

MIL-C-2939E(SH)
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SUPERSEDING
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(See 6.6)

MILITARY SPECIFICATION

COOLING COILS, AIR, DUCT TYPE AND GRAVITY TYPE; COOLER UNITS, AIR, NAVAL SHIPBOARD ENVIRONMENTAL CONTROL SYSTEMS

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 fin-tube cooling coils and unit coolers having fan assemblies mounted integral with the unit, for use in environmental control systems aboard Naval ships.

1.2 Classification. Air cooling coils and unit coolers shall be of the following types, styles, classes, sizes and composition as specified (see 6.2.1).

- Type I - Cooling coil, air
 - Style A - Duct
 - Class 1 - Chilled water (DW)
 - Class 2 - Refrigerant (DF)
 - Class 3 - Sea water (DWS)
 - Size - (See 3.6.1)
 - Composition a - Magnetic
 - Composition b - Nonmagnetic
 - Style B - Gravity
 - Class 1 - Chilled water (GW)
 - Class 2 - Refrigerant (GF)
 - Size - (See 3.7.1)
 - Composition a - Magnetic
 - Composition b - Nonmagnetic
- Type II - Unit coolers
 - Class 1 - Chilled water (UW)
 - Class 2 - Refrigerant (UF)
 - Size (See table II)
 - Composition a - Magnetic
 - Composition b - Nonmagnetic

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 5523, 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.

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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).
- QQ-A-596 - Aluminum Alloy Permanent and Semipermanent Mold Castings.
- QQ-A-601 - Aluminum Alloy Sand Castings.
- QQ-B-650 - Brazing Alloys, Copper, Copper-Zinc, and Copper-Phosphorus.
- QQ-B-654 - Brazing Alloys, Silver.
- QQ-E-450 - Electrodes, Welding, Covered: Mild Steel.
- QQ-P-35 - Passivation Treatments for Austenitic, Ferritic, and Martensitic Corrosion-Resisting Steel (Fastening Devices).
- TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.
- TT-P-664 - Primer, Coating, Synthetic, Rust-Inhibiting, Lacquer-Resisting.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.

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- MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted.
- 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-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.
- MIL-T-15005 - Tubes, 70-30 and 90-10 Copper Nickel Alloy, Condenser and Heat Exchanger.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-P-15280 - Plastic Material, Unicellular (Sheets and Tubes).
- DOD-P-15328 - Primer, (Wash) Pretreatment (Formula No. 117, for Metals) (Metric).
- MIL-C-15726 - Copper-Nickel Alloy, Rod, Flat Products (Flat Wire, Strip, Sheet, Bar and Plate) and Forgings.
- MIL-E-16298 - Electric Machines Having Rotating Parts and Associated Repair Parts: Packaging of.

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- MIL-F-16552 - Filters, Air Environmental Control System, Cleanable, Impingement (High Velocity Type).
- MIL-M-17059 - Motors, 60-Cycle, Alternating-Current, Fractional HP (Shipboard Use).
- MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral-Horsepower, Shipboard Use.
- DOD-P-17545 - Primer Coating, Alkyd-Red Lead Type, Formula No. 116 and Formula No. 116D (Metric).
- MIL-B-17931 - Bearings, Ball, Annular, for Quiet Operation.
- MIL-F-20042 - Flanges, Pipe, Bronze (Silver Brazing).

STANDARDS

FEDERAL

- FED-STD-H28 - Screw Treads Standards for Federal Service.

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- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- 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.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Water-proofing; With Appropriate Test Methods.

2.1.2 Government drawings and publications. The following Government drawings and publications form a part of this specification to the extent specified herein.

DRAWINGS

NAVSHIPS

- S3803-532636 - Cooling Coils - Gravity Type.
- 803-1310894 - Air Cooling Coils Duct Construction Details for Shipboard Mechanical Cooling.
- 805-1311397 - Air Cooling Coils Duct - Class DW and DF for Shipboard Mechanical Cooling.
- 805-1311398 - Unit Cooler Class UW and UF for Shipboard Mechanical Cooling.
- 805-1311399 - Air Cooling Coils Refrigerant Circuits for Shipboard Mechanical Cooling.

NAVSEA

- 803-5001031 - Air Cooling Coils - Coil Size 57 and 58.

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PUBLICATION

NAVSEA

0900-LP-001-7000 - Piping Systems (Brazed) Fabrication and Inspection.

(Copies of specifications, standards, drawings and publications 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 in the current DoDISS and the supplement thereto, if applicable.

AIR MOVING AND CONDITIONING ASSOCIATION INCORPORATED (AMCA)

AMCA Standard 210 - Laboratory Methods of Testing Fans for Rating.

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

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

ASHRAE Standard 16 - Method of Testing for Rating Room Air Conditioners.

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

ASTM

- A 386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products. (DoD adopted)
- A 525 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process. (DoD adopted)
- A 569 - Steel Carbon (0.15 Maximum, Percent), Hot-Rolled Sheet and Strip, Commercial Quality. (DoD adopted)
- A 635 - Steel Sheet and Strip, Commercial Quality, Heavy-Thickness Coils (Formerly Plate) (Metric). (DoD adopted)
- B 6 - Zinc (Slab Zinc).
- B 88 - Seamless Copper Water Tube. (DoD adopted)
- B 201 - Testing Chromate Coatings on Zinc and Cadmium Surfaces, Practice for.
- B 633 - Electrodeposited Coatings of Zinc on Iron and Steel. (DoD adopted)

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

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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

S1.21 - Methods for the Determination of Sound Power Levels of
Small Sources in Reverberation Rooms.

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018.)

