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OO-C-2858  
 April 7, 1995  
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 SUPERSEDING  
 MIL-C-22948D(YD)  
 10 July 1989

## FEDERAL SPECIFICATION

### COOLERS, AIR, EVAPORATIVE

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers packaged type, evaporative air coolers consisting essentially of a centrifugal fan, an evaporative media, and a system for distributing water over the evaporative media, all contained in a metal, weatherproof cabinet.

1.2 Classification. The evaporative air coolers will be of the following types, as specified (see 6.2):

Type I - Drip-type with stationary wetted pad.  
 Type II - Rotary-type with revolving drum or disk.

1.2.1 Part numbers. The specification number, type, style, and class are combined to form the specification part numbers for the air conditioning units covered by this specification (see 6.5). The part numbers for the air conditioning units are established as follows:

	OOC2858	-	X
Specification number-----*			*
			*
Type code number (see 6.6) -----*			*

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 \*Beneficial comments (recommendations, additions, deletions) and any pertinent\*  
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## 2. APPLICABLE DOCUMENTS

### 2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

#### Federal Standard

FED-STD-123 - Marking for Shipment (Civil Agencies)

#### Military Specifications

MIL-V-173 - Varnish, Moisture and Fungus Resistant (For Treatment of Communications, Electronics and Associated Equipment)

MIL-R-3593 - Refrigeration and Cooling Equipment (Excluding Household Refrigerators), Packaging of

#### Military Standards

MIL-STD-461 - Control of Electromagnetic Interference Emissions and Susceptibility, Requirements for the

MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of

MIL-STD-129 - Marking for Shipment and Storage

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

2.2 Other publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation (see 6.2).

#### Air Movement and Control Association, Inc. (AMCA)

AMCA Standard 210 - Laboratory Methods of Testing Fans for Rating

(Application for copies should be addressed to the Air Movement and Control Association, Inc., 30 W. University Drive, Arlington Heights, IL 60004.)

#### American National Standards Institute, Inc. (ANSI)

ANSI B1.1 - Unified Inch Screw Threads

ANSI B1.20.1 - Pipe Threads, General Purpose (Inch)

ANSI B1.20.3 - Dryseal Pipe Threads (Inch)

ANSI Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

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(Application for copies should be addressed to the American National Standards Institute, Inc., 11 W. 42nd Street, New York, NY 10036.)

ASTM

- ASTM A 123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- ASTM A 525 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- ASTM F 872 - Filter Units, Air Conditioning: Viscous-Impingement Type, Cleanable
- ASTM F 1040 - Filter Units, Air Conditioning: Viscous Impingement and Dry Types, Replaceable

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

National Electrical Manufacturers Association (NEMA)

- NEMA MG 1 - Motors and Generators

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

National Fire Protection Association (NFPA)

- NFPA No. 70 - National Electrical Code

(Application for copies should be addressed to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269-9101).

Sheet Metal Industry Fund (SMIF)

- SMIF - Guidelines for Seismic Restraints of Mechanical Systems (Sheets 1 through 18)

(Application for copies should be addressed to the Sheet Metal Industry Fund, 3130 Wilshire Blvd., Los Angeles, CA 90010.)

Society of Automotive Engineers, Inc. (SAE)

- SAE Handbook - J534 - Lubrication Fittings

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

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification takes precedence. Nothing in this specification, however,

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supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 Description. The evaporative air coolers (referred to herein as "coolers") shall be self-contained package units and shall include the following:

- a. A centrifugal blower to move outside air through the cooler into the space to be cooled.
- b. An evaporative media for introducing water to be evaporated into the moving airstream.
- c. A system for continuously wetting the evaporative media at a controlled rate.
- d. A bleed-off system for reducing the accumulation of salt or scale deposits on parts in contact with the water.
- e. A chemical treatment system in the form of briquets, to retard precipitation of salts in the make up of water.

The coolers shall include all required motors, belts, pulleys, gear trains, controls, and other components specified herein. The unit shall be assembled in a sturdy steel cabinet suitable for outside installation and shall be completed and ready for operation when connected to water and electrical supplies. When approved by the contracting officer, fan motors and drives for coolers may be shipped separately for installation at the site by the Government or by the installing contractor.

3.2 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.2.1, 6.2, and 6.4).

3.3 Standard commercial product. The coolers shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but which are a part of the manufacturer's standard commercial product, shall be included in the air conditioner units being furnished. A standard commercial product is a product which has been sold or is being currently offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.3.1 Repair parts and service. Replacement or repair parts and service for the standard commercial product shall be available from the manufacturer or from commercial parts distributors or service organizations.

3.3.2 System of measurement. The dimensions used in this specification are not intended to preclude the use of the metric system of measurement in the fabrication and production of the material, individual parts, and the finished product, provided form, fit, and function requirements are satisfied.

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

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

3.5.1 Dissimilar metals. Contact between dissimilar metals likely to cause deterioration of parts by galvanic corrosion shall be avoided. When such contact cannot be avoided, joints between dissimilar metals shall be protected against galvanic corrosion by plating, coating, insulation, gaskets, or other suitable means. Bolts, nuts, pins, screws, and other fastenings shall be of the same material as the metals joined or shall be cathodic to the metals joined.

