	49.5	66.5	52.0	78.7	53.5
		83.5	49.4	50.0	72.3	52.5	85.8	54.0
50	70	60.5	8.6	53.0	12.6	53.4	14.5	54.0
		63.5	11.8	53.5	16.6	54.5	19.4	55.0
		64.5	13.1	53.5	18.6	54.5	21.6	55.0
		66.0	15.2	54.0	21.7	55.0	25.3	55.5
	80	64.0	13.2	52.5	19.5	53.5	22.8	54.0
		68.5	18.8	53.5	26.9	55.0	31.5	55.5
		70.0	20.9	53.5	30.1	55.0	35.3	56.0
		73.0	25.5	54.0	37.1	55.5	43.6	56.0
	100	70.5	22.5	53.0	33.1	54.0	39.4	54.5
		77.5	33.1	54.0	48.2	56.0	56.6	57.0
		80.0	37.7	54.0	54.8	56.5	64.5	57.5
		83.5	44.5	54.5	64.5	57.0	76.6	58.0

[1/] Thousands, BTU/HR

Table IV - Size 22 performance (3.6 gpm/T).

Chilled water °F	Entering air DB °F	Entering air WB °F	SCFM					
			800		1035		1260	
			MBH[1/]	WB	MBH	WB	MBH	WB
45	70	58.0	20.6	48.5	25.7	49.0	30.1	49.0
		62.0	28.7	49.0	35.1	50.0	41.0	50.5
		64.0	33.7	49.5	41.6	50.0	48.3	51.0
		66.0	38.9	49.5	48.2	50.5	56.1	51.0
	80	62.0	30.1	48.5	37.4	49.0	44.0	49.5
		67.0	41.6	49.5	51.2	50.5	59.9	51.0
		70.0	49.9	50.0	61.5	51.0	72.2	51.5
		72.5	57.4	50.0	70.8	51.5	83.0	52.5
	100	68.5	47.4	49.0	56.2	51.0	67.1	51.0
		76.0	68.5	50.5	84.5	52.0	99.5	53.0
		81.5	87.4	51.5	108.5	53.0	128.2	54.0
		83.5	95.4	51.5	117.9	53.5	138.8	55.0
50	70	60.5	16.4	53.5	20.3	54.0	23.7	54.0
		63.5	22.5	54.0	27.4	54.5	31.6	55.0
		64.5	25.0	54.0	30.5	55.0	35.3	55.5
		66.0	29.1	54.5	35.4	55.0	41.3	55.5
	80	64.0	25.5	53.5	31.7	54.0	37.2	54.0
		68.5	35.6	54.5	44.1	55.0	51.3	56.0
		70.0	40.2	54.5	49.4	55.5	57.7	56.0
		73.0	49.3	55.0	60.4	56.0	70.6	56.5
	100	70.5	43.7	53.5	54.4	54.5	60.8	56.0
		77.5	63.5	55.0	78.8	56.5	92.3	57.5
		80.0	72.1	55.5	89.5	57.0	105.3	58.0
		83.5	85.7	56.0	106.1	57.5	123.8	59.0

[1/] Thousands, BTU/HR

Table V - Size 23 performance (3.6 gpm/T).

Chilled water °F	Entering air DB °F	Entering air WB °F	SCFM					
			1000		1540		1880	
			MBH[1/]	WB	MBH	WB	MBH	WB
45	70	58.0	26.9	48.0	39.0	48.5	45.6	49.0
		62.0	37.6	48.5	53.4	50.0	62.4	50.0
		64.0	44.1	48.5	62.9	50.0	63.5	50.5
		66.0	50.5	49.0	72.9	50.0	84.9	51.0
	80	62.0	38.9	48.0	56.6	48.5	66.8	49.0
		67.0	54.1	48.5	77.6	50.0	90.9	51.0
		70.0	64.8	49.0	92.8	50.5	109.2	51.5
		72.5	74.2	49.0	107.2	51.0	125.3	42.0
	100	68.5	60.7	46.0	84.2	51.0	100.7	51.0
		76.0	88.2	49.5	127.5	51.5	150.5	52.5
		81.5	113.2	50.0	163.7	52.5	192.1	54.0
		83.5	122.5	50.5	177.4	53.0	203.0	55.5
50	70	60.5	21.6	53.0	30.6	53.5	36.4	53.5
		63.5	29.5	53.5	41.7	54.5	48.0	55.0
		64.5	32.8	53.5	46.4	54.5	53.5	55.0
		66.0	37.2	54.0	53.9	55.0	62.7	55.5
	80	64.0	33.1	52.5	47.8	53.5	56.6	54.0
		68.5	46.7	53.5	66.5	55.0	77.6	55.5
		70.0	52.4	53.5	74.8	55.0	87.4	56.0
		73.0	63.9	54.0	91.5	55.5	107.5	56.5
	100	70.5	54.3	53.5	81.6	54.0	96.5	54.5
		77.5	82.5	54.0	117.9	56.0	138.5	57.5
		80.0	93.8	54.5	135.0	56.5	158.0	57.5
		83.5	110.2	55.0	159.0	57.0	187.8	58.5

[1/] Thousands, BTU/HR

Table VI - Size 24 performance (3.6 gpm/T).