UNIFORM CLASSIFICATION COMMITTEE AGENT

Uniform Freight Classification Ratings, Rules and Regulations

(Application for copies should be addressed to the Uniform Classification Committee Agent, Tariff Publication Officer, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

(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. The cooling coils and unit coolers 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 Materials. Aluminum casting shall conform to the requirements in table I. The other materials of construction shall be equal to the applicable specifications herein. When not specified, the materials shall be the same as successfully used in commercial application. Cast iron shall not be used in the construction of the cooling coils or the fans, nor shall cast iron be used in motors, which are components of unit cooler fans.

TABLE I. Aluminum castings.

Type	Requirement
Sand castings	QQ-A-601, alloy 356-T6, A 712, D 712 or 713
Permanent mold castings	QQ-A-596, alloy 356-T6 or Tenzaloy (613)

3.2.1 Corrosion protection. Brass, copper, 300-series corrosion resisting steel, copper nickel alloy, and galvanized steel are considered corrosion resisting materials for this application. When the corrosion resistance of the 300-series corrosion resisting steel is degraded by fabrication processes, it shall be restored by heat treatment.

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3.2.1.1 Parts fabricated from other than corrosion resisting materials shall be protected against corrosion after fabrication by chemical treatment, electrolytic processes, plating or specified paints. The following methods are considered to provide corrosion protection methods when properly applied:

- (a) Hot-dip galvanizing in accordance with ASTM A 386 with the spelter conforming to special high grade of ASTM B 6.
- (b) Electroplating with zinc in accordance with ASTM B 633, SC4, followed by a chromate treatment conforming to ASTM B 201.
- (c) Hot phosphoric or chromic treatment, or a coating of primer in accordance with DOD-P-15328 followed by two coats of primer conforming to TT-P-664.

3.2.2 Fastenings and fittings. Bolts, nuts, studs, screws and such fastenings or fittings as may be used shall be of corrosion resisting material passivated in accordance with QQ-P-35, or of a material treated in a manner to render it adequately resistant to corrosion. Self-tapping sheet metal screws shall not be used.

3.2.3 Dissimilar metals. Where dissimilar metal contacts cannot be avoided, the materials of the cooling coils or the unit coolers shall be selected to minimize galvanic corrosion as required by MIL-STD-889.

3.2.4 Nonmagnetic material. When nonmagnetic cooling coils or unit coolers are specified (see 6.2.1), parts normally fabricated of black or galvanized steel shall be fabricated of 300-series corrosion resisting steel which has a permeability of less than 2.0 after fabrication.

3.2.4.1 Unit cooler fan motors shall conform to the material requirements of MIL-M-17060 for nonmagnetic motors.

3.2.5 Recovered materials. Unless otherwise specified herein, all equipment, materials 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 Shock. Cooling coils and unit coolers shall pass the high impact shock tests specified in MIL-S-901 for grade A, class I equipment.

3.4 Vibration. Cooling coils and unit coolers shall be designed such that no damage will occur or malfunction be caused by the environmental vibrations specified in MIL-STD-167-1.

3.5 Mounting hangers. Mounting hangers for duct style cooling coils and unit coolers shall be made of bolt stock having a tensile strength of not less than 150,000 pounds per square inch (lb/in²) and threaded for 3/4 inch - 10 UNC - 2A or 1 inch - 8 UNC - 2A in accordance with FED-STD-H28.

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3.6 Style A duct cooling coils.

3.6.1 Sizes and classes. Sizes of duct style cooling coils shall be limited to those on Drawings 803-1310894 and 803-5001031, as specified (see 6.2.1).

3.6.1.1 Physical dimensions. Mounting dimensions, tolerances, flange connections for ductwork, and tube spacing of the duct type cooling coil shall conform to Drawings 803-1310894, 805-1311399 and 803-5001031 for sizes specified.

3.6.1.2 Classes. Style A duct cooling coils shall be of three classes, class 1 (DW) for use with chilled water as the refrigerant, class 2 (DF) coils for use with refrigerant 12 (R-12) as the refrigerant, and class 3 (DWS) for use with sea water as the refrigerant.

3.6.2 Casing, end sheets, intermediate sheets, bottom sheet, bottom pan, end enclosure frame and end frame and end enclosure. The casing, end sheets except as specified in 3.6.2.2.1, intermediate sheets, bottom sheet, bottom pan, end frame and end enclosure frame shall be made of galvanized steel equal to that specified in ASTM A 525, or black steel equal to that of specified in ASTM A 569.

3.6.2.1 Casing. The casing shall be at least 0.130-inch thick when the coil face area is 5 square feet or less and at least 0.170-inch thick when the coil face area exceeds 5 square feet. The casing shall be continuously welded construction, with corners of flanges made smooth and airtight by welding to receive matching duct flanges.

3.6.2.2 End sheet. The end sheet, except when made of copper nickel alloy, shall be at least 0.130-inch thick when the coil face area is 5 square feet or less and at least 0.170-inch thick when the coil face area exceeds 5 square feet. Each end sheet shall be attached to the casing, the bottom sheet and the bottom pan by means of continuous welds.

3.6.2.2.1 End sheet (class 3 (DWS) coil only). The end sheet at the header end of the class 3 (DWS) cooling coil shall be at least 0.750-inch thick and shall be made of 90-10 copper nickel alloy conforming to MIL-C-15726.

3.6.2.3 Intermediate sheet. Intermediate sheet(s) for supporting the tubes shall be provided when the coil face dimension length exceeds 26 inches and the distance between the intermediate sheets shall not exceed 19 inches, except for coils having a face dimension height less than 15 inches. The intermediate sheet shall be at least 0.125-inch thick. Each intermediate sheet shall be attached to the casing, the bottom sheet, and the bottom pan by means of continuous weld on each side of the intermediate sheet.

3.6.2.4 Bottom sheet and bottom pan. Bottom sheet(s) and bottom pan shall be provided in accordance with Drawing 803-1310894 when coil face area is 5 square feet or less and Drawing 803-5001031 when coil face area exceeds 5 square feet. The bottom sheet(s) shall be attached to the casing, end sheets, and the intermediate sheet(s) by means of continuous weld on each side of the bottom sheet. The bottom pan shall be attached to the end sheets and the intermediate sheet(s) by means of continuous weld on each side of the bottom pan.

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3.6.2.5 End enclosure frame and end frames. End enclosure frame and end frame, except as specified in 3.6.2.5.1, shall be provided in accordance with Drawing 803-1310894 when coil face area is 5 square feet or less and Drawing 803-5001031 when coil face area exceeds 5 square feet. The end frame shall be of continuously welded construction and shall be attached to the casing and end sheets by means of continuous welds.

3.6.2.5.1 The end enclosure frame and end frame on the header end shall be omitted on the class 3 (DWS) cooling coil.

3.6.2.6 End enclosures. Removable end enclosures and access covers except as specified in 3.6.2.6.1 shall be provided in accordance with Drawing 803-1310894 when the coil face area is 5 square feet or less and Drawing 803-5001031 when the coil face area exceeds 5 square feet.

3.6.2.6.1 The removable end enclosure and access cover at the header end shall be omitted on the class 3 (DWS) cooling coil.

3.6.3 Cooling element and headers.

3.6.3.1 Cooling element and headers (class 1 (DW) and class 2 (DF) coils only). The cooling element shall be of the extended surface type consisting of copper tubing expanded into fins, having twin headers for class 1 (DW) coils or a distributor and suction header for class 2 (DF) coils. The coils shall be eight rows deep in direction of air flow with rows staggered in direction of air flow. The tubes shall be seamless copper tubing not less than 5/8-inch outside diameter (o.d.) and shall have a minimum wall thickness of 0.025 inch. When used in the construction of the cooling element, hairpin tubes shall have a minimum wall thickness of 0.025 inch throughout the tube. U-bends shall have an internal diameter at least equal to the diameter of the tube. Brazed joints of the cooling element shall be made with silver brazing alloy in accordance with QQ-B-654 or phosphorous copper in accordance with QQ-B-650.

3.6.3.1.1 Headers. Header(s) shall be made of copper or brass having a wall thickness of not less than that of type L in accordance with ASTM B 88 of equivalent size. Header sizes and the supply and return connections for class 1 (DW) coils shall be in accordance with Drawing 803-1310894 when the coil face area is 5 square feet or less and Drawing 803-5001031 when the coil face area exceeds 5 square feet. The suction headers and the liquid connections for class 2 (DF) coils shall be in accordance with Drawings 803-1310894 and 805-1311397. The headers shall be enclosed within the coil frame but not in the air stream, and the connections to the headers shall be secured to the coil frame to relieve the header joints from stresses due to external pipe whip.

3.6.3.1.2 Supply and return connections. The supply and return connections for class 1 (DW) coils shall be on the same end of the coil and shall have flanged connections conforming to MIL-F-20042 with pre-inserted rings. Flange sizes shall be as specified on Drawing 803-1310894 when the coil face is 5 square feet or less and Drawing 803-5001031 when coil face area exceeds 5 square feet.

3.6.3.1.3 Circuitry. The cooling coils shall be circuited as shown on Drawing 805-1311399 for class and sizes specified.

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3.6.3.2 Cooling element and header (class 3 (DWS) coil only). The cooling element shall be of the extended surface type consisting of copper nickel tubing expanded into fins and removable box type header on the supply connection end for cleaning the internal surface of the tubing and header. The coils shall be eight rows deep in the direction of air flow with rows staggered in the direction of air flow. The tubes shall be at least 5/8-inch o.d., 90-10 copper nickel tubing conforming to MIL-T-15005 and shall have a minimum wall thickness of 0.035 inch. When used in the construction of the cooling element, hairpin tubes shall have a minimum wall thickness of 0.035 inch throughout the tube. U-bends shall have an internal diameter at least equal to diameter of the tube. Tubes shall terminate and shall be rolled into the copper nickel end sheet at the header on the supply connection end of coil. Brazed joints of the cooling element shall be made with silver brazing alloy conforming to QQ-B-654 or phosphorous copper conforming to QQ-B-650.

3.6.3.2.1 Header. A removable box type header shall be provided on the supply connection end of the coil. The header shall be continuously welded construction and shall be constructed of 90-10 copper nickel alloy conforming to MIL-C-15726. The header shall be gasketed and bolted to the end sheet on the supply connection end of the coil. The header shall also be in accordance with the following:

- (a) Designed for an operation pressure of at least 100 lb/in².
- (b) Baffled for double serpentine circuitry.
- (c) Refrigerant supply and return connections flanged as specified for the class 1 (DW) coil in 3.6.3.1.2.
- (d) One quarter inch o.d. tubing connection in each corner for draining and venting.

3.6.3.3 Fins. Fins shall be of the smooth continuous plate type, not less than 0.016-inch thick and shall be uniformly spaced. Fins shall have rolled collars with tubes expanded into the collars to form a permanent bond. The number of fins per linear inch of tube shall not be less than 7 nor more than 7-1/2.

3.6.3.3.1 The fin surface of the cooling element shall be made of copper known commercially as "electrolytic tough pitch copper".

3.6.3.4 Ferrules. Brass, copper or corrosion-resisting steel ferrules shall be provided where tubes pass through end sheets and intermediate sheets. Tubes shall be expanded into the ferrules to allow wear, due to shipboard vibration and expansion and contraction of the tubes, to occur between the ferrules and end sheets and between the ferrules and the intermediate sheets.