Chilled water °F	Entering air DB °F	Entering air WB °F	SCFM					
			1500		2065		2550	
			MBH[1/]	WB	MBH	WB	MBH	WB
45	70	58.0	38.5	48.5	47.7	49.5	56.9	50.0
		62.0	52.6	49.5	67.2	50.5	78.8	51.0
		64.0	61.8	49.5	79.4	50.5	93.2	51.5
		66.0	72.1	49.5	92.5	51.0	108.7	51.5
	80	62.0	56.8	48.5	74.1	49.0	84.1	50.5
		67.0	76.9	49.5	99.8	51.0	117.7	51.5
		70.0	93.0	50.0	120.7	51.5	143.1	52.0
		72.5	107.6	50.0	140.0	51.5	165.0	52.5
	100	68.5	90.0	48.5	113.8	50.5	137.5	50.5
		76.0	128.9	50.0	168.0	52.0	197.7	53.5
		81.5	154.7	50.5	203.1	52.5	240.5	54.0
		83.5	180.0	51.0	235.4	53.5	277.8	55.0
50	70	60.5	30.2	53.5	38.8	54.0	43.7	54.5
		63.5	40.2	54.5	51.0	55.0	45.2	54.5
		64.5	45.2	54.5	57.1	55.5	65.5	56.0
		66.0	52.5	55.0	66.6	55.5	78.0	56.5
	80	64.0	47.9	53.0	62.1	54.0	70.8	54.5
		68.5	66.5	54.5	85.2	55.5	99.5	56.5
		70.0	73.9	55.0	95.2	56.0	111.4	56.5
		73.0	91.2	55.0	118.0	56.5	139.2	57.0
	100	70.5	82.3	53.5	103.0	55.0	124.5	55.5
		77.5	119.0	55.0	154.8	57.0	183.1	58.0
		80.0	135.9	55.5	176.2	57.5	209.4	58.5
		83.5	161.9	55.5	211.1	57.5	247.0	59.5

[1/] Thousands, BTU/HR

Table VII - Size 25 performance (3.6 gpm/T).

Chilled water °F	Entering air DB °F	Entering air WB °F	SCFM					
			2300		3080		3800	
			MBH[1/]	WB	MBH	WB	MBH	WB
45	70	58.0	60.0	48.0	75.8	48.5	86.1	49.5
		62.0	81.5	49.5	103.0	50.0	119.4	51.0
		64.0	96.5	49.5	121.6	50.5	142.3	51.0
		66.0	111.4	49.5	141.5	50.5	165.0	51.5
	80	62.0	87.6	48.5	112.1	49.0	126.5	50.0
		67.0	119.6	49.5	151.3	50.5	178.4	51.5
		70.0	144.3	49.5	183.2	51.0	216.3	52.0
		72.5	166.5	50.0	210.9	51.5	248.9	52.5
	100	68.5	138.9	48.5	170.7	50.5	206.5	50.5
		76.0	199.4	50.0	252.6	51.5	300.2	53.0
		81.5	255.7	50.5	327.4	52.5	388.8	54.0
		83.5	277.8	51.0	354.8	53.0	420.3	54.5
50	70	60.5	47.0	53.5	59.6	53.5	69.9	54.0
		63.5	63.2	54.0	77.9	55.0	91.3	55.5
		64.5	69.9	54.5	86.5	55.5	100.8	56.0
		66.0	81.5	54.5	102.8	55.5	119.4	56.0
	80	64.0	74.1	53.0	94.3	53.5	106.7	54.5
		68.5	102.6	54.5	130.1	55.0	151.5	56.0
		70.0	115.3	54.5	144.6	55.5	170.9	56.5
		73.0	141.7	55.0	178.7	56.0	209.6	57.0
	100	70.5	127.1	53.5	163.2	54.0	186.7	55.5
		77.5	184.5	55.0	234.5	56.5	277.3	58.0
		80.0	210.6	55.0	267.8	56.5	316.6	58.0
		83.5	249.6	55.5	316.7	57.5	373.3	59.0

1/ Thousands, BTU/HR

3.3.4.2 Cooling coil section. The cooling coil section shall consist of a cooling coil and a condensate pan with a drain of not less than 1 inch iron pipe size (ips) on each end. The condensate drains shall be accessible without the removal of an access panel. Provision shall be made to permit access to and removal of the cooling coil through removable side panels. The removable side panels shall have standard features which permit making a left hand or right hand assembly of the cooling coil by the installing activity after delivery. The removable panels shall be flanged. All flanged surfaces shall be gasketed and shall be air tight.

3.3.4.2.1 Right hand assembly. The chilled water supply and return connections of the cooling coil shall be to the right when facing the front of the assembled fan-coil assembly. Unless otherwise specified (see 6.2.1), the fan-coil assembly shall be delivered with a right hand assembly of the cooling coil.

3.3.4.3 Fan-motor section. The fan-motor section shall consist of a centrifugal fan, fan drive, electric motor and internal cooling coil air bypass damper. A provision shall be made to permit access to and removal of the fan through removable side panels. The removable side panels shall be flanged and shall be interchangeable on each section. Provisions shall be made to permit access to the fan drive and the fan-motor, to adjust the cooling coil by-pass damper, to service and adjust the fan belts and pulley, and to remove the fan pulley and the fan motor through a removable front panel. The removable front panel shall be flanged. All flanged panels shall be gasketed and shall be air tight.

3.3.4.3.1 Air bypass damper. The cooling coil air bypass damper shall be adjustable so that 0 to 17 percent additional air can be bypassed while the specified rated air flow (see 3.3.3) is maintained through the cooling coil. A provision shall be made for locking the manual damper in any fixed position from fully closed to fully open. The mechanism for adjusting and locking the damper shall be enclosed inside the cabinet to prevent adjustment of the damper from exterior of the cabinet without the removal of a panel.