3.6.3.5 When tested as specified in 4.8.6, the cooling coil shall show no leakage.

3.6.3.6 Venting and draining (class 1 (DW) only). Class 1 (DW) cooling coil shall be provided with means for venting and draining the coil. The vent shall be either 1/8 nominal pipe size brass pipe, or 1/4-inch o.d. tubing and shall be located at the top of either header. Draining the coil shall be other than breaking the chilled water flange connections.

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3.6.3.7 Turbospirals (class 1 (DW) only). Class 1 (DW) cooling coils shall have turbospirals in all tubes. The turbospiral shall be made of electrolytic hard drawn copper wire of at least 0.032-inch diameter and shall have a uniform pitch of at least 16 turns per lineal foot of tube. The spiral shall fit snugly against the inside surface of the tube.

3.6.4 Equalizer line (class 2 (DF) only). A 1/4-inch o.d. equalizer line shall be provided which shall be connected to the top of the suction header, and shall be of sufficient length to permit brazing the connection at the power assembly before the assembly is secured to the body flange.

3.6.5 Distributor (class 2 (DF) only). A multi-outlet type venturi-flow distributor shall be installed on each cooling coil and shall have an inlet connection for 5/8-inch o.d. tubing for all coils, except coils having 12 or more refrigerant circuits which shall have an inlet connection for 7/8-inch o.d. copper tubing. The outlet connections shall be for 1/4-inch o.d. copper tubing and the number of unused outlets that may be plugged shall be limited to one. The distributor shall have sweat type inlet and outlet connections.

3.6.6. Expansion valve (class 2 (DF) only). Expansion valve, including the power assembly and cage assembly, shall be furnished and installed by the installing activity. The valve shall be the modulating type actuated by a direct operating thermal type element. The capillary tube shall be 5 feet long. The valve shall be constructed so that it may be disassembled for repair or replacement of parts without disconnecting other than the external equalizer. Parts of the valve subject to corrosion shall be of brass, bronze or corrosion-resisting steel as applicable. Valve design, including capacity in tons of refrigeration at various pressure differences across the valve, and construction, shall be approved by NAVSEA.

3.6.7 Drain pan. A removable, insulated drain pan shall be provided and shall be constructed in accordance with Drawing 803-1310894 when the coil face area is 5 square feet or less and Drawing 803-5001031 when the coil face area exceeds 5 square feet. The pan shall be constructed of aluminum or steel.

3.7 Gravity type cooling coil.

3.7.1 Sizes. Sizes of gravity style cooling coils shall be limited to those on Drawing S3803-532636 as specified (see 6.2.1).

3.7.2 Construction requirements. Gravity style cooling coil and drain trough shall be constructed in accordance with Drawing S3803-532636 for sizes specified and as follows:

- (a) The fins and tubes shall be of the same material and thickness as specified for duct style cooling coils.
- (b) The number of fins per linear inch of tube shall not be less than 3 nor more than 3-1/2.
- (c) Ferrules shall be provided as specified in 3.6.3.4.
- (d) When tested as specified in 4.8.6, the cooling element shall show no leakage.

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3.8 Unit coolers. The unit cooler shall consist of a fan and motor, either a style A, class 1 or class 2 duct type cooling coil specified in 3.6, air filters and directional louvers, built as a single unit, ready for installation and connection to a power source and to the cooling medium supply and return.

3.8.1 Sizes and classes. Sizes of unit coolers shall be as specified in table II. Unit coolers shall be of two classes, class 1 (UW) for use with chilled water as the refrigerant and class 2 (UF) for use with R-12 as the refrigerant.

TABLE II. Sizes and capacities.

Sizes	Capacity BTU/hr, minimum	Air flow standard cubic feet per minute	Water gal/min
51	13,500	215	4.0
52	22,200	340	7.0
53	33,500	510	10.0
54	49,300	750	15.0
55	62,400	1120	19.0

3.8.1.1 The physical dimensions, mounting dimensions and tolerances of the unit cooler shall conform to Drawing 805-1311398 for sizes specified (see 6.2.1).

3.8.2 Capacity. The capacity of each size unit cooler shall be at least equal to that specified in table II, based on 85 degrees Fahrenheit (°F) dry bulb (DB) temperature, 71°F wet bulb (WB) temperature, entering the unit cooler with $49 + 1.5^\circ\text{F}$ WB temperature leaving the coil when the entering water is 45°F. The specified performance of the unit cooler shall be such that the air flow and water flow rates are within plus 7.5 percent of those specified in table II. The air distribution across the outlet face of the coil shall be uniform (see 4.8.8).

3.8.3 Transition. Unit cooler transition shall be constructed in accordance with Drawing 805-1311398, and shall be made of galvanized steel equal to that specified in ASTM A 525, or black steel equal to that specified in ASTM A 569. The transition shall be at least 0.070-inch thick and shall be of continuously welded construction. Corners of flanges shall be made smooth and airtight by welding to meet matching duct cooling coil flange and motor assembly mounting plate.

3.8.4 Air filters. Air filters shall be provided in the transition for filtering all the air entering the cooling coil. 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 on Drawing 805-1311398.

3.8.5 Directional louvers. Each unit cooler shall be provided with removable directional louvers. The louvers shall be constructed to permit adjustable directional air flow in the vertical plane and to prevent overheating the fan motor when the louvers are in the closed position. The louver frame shall be at least 0.10-inch thick and the louver vanes shall be at least 0.07-inch thick.

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3.8.6 Fan. The fan for the unit cooler shall be of the axial type, complete with motor, mounting plate and fan guard. The fan shall be a direct-driven unit with the fan impeller overhung on the motor shaft. The fan shall be quiet in operation and shall be statically and dynamically balanced. Rotating parts of the fan shall have a factor of safety of not less than 8, based on the ultimate tensile strength of the material involved.

3.8.6.1 Fan impeller. The fan impeller, consisting of hub, web, rim and blades, shall be one-piece sand casting or permanent-mold casting of aluminum alloy conforming to table I and 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. The nose piece shall be of aluminum, either cast or formed, and shall be match-marked with the impeller or attached so as to assure reinstallation in the same position relative to the impeller. The hub diameter shall be at least as great as the diameter of the motor and shall have a liner of 300-series corrosion resisting steel. The fan blades shall be of air foil design. The fan impeller shall be secured to the motor shaft by a key and by a castellated nut with a cotter pin.

3.8.6.2 Fan casing and mounting plate. The fan casing shall be made of cast aluminum alloy conforming to table I and shall be at least 0.250-inch thick. Flanges shall be provided at each of the casings for mounting the fan assembly to the transition and for attaching the fan guard. The flanges shall be an integral part of the casing. The fan assembly mounting plate for mounting the assembly to the transition shall be made of aluminum and shall be at least 0.120-inch thick.

3.8.6.3 Fan guard. A fan guard shall be provided, which shall be securely fastened to one end of the fan casing by suitable means to permit ready removal, and shall be in accordance with the following requirements:

- (a) Sufficiently rugged to prevent distortion under normal operating conditions.
- (b) Adequate to protect personnel from injury, maximum 1-inch mesh.
- (c) Will not restrict the airflow appreciably.
- (d) Will not vibrate excessively when the fan is in operation.

3.8.7 Electrical equipment. The design of the electrical equipment shall be in accordance with the basic requirements of MIL-E-917.

3.8.7.1 Electric service. Fan motor shall be supplied for 115 volts, single-phase, 60 hertz (Hz) alternating current service.

3.8.7.2 Motor. The motor shall be service A in accordance with MIL-M-17059, shall be designed for 65 degrees Celsius ($^{\circ}\text{C}$) ambient temperature with temperature rise not to exceed 55 $^{\circ}\text{C}$ in 65 $^{\circ}\text{C}$ ambient, continuous duty, constant speed, and shall have class B or F insulation and a spraytight enclosure. Shaft rubbing seal not permitted. The motor shall be equipped with normal internal fit ball bearings in accordance with MIL-B-17931 or FF-B-171 and shall be type 120 or type 111, classes 1, 2 or 7. The maximum horsepower (hp) for each size fan shall be as shown on Drawing 805-1311398.

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3.8.8 Noise limitation. The unit cooler shall be designed such that it is capable of meeting the sound power level indicated in table III when tested as specified in 4.8.5.

TABLE III. Sound power level in decibels (dB), re 10^{-12} watts.

Size	Octave band center frequency - Hz							
	63	125	250	500	1000	2000	4000	8000
51	58	69	68	72	71	68	64	57
52	59	70	69	73	72	69	65	58
53	60	71	70	74	73	70	66	59
54	63	74	73	77	76	73	69	62
55	66	77	76	80	79	76	72	65

3.9 Thermal insulation. The duct style cooling coils shall be insulated as shown on Drawings 805-1311397 and 803-5001031. Unit coolers shall be insulated as shown on Drawing 805-1311398. The insulation shall be in accordance with type II of MIL-P-15280 and shall be at least 5/8-inch thick. The insulation shall be bonded in place with an adhesive as specified in MIL-P-15280.

3.10 Welding and brazing. Welding procedures and materials shall be in accordance with MIL-STD-278, except that only visual examination of welds is required. Brazing procedures shall be in accordance with NAVSEA 0900-LP-001-7000.

3.10.1 Zinc-coated surfaces. Where zinc-coated steel is used for fabricating parts, the metallic zinc shall be removed from 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 is necessary to weld over the zinc-coated surfaces, electrode type G6010 and G6011 shall be used in accordance with QQ-E-450 and the welded region shall be coated with a cold galvanizing compound.

3.11 Painting. Interior and exterior surfaces of cooling coils and unit heaters, except the cooling elements and those surfaces constructed of brass, copper, corrosion resisting steel or copper nickel alloy shall be thoroughly cleaned and coated as follows:

- (a) One coat of pretreatment coating in accordance with DOD-P-15328.
- (b) Two coats of zinc chromate primer in accordance with TT-P-645,
or two coats of red lead primer in accordance with DOD-P-17545.

3.12 Identification plates. Each duct style cooling coil, gravity style cooling and unit cooler shall be provided with an identification plate. The identification plates shall be color style II and shall conform to types A, B, D, F, or H of MIL-P-15024 and MIL-P-15024/5. The physical dimensions of the identification plates shall be equal to or less than the dimensions of a size number 10 plate in accordance with MIL-P-15024.

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3.12.1 The identification plate shall contain the following information:

- (a) Nomenclature.
- (b) Size and style (see 3.12.1.1).
- (c) National stock number.
- (d) Component identification number.
- (e) Contract or order number.
- (f) Manufacturer's part number, name and address.

3.12.1.1 The letters DW, DF or DWS shall be added after the size designation to designate that the duct coil is constructed for use with chilled water, R-12 or sea water respectively; and the letters UW or UF shall be added after the size designation to designate that the unit cooler is constructed for use with chilled water or R-12 respectively. In addition to the type designation, the letters NM to designate that the cooling coil or unit cooler shall be constructed of nonmagnetic material and shall be added after the size or style designation, as applicable.

3.13 Technical data. The contractor shall prepare technical data in accordance with the data ordering documents included in the contract or order (see 6.2.2) and as specified in 3.13.1 through 3.13.3.