3.4.4.4 Electrostatic precipitator section. The electrostatic precipitator section shall consist of the electrostatic precipitator and its power pack, air filters and air flow connections. Provisions shall be made to permit access to and the removal of the ionizing modules, collecting modules and screen modules of the electrostatic precipitator and

the removal of the air filters through front accesses. The air filters and electrostatic precipitator shall have separate access openings. The accesses shall be flanged, and all flanged surfaces shall be gasketed and shall be air tight.

3.3.4.4.1 Air flow connections. Air flow duct connections shall be provided for the air inlet and the air outlet. The air inlet and the air outlet shall be on the top of the section cabinet enclosure. The inlet and outlet shall have smooth flat surfaces for flanged duct connections. The size of each connection (inside diameters) shall be as specified in table II. The inlet and outlet connections shall be provided with coverplates.

3.3.4.4.2 Electrostatic precipitator-power pack. The electrostatic precipitator and accompanying power pack shall be in accordance with type I of MIL-F-22963 as follows:

(a) Resistance to air flow.
(b) DOP (dioclyphthalate) smoke penetration.
(c) Ozone and oxides of nitrogen production.
(d) Electromagnetic interference.
(e) Utilization of standard module sizes.
(f) In lieu of a remote power pack, the power pack shall be an integral part of the unit.
(g) Electrical requirements except for the construction of the enclosure and cable entrance for the power pack.
(h) Safety devices.

3.3.5 Type II, fan-coil assembly. The type II fan-coil assembly shall be a three-section unit consisting of a cooling coil section which shall be the base of the unit, a fan-motor section and the air distribution plenum section. Each section shall be not greater than 25 inches in height, and when assembled together the overall height of the unit shall not exceed 75 inches. The overall width and depth of each assembled unit shall not exceed the dimensions specified in table II.

3.3.5.1 Cabinet. The cabinet shall be in accordance with 3.3.4.1.

3.3.5.2 Cooling coil section. The cooling coil section shall be in accordance with 3.3.4.2 and 3.3.4.2.1.

3.3.5.3 Fan-motor section. The fan-motor section shall be in accordance with 3.3.4.3 and 3.3.4.3.1.

3.3.5.4 Air distribution plenum section. The air distribution plenum section shall consist of the plenum for air distribution, a single air inlet located on top of the cabinet and air filters. Provisions shall be made in the air distribution plenum for one air outlet on the front, one on the top and one on each end. The size (inside diameters) of the air inlet and each of the air outlets shall be as specified in table II. The air inlet and outlets shall have smooth flat surfaces for flanged duct connections. Each air outlet shall be supplied with either a grille or a coverplate that harmonizes with the cabinet enclosure. The grille shall be constructed to permit adjustable directional air flow in both horizontal and vertical planes. Unless otherwise specified (see 6.2.1), the fan-coil assembly shall be delivered with coverplates. A provision shall be made to permit access to and the removal of the air filters through an access on each end of the cabinet. The end accesses shall be interchangeable and shall be flanged. The flanged surfaces shall be gasketed and shall be air tight.

3.3.6 Type III, fan-coil assembly. The type III fan-coil assembly shall be a two-section unit consisting of a cooling coil section which shall be the base of the assembled unit and a fan-motor section. Each section shall not be greater than 25 inches in height and when assembled together the overall height of the unit shall not exceed 50 inches. The overall width and depth of each assembled unit shall not exceed the dimensions specified in table II.

3.3.6.1 Cabinet. The cabinet shall be in accordance with 3.3.4.1.

3.3.6.2 Cooling coil section. The cooling coil section shall be in accordance with 3.3.4.2 and 3.3.4.2.1.

3.3.6.3 Fan-motor section. The fan-motor section shall be in accordance with 3.3.4.3 and 3.3.4.3.1, and shall contain air filters, a single air inlet and a single air outlet located on top of the cabinet. The size (inside diameters) of the air inlet and the air outlet shall be as specified in table II. The air inlet and the air outlet shall have smooth flat surfaces for flanged duct connections. Provision shall be made to permit access

to and the removal of the air filters through an access on each end of the cabinet. The end accesses shall be interchangeable and shall be flanged. The flanged surfaces shall be gasketed and shall be air tight.

3.4 Cooling coil. A chilled water cooling coil shall be provided having nonferrous tubes, fins and headers. The face area of the cooling coil for each size assembly shall not be less than that specified in table II. The cooling coil shall be eight rows deep in the direction of air flow. The tubes shall be seamless copper tubing not less than 5/8 inch outside diameter and shall have a minimum wall thickness of 0.025 inch. When used in the construction of the coil, hairpin tubes shall have a minimum wall thickness of 0.025 inch throughout the tube. The tubes shall be silver-brazed to the headers. The headers shall be of brass or copper and shall have a wall thickness of not less than that of type M of ASTM B-88-72 or equivalent size. The fins shall be of copper not less than 0.010 inch thick and shall be uniformly spaced. The tubes shall be expanded into fins to form a permanent bond. The number of fins per linear inch of tube shall be not less than 7 nor more than 12. To prevent wear and breakage due to shipboard vibration, expansion and contraction of tubes, brass or copper ferrules shall be provided where tubes pass through tube sheets. The chilled water supply and return connections shall be on the same end of the coil and shall have flanged connections conforming to MIL-F-20042.