3.13.1 Drawings. In addition to the drawing content required by the data ordering document (see 6.2.2), the following unique technical features shall include:

- (a) Methods and sizes of fastening, and clearances for installation and serving.
- (b) Supplementary data necessary to permit shipyard installation without contractor's assistance.
- (c) Specify total weight of each assembled cooling coil, unit cooler and fan-motor unit.
- (d) Specify specific gravity of each assembled cooling coil, unit cooler and fan-motor unit.
- (e) Fan-motor assembly shall include fan characteristic curves which show total pressure, static pressure, brake hp and power input (kilowatts) as ordinates, and cubic feet of standard air from free delivery to no delivery, as the abscissa.
- (f) List of materials.

3.13.2 Motor drawings. Motor drawings shall be in accordance with MIL-M-17059.

3.13.3 Drawing review. Drawings shall be reviewed by NAVSEA, except for certification data drawings which shall be reviewed by the purchasing activity, and then put on operation cards in accordance with the contract or ordering data (see 6.2.2).

3.14 Workmanship. Cooling coils and unit coolers shall be free from defects that affect their appearance and operation. Tube sheets shall not show cracks due to punching or forming, and fin collars shall not show cracks after tubes are expanded into collars. Fin edges shall be free of burrs and shall not be bent. Casing corners shall be square, flanges shall be parallel and smooth, fan guard screen shall not be bent, mount bolts for direction louvers and fan assembly of the unit cooler shall be in place and secured.

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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 maintain an inspection system acceptable to the Government for supplies and services covered by this specification as specified in the contract or order (see 6.2.1).

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

- (a) Qualification inspection (see 4.3)
- (b) Type tests (see 4.4)
- (c) Periodic tests (see 4.5)
- (d) Quality conformance inspection (see 4.6)

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to NAVSEA and shall consist of the tests specified in table IV. Prior to test authorization, drawings delineating the products covered by this specification and conforming to 3.13 through 3.13.2 shall be submitted for review and approval.

TABLE IV. Test agenda.

Tests	Applicability of test to cooling coil/unit cooler					
	Qualification ^{1/}	Class ^{2/}	Periodic ^{3/}	Quality conformance ^{3/}	Requirement paragraph	Test paragraph
Shock	53UW, 53DWS, 3GW	DW, UW, UF, DWS, DGW			3.3	4.8.1
Vibration	53UW, 53DWS, 3GW	DW, UW, UF, DWS, GW			3.4	4.8.2
Capacity	53UW	UW, UF	UW, UF		3.8.2	4.8.3
Volume	53UW	UW, UF	UW, UF		3.8.2	4.8.4
Sound	53UW	UW, UF	UW, UF		3.8.8	4.8.5
Leakage, coil	53UW	all	all	all	3.6.3.5, 3.7.2(d)	4.8.6

See footnotes at end of table.

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TABLE IV. Test agenda. - Continued

Tests	Applicability of test to cooling coil/unit cooler					
	Qualification ^{1/}	Class ^{2/}	Periodic ^{3/}	Quality conform- ance ^{3/}	Requirement paragraph	Test paragraph
Operation	--	--	--	UW, UF	3.8.6	4.8.7
Air distribution	53UW	UW, UF	UW, UF	UW, UF	3.8.2	4.8.8
Insulation resistance	53UW	UW, UF	UW, UF		3.8.7.2	4.8.9
Dielectric strength	53UW	UW, UF	UW, UF		3.8.7.2	4.8.10
Heat	53UW	UW, UF	UW, UF		3.8.7.2	4.8.11
Cast impeller and casings	53UW	UW, UF	UW, UF	UW, UF	3.2	4.8.12

^{1/} Applies to test specimen size 53UW, or larger.

^{2/} Applies to test specimen for each size of the styles indicated.

^{3/} Applies to every cooling coil and unit cooler produced, as applicable.

4.3.1 Sample for qualification. Qualification tests shall be conducted on one size 53 or larger, class 1 (UW) unit cooler and for sizes 58 DW, 56 DW, and 55 DW for shock and vibration tests. Qualification of the class 1 (UW) unit cooler shall include qualification of all sizes and classes duct type cooling coils, all sizes of gravity style cooling coils, and all sizes and classes of unit coolers.

4.3.2 Where a cooling coil of a size larger of the identical style and class than submitted for tests has successfully passed the shock test specified in 4.8.1 and the vibration test specified in 4.8.2, the tests may be extended by NAVSEA.

4.4 Type tests. Type tests are in-depth tests of unit coolers of any class and size by producers whose product of the class being tested is listed in the QPL. Type tests shall consist of the tests specified in table IV and shall be conducted prior to production on each new unit cooler, 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-motor unit is similar aerodynamically and the motor is of identical manufacturer, hp and of identical frame size, provided that the speed and heating are determined by a heat test with the motor installed in the fan.

4.5 Periodic tests. Periodic tests are required to assure continuing satisfactory operation of identical units. The tests are required under any contract or order for unit coolers of existing design when the invitation is dated 5 years or more subsequent to the date of the last previous test of an identical unit. Periodic tests shall consist of the tests specified in table IV.

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4.6 Quality conformance inspection.

4.6.1 Lot. Cooling coils or unit coolers of one type, class or size offered for delivery at one time shall be considered a lot.

4.6.2 Sampling for examination. A random sample of cooling coils or unit coolers shall be selected from each lot for examination specified in 4.7 with quality conformance based on the sampling requirements as specified in MIL-STD-105, at inspection level II. The acceptable quality level is 1.5 percent defective.

4.6.3 Sampling for tests. Each cooling coil and unit cooler in the lot shall be subjected to the tests specified in table IV.

4.7 Examination. Each of the sample cooling coils or unit coolers selected in accordance with 4.6.2 shall be examined and measured to verify compliance with the requirement of this specification, not involving tests. The classification of defects in table V is the minimum that is to be considered in the examination. Any cooling coil or unit cooler 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 V. Classification of defects.