3.4.1 Vent and drain. The cooling coil shall be provided with means for venting and draining the coil. The vent shall be accessible through a removable access. Draining the coil shall be by a means other than breaking of the chilled water flange connections.

3.4.2 Leakage. When tested as specified in 4.5.2.1, the cooling coil shall show no leakage.

3.5 Air filters. Air filters shall be provided for filtering all air entering the assembly. The air filters shall be in accordance with MIL-F-16552, and the size and number of filters that are required for each assembly shall be as specified in table II.

3.6 Thermal insulation. Surfaces of the cabinet or chassis that are subject to the formation of condensation shall be provided with internal insulation to prevent dripping or running off of moisture under rated capacity conditions. The insulation shall be in accordance with type II of MIL-P-15280. The insulation shall be bonded in place with an adhesive as specified in MIL-P-15280.

3.7 Fan. The fan used in the assembly shall be a belt driven centrifugal fan. Unless otherwise specified (see 6.2.1), the fan shall produce an available total discharge pressure of 2 inches of water at the outlet of the fan-coil assembly. The fan motor horsepower for each assembly shall not exceed that specified in table II, when total discharge pressure is 2 inches of water or less.

3.7.1 Fan housing. The centrifugal fan shall be double width, double inlet, multiblade type. The fan housing and fan wheel shall be constructed of steel or aluminum. The fan housing shall have smooth curved inlets and all rotating parts of the fan shall be designed to have a factor of safety of not less than eight, based on the ultimate tensile strength of the material involved. The fan wheel shall be mounted on a properly sized one piece shaft supported by ball bearings mounted externally of the fan housing. The ball bearings shall be double seal, double-row width, single row, cartridge type, normal internal fit bearings conforming to FF-B-171 and prelubricated with silicone grease in accordance with MIL-L-15719. The fan shaft shall be connected to the motor by means of V-belts and grooved pulley. The fan brake horsepower shall not exceed that of the motor specified in table II. The fan shall be statically and dynamically balanced and tested after being installed in the assembly.

3.7.2 Fan drive. The fan drive shall be multiple V-belt drive, and shall include the fan pulley, V-belts and motor pulley. The fan pulley shall be overhung on the fan shaft to eliminate the need for disassembling and realigning the fan if the belts must be replaced. The drive pulley shall be of the variable pitch type, and shall be adjustable to allow for at least 30 percent variation in fan speed. The pulleys shall be machined to a finished surface and accurately balanced. The V-belts shall be selected for at least 125 percent of motor horsepower at rated capacity conditions. A positive acting belt adjustment device shall be provided to permit adjustment of belt tension.

3.8 Electrical requirements.

3.8.1 Power requirements. The electric motors shall be designed to operate on an input of 440 volts, three-phase, 60 Hz type I of MIL-STD-1399, section 103. The power requirement for the electrostatic precipitator shall be as specified in 3.3.4.4.2.

3.8.2 Ambient temperature. All electrical components shall be designed for continuous operation in a maximum of 122°F (50°C). ambient temperature.

3.8.3 Electrical motors. Motors shall be service A in accordance with MIL-M-17059 or "T" frame size of MIL-M-17060. All motors shall be equipped with double sealed, double-row width, single row, cartridge type ball bearings.

3.8.4 Cable entrance. Provisions shall be made to permit entrance of electrical cables through knockouts in the fan-motor section of the fan-coil assembly.

3.9 Welding and brazing. The surfaces of all parts to be welded shall be free from rust, scale, paint, grease and other foreign matter. All welding shall be at least equal to that required by MIL-STD-278. Brazing procedures and qualification of welder (brazer) shall be in accordance with NAVSHIPS 0900-001-7000.

3.9.1 Zinc-coated surfaces. Where zinc-coated steel is used for fabricating parts, the metallic zinc shall be removed from all joints and surfaces on which welds are to be deposited and for a distance of 1 inch from the expected toes of the welds. In areas where the metallic zinc cannot be removed and it is necessary to weld over the zinc-coated surfaces, electrode type G6010 or G6011 shall be used in accordance with QQ-E-450.

3.10 Painting. All exterior surfaces of the fan-coil assembly, except those surfaces constructed of brass, copper or corrosion-resisting steel shall be thoroughly cleaned and coated as follows:

(a) One coat of pretreatment coating in accordance with MIL-P-15328.
(b) One coat of zinc chromate primer in accordance with TT-P-645, or one coat of red lead primer in accordance with MIL-P-17545.
(c) One final coat of grey enamel in accordance with class 2 of MIL-E-15090.

3.11 Identification, information and label plates. Identification and label plates shall be style II and shall conform to type A, B, D, F or H of MIL-P-15024 and MIL-P-15024/5. Information plates shall be style VI and shall conform to types F or H of MIL-P-15024. The physical dimensions of the identification and the information plates shall not exceed the dimensions of a size 10 plate of MIL-P-15024.

3.11.1 Identification plates. Each fan-coil assembly shall be provided an identification plate, and it shall contain the following information:

(a) Nomenclature.
(b) Type, size and capacity in BTU/HR.
(c) Federal stock number (FSN).
(d) Component identification number (CID).
(e) Contract or order number.
(f) Electrical characteristics (type I fan-coil assembly only).
(g) Manufacturer's name and address.

3.11.2 Information plate (type I only). Each type I fan coil assembly shall be provided with an information plate which warns personnel as to the potential danger of the high voltage in the electrostatic precipitator section and specifies the safety precautions that must be observed while operating and servicing the equipment. The proposed information plate(s) design shall be submitted to the Naval Ship Engineering Center (NAVSEC) or the agency concerned for review.

3.11.3 Label plates (type I only). The power pack for the electrostatic precipitator shall be provided with label plates in accordance with MIL-F-22963.

3.12 Technical manuals (type I only) (see 6.2.1). Technical manuals shall be furnished only for the type I fan-coil assembly. The technical manuals furnished shall comply with type I of MIL-M-15071, photo views of the equipment shall be included as part of the general description. A section shall be provided containing reduced copies of all drawings required to amplify or illustrate the text including diagrams, assembly drawings and detail drawings of repair parts. The technical manuals shall be reviewed by NAVSEC or the agency concerned. The quantity of technical manuals furnished shall be as specified (see 6.2.1). Where identical technical manuals have been distributed to addressees, additional technical manuals need not be furnished except for two technical manuals packaged with the equipment and for the quantity of technical manuals specified for Naval stock.

3.13 Drawings (see 6.2.1). Drawings delineating the equipment shall be furnished. Drawings shall be type II or IV in accordance with MIL-D-1000/2 except that the drawings

shall be reviewed by NAVSEC or by the command or agency concerned. The drawings shall be for intended use categories A, B, G and H as delineated in accordance with MIL-D-1000. Separate drawings need not be furnished for each category. Parts lists, bill of materials lists and so forth shall be included on equipment drawings.

3.13.1 Assembly drawings (see 6.2.1). Assembly drawings, type II or IV of MIL-D-1000/2, shall be furnished for the complete fan-coil assembly, the cooling coil, the fan and the motor. The assembly drawing shall show outline, mounting, attachment and connection dimensions including methods and sizes of fastenings and clearances for installation and servicing plus supplementary data necessary to permit shipyard installation without supplier's assistance. The drawing shall illustrate design, construction, operation, identity of parts, total weight of the assembled parts. The drawing(s) shall be complete to show compliance with specification requirements. Where necessary to illustrate compliance, details may be included on the assembly drawing or provide as separate drawings. Sub-assembly drawings shall be furnished where assembly drawings do not adequately describe and identify sub-assembly parts and components.

3.13.1.1 Fan drawings. The assembly drawing for the fan shall include the fan characteristic curves. The characteristic curves shall show total pressure at fan outlet from free delivery to no delivery, static pressure, brake horsepower required and efficiency of the fan.

3.13.1.2 Motor drawings. The assembly drawing for the electric motor shall contain all the information required by the applicable motor specification specified herein.

3.13.2 Detail drawings (see 6.2.1). Detail drawings shall be furnished of all parts and sub-assembly necessary for evaluation of the equipment, and all parts necessary for maintenance and overhaul of the equipment. Drawings shall show all essential fabrication details including welding requirements and symbols. Sub-assemblies whose parts cannot be procured or serviced individually should be shown as a single part. Multi-detail drawings are preferred, but mono-detail drawings may be used. Drawings are not required for those parts which are in common commercial use and can be referenced to commercial standards.

3.13.3 Electrical diagramatic drawings (see 6.2.1). Electrical diagramatic drawing(s), type II or IV of MIL-D-1000/2, shall be furnished and shall include elementary, detail schematic and connection diagrams. Each diagram shall show by symbolic representation of all electrical wiring and connections, component accessories, controls and associated instruments. Size and type of all wiring shall be indicated on the drawing. All electrical components shall be identified by a piece number of the bill of material list in addition to a detailed explanation of the operation of the system. All electrical connections that must be made by the installing activity shall be indicated by special symbols.

3.13.4 Outline installation drawings (see 6.2.1). Outline installation drawings shall be provided for each type and each size fan-coil assembly. Contents of the outline drawing shall be as follows:

(a) Dimensional front and plan views and sufficient additional views showing overall and principal dimensions in sufficient detail to establish the limits of space in all directions required for installation and servicing exclusive of space required for personnel. Include the amount of clearance required to permit opening of removable access panels and any other operations necessary to obtain access to the equipment. The clearances for withdrawal of part or assemblies shall also be included.

(b) All information necessary for preparation of foundation plans including mounting plate details and drilling plans with dimensions and tolerances and information as to optional mounting methods. Center of gravity shall be indicated.

(c) Location, type and dimensions of chilled water connections, condensate drain connections, duct connections, access panels, air filter access and electrical service entrance shall be indicated.

(d) Schematic diagrams for duct work, condensate removal and piping of the chilled water to and from the unit.

(e) Performance data, table form; capacities of BTU/HR and leaving WB temperatures for the following conditions:
  (1) Entering DB temperatures, 70°F to 100°F at 5 degree intervals.
  (2) Entering WB temperatures, 57°F to 84°F at 1 degree intervals, as applicable (see 3.3.3.1).
  (3) Air flow, Standard cubic feet per minute (SCFM), at airflows specified in 3.3.3.1 for specific size.
  (4) Chilled water temperatures at 42°F, 45°F and 50°F.

(5) Chilled water flow rate at 2.5 and 3.6 gpm/T of refrigeration.
(f) Weight of complete assembly (uncrated).
(g) Any special instructions for hoisting, alignment, initial lubrication, installation, or assembly, as necessary.