Categories	
Critical:	None defined.
Major:	
101	Size, class and type not as specified.
102	Incomplete, component parts missing or improperly assembled.
103	Materials defective or not as specified.
104	Welding incomplete, not continuous, not free of cracks, non-fusion, heavy porosity, heavy undercut, slag inclusions.
105	Tube wall thickness or header wall thickness less than specified minimum.
106	Fin thickness, spacing not as specified, or fins not tight on tubes.
107	Not provided with a means of preventing wear on tubes, failure of allowing for expansion and contraction of tubes.
108	Flange holes and mounting dimensions not as specified.
109	Supply and return connections not secured to frame or casing.
110	Bolts, nuts and screws not tight, missing (parts shall be properly fastened and secured).
111	Drain pan not as specified.
112	Insulation, thermal missing.
113	Corners of flanges not smooth and airtight.
114	Not in accordance with approved drawings.
115	Limiting dimensions exceeded.
116	Fin collars and tube sheets cracked.
117	Painting (as applicable), non-conforming.
118	Marking, identification plate not complete, missing, not permanent, illegible or not as specified.
Minor:	None defined.

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4.8 Tests.

4.8.1 High-impact shock. Cooling coils and unit coolers shall be shock tested on the medium weight machine as prescribed for type A in accordance with MIL-S-901 if its weight with fixture and mounting bracket exceeds 550 pounds or if the mounting bracket extends beyond the anvil; otherwise, they shall be shock tested on the light weight machine as prescribed for type A in accordance with MIL-S-901. A hydrostatic pressure of at least 100 lb/in² shall be maintained on the cooling element of the cooling coil and the unit cooler, and the fan of the unit cooler shall be operated at rated voltage and current during the shock tests. The high-impact shock test shall be conducted prior to the tests specified in 4.8.2 through 4.8.12, and the correction of damages, which may have occurred during the shock test, shall not be performed prior to these tests. Evidence of fragmentation or missile effects of parts, deformation of parts that will cause active interference between parts, leakage of the cooling element, or failure of unit cooler fan to operate, shall be cause for rejection.

4.8.1.1 Upon completion of shock tests, the sample cooling coil or unit cooler shall be returned to the contractor for examination and further testing.

4.8.2 Vibration. Cooling coils and unit coolers 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 4.8.3 through 4.8.12, and the correction of damages, which have occurred during vibration tests shall not be performed prior to these tests.

4.8.3 Capacity. The capacity of the unit cooler shall be determined at the conditions specified in 3.8.2. The capacity of the unit cooler and the measurement of the air flow shall be conducted in general accordance with ASHRAE Standard 16. The capacity, the air flow, and water flow rates not within the specified limits are cause for rejection.

4.8.4 Volume. The volume of air delivered through each unit cooler with louvers and fan guard installed shall be determined in accordance with AMCA Standard 210. A volume exceeding 7.5 percent of that specified in table II for size tested is cause for rejection.

4.8.5 Sound. The sound power of each unit cooler with louvers and fan guard installed shall be established in accordance with ANSI Standard S1.21. Sound power levels shall be taken in each octave band (see table III) with unit cooler fan operating at rated voltage and current, and shall be referenced to a power of 10⁻¹² watts. Exceeding the level in any octave band is cause for rejection.

4.8.6 Leakage. The cooling element of each class 1 (DW), class 2 (DF) and gravity type cooling coil and each class 1 (UW) and class 2 (UF) unit cooler shall be tested at a hydrostatic pressure of 300 lb/in² and each class 3 (DWS) cooling coil shall be tested at a hydrostatic pressure of 110 lb/in². While under this pressure, all joints, tube and "U" bends, and between tubes and headers shall be given a sharp blow with a 2-pound rubber mallet. The

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cooling element shall be drained and then be filled with air or gas at a pressure not less than 50 lb/in² and immersed in water to determine whether leaks have developed. Any cooling coil or unit cooler in which there is evidence of leakage when tested, shall not be offered for delivery.

4.8.7 Operation. The fan assembly of each unit cooler shall be tested at rated voltage and current to determine whether the fan will operate. Any unit cooler in which the fan, or fan assembly fails to operate, shall not be offered for delivery.

4.8.8 Air distribution. Each unit cooler shall be tested to determine the air distribution pattern. The directional louvers shall be removed and reading made with a 4-inch calibrated anemometer held directly against the fin edges, and each 4-inch division of coil face area horizontally and vertically. The maximum variation in the measured air velocity at any point on the outlet face of the coil shall not vary by more than 15 percent with variations between adjacent divisions limited to 5 percent. Air distribution not being within specified limits is cause for rejection.

4.8.9 Insulation resistance. The insulation resistance test of the fan motor shall be conducted in accordance with MIL-M-17059.

4.8.10 Dielectric strength. The fan motor shall be subjected to and shall withstand the dielectric strength test specified in MIL-M-17059.

4.8.11 Heat. Motor heating shall be measured as specified in MIL-M-17059. In each test, the motor shall be installed in the unit cooler, and the louvers closed at least 50 percent but not more than 75 percent. Exceeding the heating limits specified in MIL-M-17059 is cause for rejection.

4.8.12 Cast impeller and casings. Test samples shall be inspected for chemical content and mechanical properties in accordance with QQ-A-601. There is no requirement for radiography of visually sound castings. Repair of cast impellers is not permitted. Cast casings may be repaired by welding or impregnation, subject to radiographic inspection and NAVSEA approval for each casting involved.