3.13.5 Certification data (see 6.2.1). Certification data drawing(s) for the complete fan-coil assembly shall be furnished for review by the purchasing activity. The drawing(s) shall be in accordance with type III of MIL-D-1000/2 and shall include the following information:

(a) Type and size designation.
(b) Weight.
(c) Electrical characteristics.
(d) Elementary diagram (electrical).

3.13.5.1 System safety check list. The contractor shall prepare a system safety check list (see 6.2.2).

3.13.6 Tabulating index cards and microfilm of engineering drawings (see 6.2.1).

3.13.6.1 Microfilm mounted in aperture cards shall be supplied with coverage of all drawings applicable to all items of equipment. Microfilm shall be type I, class 1 or type II, class 2 in accordance with MIL-M-9868, one sheet per frame format shall apply. A set of cards shall consist of that number of cards necessary for the required coverage.

3.13.6.2 Tabulating index cards shall be supplied for aperture cards. A set of tabulating index cards shall consist of an index card for each aperture in a set of microfilm aperture cards as defined herein.

3.13.6.3 Selection and preparation of aperture and tabulating index cards shall be in accordance with MIL-STD-804, MIL-M-38761, and MIL-C-9877.

3.13.6.4 Dual purpose engineering document card DD Form 1562. Card Code "T", lower legends of MIL-STD-804 shall be obtained commercially and used in the preparation of all aperture and tabulating index cards.

3.13.6.4.1 Aperture and tabulating index cards shall be punched and interpreted in accordance with MIL-STD-804 and the following:

(a) Card columns 31-32; punch the frame number of a multiframe drawing. A single drawing shall have frame number "1" entered in right hand column. This information shall be interpreted using interpreter bar locations 29U30.
(b) Card columns 33-34; punch the number of frames required to completely photograph the drawing. The number of frames digit shall be entered in the right hand column. This information shall be interpreted using interpreter bar locations 31U32.
(c) Card columns 35-36 shall be left blank.
(d) Card columns 48-49; insert control activity symbol "HR". This information shall be interpreted using interpreter bar locations 51U52.
(e) Card columns 53-80; punch the drawing title in the tabulating index card only. This information shall be interpreted on both index and aperture cards using interpreter bar locations 12L39.

3.13.6.5 Responsibility to update sets of microfilm aperture cards and tabulating index cards supplied to the Government. Microfilm mounted in aperture cards and tabulating index cards shall be supplied for drawings generated or revised during the time period between initial submittal of card sets and expiration of the contractors responsiblity for last ship set of equipment.

3.13.6.6 Distribution of microfilm aperture cards and tabulating index cards. Distribution of the microfilm aperture cards and tabulating index cards shall include special requirement of the contract or purchase order and the following:

(a) One set of aperture cards and one set of tabulating index cards to Navy Publication and Printing Service Office, Building Office, Building 157, Washington Navy Yard, Washington, D.C., 20390.
(b) One set of aperture cards to Naval Ship Engineering Center (Surface Combat Ship Section), Center Building, Prince George's Center, Hyattsville, Maryland 20782.

3.14 Onboard repair parts. When specified (see 6.2.1), onboard repair parts shall be furnished in accordance with table VIII. The procedure for furnishing and identifying repair parts shall be in accordance with MIL-P-15137. The quantities specified refer to number required for each quantity of similar equipment furnished per ship.

Table VIII - Onboard repair parts.

Item	For quantity of onboard parts required per ship, multiply the allowance factor in the applicable component column times the quantity installed in one component and round the product to the nearest whole number.							
	Quantity of identical equipment installed per ship							
	1	2	3	4	5-8	9-20	21-50	51-100
V-belts	1	1	1	1	2	3	4	5
Gaskets, set	1	1	1	1	2	3	4	5
Bearings, fan	1	1	1	1	1	1	2	2
Fan motor	See MIL-M-17059 and MIL-M-17060, as applicable							
Electrostatic precipitator	See MIL-F-22963							

3.15 Workmanship. The fan-coil assembly shall be free from defects that affect appearance and operation. The tube sheets of the cooling coil shall not show cracks due to punching or forming, and fin collars shall not show cracks after tubes are expanded into collars. Fin edges of the cooling coil shall be free of burrs and shall not be bent. Sharp edges, burrs and other imperfections shall be removed from all parts subject to contact with personnel to prevent cuts during repair and maintenance. Cabinet corners shall be square, and fasteners shall be in place and secured.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the supplier may use his own or any other facilities suitable for the performance of the inspection requiremements, as 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 the prescribed requirements.

4.1.1 Inspection system. The supplier 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 (see 6.2.1 and 6.3).

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

(a) First article inspection (see 4.3).
(b) Quality conformance inspection (see 4.5).
(c) Maintainability inspection (see 4.6).
(d) Inspection of preparation for delivery (see 4.7).

4.3 First article inspection. Unless otherwise specified (see 6.2.1), one sample of each type and size fan-coil assembly covered in the contract or order shall be submitted for first article inspection. First article inspection shall consist of the examination and tests specified in 4.3.4, 4.5.1, 4.5.2 and 4.6.1. In addition to this inspection, the largest size of each type fan-coil assembly covered by the contract or order shall be tested as specified in 4.3.3.

4.3.1 Where a fan-coil assembly of the same design, type and of a size larger than that submitted for tests has successfully passed the shock tests specified in 4.3.3, the hi-shock tests may be extended by the command or agency concerned.

4.3.2 Unless otherwise specified (see 6.2.1), first article inspection will not be required on types and sizes of fan-coil assemblies that are identical to those which have successfully passed the first article examination and tests within a period of 3 years of the date of the contract or order. First article inspection, assembled in manual form and certified by the inspector shall be forwarded in triplicate to substantiate the fact that the examination and tests have been conducted and that the specification requirements have been met.

4.3.3 High impact shock tests. The sample fan-coil assembly shall be shock tested on the medium-weight machine as specified for type A shock of MIL-S-901. The fan-coil assembly shall be operated at rated voltage and current, rated air flow, and a hydrostatic pressure of at least 100 pounds per square inch gage (psig) shall be maintained on the cooling coil of the unit during the shock tests. The high-impact shock tests shall be conducted prior to tests specified in 4.3.4 and 4.5.2, and correction of damage, which may have occurred during shock test, shall not be performed prior to these tests. Evidence of fragmentation or missile effect of parts, deformation that will cause active interference between parts, failure to operate, or leakage of the cooling coil shall be cause for rejection.

4.3.3.1 Upon completion of shock test and post-shock test inspection, the fan-coil assembly shall be returned to the supplier for his examination.

4.3.4 Performance tests. Performance tests shall be as specified in 4.3.4.1 through 4.3.4.8 and shall be conducted in the order listed.

4.3.4.1 Vibration tests. The fan-coil assembly shall be subjected to the type I vibration tests as specified in MIL-STD-167.

4.3.4.2 Capacity tests. The capacity of each type and size fan-coil assembly shall be determined at the conditions specified in 3.3.3 and 3.7. The cooling coil bypass shall be closed and sealed to prevent air leakage through the bypass during tests. The airflow through the fan-coil assembly shall be measured in accordance with ASHRAE 37-69. The capacity tests of the cooling coil, installed in the assembly, shall be conducted in accordance with ASHRAE 33-64.

4.3.4.3 Flexibility and range tests. The leaving WB temperature and capacity (BTU/HR) for each type and size fan-coil assembly shall be determined at the conditions specified in 3.3.3.3.1 and 3.7. Air flow measurement and cooling coil tests shall be conducted as specified in 4.3.4.2. At least one test shall be conducted with the unit inclined 15 degrees from the normal horizontal position in any direction.

4.3.4.4 Bypass test. Each type and size fan-coil assembly shall be tested with the bypass damper in at least four positions between 0 to 100 percent open to determine the increase in air delivery and the DB temperature of the air leaving the assembly, the air flow through the bypass and the motor rpm for the increase in air delivery at various pressures at the air discharge resulting from the use of the bypass damper. The bypass shall be tested at air flow for rated capacity and at air flows through the cooling coil of plus and minus 15 percent of the air flow for rated capacity. Air flow measurement shall be conducted as specified in 4.3.4.2.

4.3.4.5 Limitation tests. The maximum acceptable operating limits of each type and size of fan-coil assembly shall be established without exceeding noise limitations or without carry over of cooling coil condensate.

4.3.4.6 Sound test. The noise level of each type and size fan-coil assembly shall be established in accordance with ASHRAE 36-62 under the following conditions:

(a) At the air flow rate used for determining the capacity rating.
(b) Type I and type II only; free delivery from a 90 degree elbow attached to the air outlet connection of the unit. Face dimensions of the elbow shall be the same as the air outlet connection of the unit being tested, and the air outlet of the elbow shall extend 1 foot beyond the front of the unit being tested.
(c) Type II only; free delivery with the cover-plate removed from the front opening only.

4.3.4.7 Electrostatic precipitator tests (type I only). DOP smoke penetration, ozone and oxides of nitrogen production, and the electromagnetic interference characteristics of the electrostatic precipitator and its accompanying power pack shall be determined as specified in MIL-F-22963.

4.3.4.8 Motor tests. The insulation resistance test and the dielectric strength test shall be conducted as specified in MIL-M-17059 and MIL-M-17060, as applicable.

4.4 Sampling for quality conformance inspection.

4.4.1 Lot. All fan-coil assemblies of the same type and size offered for delivery at one time shall be considered a lot.

4.4.2 Sampling for examination. Sample fan-coil assemblies of the same type and size shall be selected at random from each lot in accordance with table IX for the examination specified in 4.5.1.

Table IX - Sampling for examination.

Lot size number of units	Sample size number of units	Defective units	
		Acceptance number	Rejection number
1 to 6	All	-	-
7 to 15	7	0	1
16 to 25	10	0	1
26 to 40	13	0	1
41 to 65	17	1	2
66 to 110	22	1	2
111 to 180	28	2	3
181 to 300	35	2	3
301 to 500	45	3	4

4.5 Quality conformance inspection.

4.5.1 Examination. Each of the sample fan-coil assemblies selected in accordance with 4.4.2 shall be examined and measured to verify compliance with the requirements of this specification, not involving tests. Examination shall be conducted as specified in table X. Any assembly in the sample containing one or more defects shall not be offered for delivery, and if the number of defective units in any sample exceeds the acceptance number for that sample, the lot represented by the sample shall not be offered for delivery.

Table X - Classification of defects.