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) Type test (see 4.4).
- (b) Periodic test (see 4.5).
- (c) Shock test (see 4.8.1). Shock tests shall include the following unique features:
 - (1) Drawing number identification of the cooling coil or unit cooler.
 - (2) Photographs of the cooling coil or unit cooler in each test mounting.
- (d) Vibration test (see 4.8.2).
- (e) Capacity test (see 4.8.3).
- (f) Volume test (see 4.8.4). Volume test shall include the following unique technical features:

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- (1) The figure number of AMCA Standard 210 shall be identified.
- (2) The duct or chamber dimensions and the diameter of nozzle, if used, shall be identified.
- (3) Computations, if not made strictly in accordance with AMCA Standard 210.
- (g) Sound test (see 4.8.5). Sound test including tables of sound power in each octave band.
- (h) Air distribution test (see 4.8.8). Air distribution test including sketch of division of coil face area horizontally and vertically.
- (i) Heat test (see 4.8.11).

4.9.1 Type and periodic test reports shall be submitted to NAVSEA for approval.

4.10 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-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 referenced documents listed in section 2, see 6.5.)

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2.1).

5.1.1 Level A. Each cooling coil and each unit cooler shall be cleaned by process C-1, unit protected and packaged in accordance with method III of MIL-P-116 and as follows:

- (a) Each coil shall be thoroughly drained, and blown out by clean, dry compressed air.
- (b) All coil openings shall be sealed to prevent entrance of dirt and moisture.
- (c) R-12 coils shall be filled with R-12 gas prior to sealing.
- (d) Fan assemblies of unit coolers shall be removed from the equipment and packaged in accordance with level A requirements of MIL-E-16298. Hardware removed in the disassembly process shall be preserved and packaged in accordance with method I of MIL-P-116.

5.1.2 Level C. Preservation and packaging of each unit shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity for early installation. This level may conform to the contractor's commercial practice when such meets the requirements of this level.

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5.2 Packing. Packing shall be level A, B or C as specified (see 6.2.1).

5.2.1 Level A. Each cooling coil and unit cooler, packaged as specified in the contract or order, shall be packed in a container conforming to any one of the following specifications at the option of the contractor:

<u>Specification</u>	<u>Classification</u>
PPP-B-601	Overseas type
PPP-B-621	Class 2
MIL-C-104	--

Wood and wood-cleated boxes shall be provided with waterproof caseliners in accordance with MIL-L-10547. Caseliners shall be closed and sealed in accordance with the appendix to MIL-L-10547. Wood or wood-cleated boxes shall not exceed the weight limitations of the applicable box specification. Boxes shall be modified by the addition of wood skids in accordance with the applicable box specification. Blocking, bracing, anchoring and cushioning of container contents shall be in accordance with MIL-STD-1186 and the appendix to MIL-C-104. Shipping container closure shall be in accordance with the applicable box or crate specification or appendix thereto.

5.2.2 Level B. Each complete unit packaged as specified, shall be packed in a container conforming to any one of the following specifications at the option of the contractor:

<u>Specification</u>	<u>Classification</u>
PPP-B-601	Domestic type
PPP-B-621	Class 1
MIL-C-104	--

Wood or wood-cleated boxes shall be modified by the addition of skids in accordance with the applicable box specification. Wood or wood-cleated boxes shall not exceed the weight limitations of the applicable box specification. Blocking, bracing, anchoring and cushioning of container contents shall be in accordance with MIL-STD-1186 and the appendix to MIL-C-104. Shipping container closure shall be in accordance with the applicable box or crate specification or appendix thereto.

5.2.3 Level C. Each cooling coil and each unit cooler packaged as specified in the contract or order, shall be packed in containers, at the lowest rate, in a manner which will insure acceptance by the common carrier and will afford protection against physical or mechanical damage during direct shipment from the supply source to the first receiving activity for immediate use. This level shall conform to the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may be the contractor's commercial practice when such meets the requirements of this level.

5.3 Marking. In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked for shipment in accordance with MIL-STD-129.

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6. NOTES

6.1 Intended use. Fin-tube cooling coils and unit cooler having fan assemblies mounted integral with the unit are intended for use in heating, ventilation and cooling system aboard Navy ships.

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, style, class, size and composition required (see 1.2).
- (c) Whether nonmagnetic cooling coils or unit coolers are required (see 3.2.4).
- (d) Size of cooling coil or unit cooler required (see 3.6.1, 3.7.1 and 3.8.1.1).
- (e) Inspection system in accordance with MIL-I-45208 (see 4.1.1).
- (f) Level of preservation, packaging and packing required (see 5.1 and 5.2).

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.

<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
3.13	Drawings, engineering and associated lists	DI-E-7031	Level 3 Design activity designation - contractor Design activity drawing no. - contractor
3.13.3	Imaged aperture/ tabulating cards	DI-E-20477	Microfilming of drawings on aperture cards - type I, class 1 or type II, class 2 Microfilm Repository Commanding Officer Naval Shipyard Portsmouth, NH 03801 Attn Code 202.2

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<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
4.9	Reports, test	DI-T-2072	10.1.b
4.9	Reports, equipment shock test	UDI-T-23753	----
4.9	Reports, vibration testing	UDI-T-23762	----

(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 sections 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 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 Qualified Products List QPL-2939 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, 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.

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6.5 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.

6.6 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 4130-N271)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-C-2939E(SH)	2. DOCUMENT TITLE Cooling Coils, Air, Duct Type And Gravity Type; Cooler Units, Air, Naval Shipboard Environmental Control System
3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION (Mark one) <input type="checkbox"/> VENDOR <input type="checkbox"/> USER <input type="checkbox"/> MANUFACTURER <input type="checkbox"/> OTHER (Specify): _____
b. ADDRESS (Street, City, State, ZIP Code)	
5. PROBLEM AREAS	
a. Paragraph Number and Wording:	
b. Recommended Wording:	
c. Reason/Rationale for Recommendation:	
6. REMARKS	
7a. NAME OF SUBMITTER (Last, First, MI) - Optional	7b. WORK TELEPHONE NUMBER (Include Area Code) - Optional
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional	8. DATE OF SUBMISSION (YYMMDD)