Categories	Defects
Critical:	
1	None defined.
Major:	
101	Type and size not as specified.
102	Incomplete, component parts missing (fan, motor, cooling coil, air filters, V-belts, pulleys, modules of electrostatic precipitator for type I assemblies).
103	Materials defective or not as specified.
104	Limited dimensions, exceeded.
105	Welding incomplete, not free of cracks, nonfusion, heavy porosity, heavy undercut, slag inclusions.
106	Insulation, thermal or acoustical missing.
107	Bypass damper, condensate drain, air filter access, removable panels or coverplates (for type II assemblies) not provided.
108	Removable end panels are not interchangeable.
109	Removable panel and access plate gaskets missing or defective.
110	Grilles (as applicable) missing, nonadjustable.
111	Cable entrance knockouts missing.
112	Information or label plates (as applicable) missing.
113	Tube sheets of the cooling coil and fin collars, cracked.
114	Cooling coil fins bent or burrs not removed.
115	Sharp edges and burrs not removed from parts subject to personnel contact.
116	Cabinet corners not square.
117	Bolts, nuts and screws not tight, missing (parts shall be properly fastened and secured).
118	Drawings not followed.
119	Painting (as applicable), nonconforming.
120	Marking, manufacturer's identification plate, not permanent, illegible or not as specified.

4.5.2 Tests.

4.5.2.1 Leakage test. The cooling coil of each fan-coil assembly shall be tested at a hydrostatic pressure of at least 300 psig. Any fan-coil assembly in which there is evidence of cooling coil leakage when tested shall not be offered for delivery.

4.5.2.2 Operational test. The fan motor of each fan-coil assembly shall be tested at rated voltage and current to determine whether the fan and motor will operate. In addition to this test, the electrostatic precipitator and power pack of the type I fan-coil assembly shall be tested as specified in 4.5.2.2.1. Any fan-coil assembly in which the motor or the fan and motor, fail to operate shall not be offered for delivery.

4.5.2.2.1 Electrostatic precipitator - power pack (type I only). The operational test of the electrostatic precipitator and its power pack shall be conducted as specified in MIL-F-22963. Any type I fan-coil assembly in which the safety devices of the electrostatic precipitator and power pack fail to operate, personnel hazards exist, ozone production exceeds specification limits, or the ionizing and collecting current and voltage vary more than 10 percent from the values determined under first article inspection, shall not be offered for delivery.

4.6 Maintainability inspection. Maintainability inspection shall be in accordance with 4.6.1.

4.6.1 Maintainability demonstration. The first production unit shall be examined after testing, and the capability to maintain, disassemble and repair the unit shall be demonstrated to a Government representative. The demonstration shall be conducted utilizing the recommended tools and with other than expert mechanics. Evidence that maintainability of the fan-coil assembly cannot be accomplished by other than expert mechanics shall be cause for rejection. The maintainability demonstration shall include but not be limited to the following:

(a) Replacement of fan bearing.
(b) Replacement of V-belts.
(c) Replacement of fan-motor.
(d) Replacement of motor bearing.
(e) Air filters can be removed for servicing and replaced.
(f) Ionizer(s), collector(s) and screen(s) modules of the type I fan-coil assembly are movable for cleaning and repair.

4.7 Inspection of preparation for delivery. The packaging, packing, and marking shall be inspected for compliance with section 5 of this document.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. The requirements and level of preservation, packaging, packing and marking shall be as specified (see 6.2.1).

6. NOTES

6.1 Intended use. The fan-coil assembly is intended for use in lieu of a fan room onboard ship. It is designed for ready connection to a chilled water system, a drainage system, an air distribution system and a power source. The belt drive for the centrifugal fan is intended to permit selection of capacity to fit application depending on the use or extent of ductwork required and to keep within noise limitations. The adjustable motor pulley is specified to permit ready selection of fan speed to fit specific application. When the installation and selection of fan speed have been made, a fixed sheave should be substituted for the adjustable pulley to prevent unauthorized changing of fan speed.

6.2 Ordering data.

6.2.1 Procurement requirements. Procurement documents should specify the following:

(a) Title, number and date of this specification.
(b) Type and size required (see 1.2).
(c) Whether left hand assembly is required (see 3.3.4.2.1).
(d) Whether grilles or coverplates are required (see 3.3.5.4).
(e) Fan pressure requirement, if other than specified (see 3.7).
(f) Quantity of technical manuals (see 3.12).
(g) Distribution of microfilm (see 3.12.6.5).

(h) Onboard repair parts required (see 3.14).
(i) Quality assurance provisions (see 4.1.1).
(j) First article inspection requirements (see 4.3 and 4.3.2).
(k) Preservation, packaging, packing and marking requirements (see 5.1).

6.2.2 Contract data requirements. Data generated by this document are not deliverable unless specified on the Contract Data Requirements List (DD Form 1423) or the contract schedule. The data required by this specification include, but are not restricted to the following:

(a) Manuals for type I fan-coil assembly (see 3.12).
(b) Drawings (see 3.13, 3.13.1, 3.13.2 and 3.13.4).
(c) Electrical diagramatic drawings (see 3.13.3).
(d) Certification data (see 3.13.5).
(e) System safety check list (see 3.13.5.1).
(f) Tabulating index cards and microfilm of engineering drawings (see 3.13.6).

6.3 Management control system documents. The following management control system documents shall be included on DD form 1660:

(a) MIL-P-15137 (see 3.14).
(b) MIL-I-45208 (see 4.1.1).

6.4 THE MARGINS OF THIS SPECIFICATION ARE MARKED "#" 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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1. HAS ANY PART OF THE DOCUMENT CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

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   ☐ YES ☐ NO *(If "Yes", in what way?)*

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