3.5.2 Zinc-coated steel. Galvanized steel sheets shall have coatings conforming to ASTM A 525, coating class G90. Subassemblies and steel components may be galvanized after fabrication at the option of the manufacturer, in which case the zinc coating shall conform to the requirements of ASTM A 123.

3.5.3 Copper and copper alloys. Copper and copper-base alloys shall be of commercial grades for the intended purpose. If copper-zinc alloys are used, they shall contain not less than 85 percent copper to prevent dezincification.

3.6 Performance. The coolers shall reduce the dry-bulb temperature of the ambient air introduced into the space to be cooled by conversion of the sensible heat of the ambient air to the latent heat of vaporization as the airstream passes through the wetted evaporative media. The composition, surface area and thickness of the evaporative media pads, the velocity of air flow through the evaporative media, and the rate of application of water to the evaporative media shall insure that the following performance requirements will be met:

- a. No moisture shall be entrained into the airstream or shall enter the space being cooled (see 4.6.2).
- b. No sections of the evaporative media shall become dry while the cooler is supplied with ambient air at 110 degrees Fahrenheit (oF) (43.33o Celsius (C)) dry-bulb and 72oF (22.22oC) wet-bulb.

3.6.1 Capacity. The capacity of the coolers shall be as specified (see 6.2), and shall be based on the volume of air in cubic feet per minute (cfm) (cubic meters per second ( $\text{m}^3/\text{s}$ )) delivered at the discharge outlet against the specified static pressure external to the cooler in water gage inches. The capacity shall be based on the standard air density of 0.075 pounds per cubic foot ( $\text{lb}/\text{ft}^3$ ) (1.20 kilograms per cubic meter ( $\text{kg}/\text{m}^3$ )) (see 4.6.2).

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3.6.2 Efficiency. The evaporative efficiency of the coolers shall be not less than 80 percent when determined by the following formula (see 4.7.2):

$$\text{Efficiency} = \frac{(T_{r1} - T_{r2}) \times 100}{T_{r1} - T_{rw}}$$

Where:  $T_{r1}$  = dry-bulb temperature in oF (oC) of the ambient air entering the cooler.

$T_{r2}$  = dry-bulb temperature in oF (oC) of the air leaving the cooler.

$T_{rw}$  = wet-bulb temperature in oF (oC) of the ambient air entering the cooler.

3.7 Construction. Coolers shall be rigidly constructed to withstand the stresses, jars, and vibrations incidental to shipping, storage, installation, and operation. Fasteners shall be corrosion-resistant. Coolers shall be weatherproof and shall be furnished complete in all details, including those not specifically mentioned herein. The cooler shall permit ready accessibility for maintenance, servicing, cleaning, and repair to interior compartments and components. Screw-threads and pipe-threads shall conform to ANSI B1.1, B1.20.1, or B1.20.3, as applicable. Unless otherwise specified (see 6.2), coolers shall be constructed to discharge through a vertical side.

3.7.1 Type I. Type I coolers shall be of the drip-type, in which water is circulated from a water reservoir in the base of the cabinet, through a distribution system, to drip troughs at the top of the evaporative media pads. The cabinet, water reservoir, media pad frames, and water distribution troughs shall be fabricated of zinc-coated steel. The evaporative media shall be composed of materials that will not support combustion. The pattern, density, and thickness of media pads shall insure conformance with the applicable provisions of 3.6. The media shall be held firmly in place by a zinc-coated steel framework or zinc-coated wire mesh to prevent shifting and sagging during shipment and operation. Media pad frames shall be constructed to permit easy removal of the media pads for replacement.

3.7.1.1 Type I components and accessories. Each type I cooler shall be furnished with a motor-driven recirculating pump, mounted integrally with the unit. A bleed-off connection to provide a continuous bleed of recirculated water, a water level float control (see 3.7.3.2), and a drain and an overflow pipe shall also be furnished. The bleed-off rate shall be manually adjustable. When specified (see 6.2), an automatic flush valve conforming to the requirements of 3.7.3.3 shall be furnished in lieu of the continuous bleed-off connection.

3.7.2 Type II. Type II rotary coolers shall be either the disk-type or drum-type unless one type is definitely specified (see 6.2). The evaporative media shall be formed onto a rotating disk or drum and shall be continuously wetted and flushed of accumulated salt during operation by recurrent immersion in the water reservoir. The cooler cabinet shall be completely enclosed. The water reservoir shall be fabricated of copper or stainless steel. The evaporative media shall be bronze-wool or specially formed bronze screening

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secured to and supported on the disk or drum in a manner to prevent significant shifting or sagging during shipment and operation. Evaporative media shall be readily replaceable. All parts of the drum or disk coming in contact with the water shall be fabricated of copper or copper-base alloys.

3.7.2.1 Type II component and accessories. Each type II cooler shall be furnished with a water-level float control, an automatic flush valve, a manually operated drain, and an overflow pipe (see 3.7.3.2 and 3.7.3.3). When specified (see 3.7.5), the air inlet shall be equipped with air filters. The water reservoir shall be furnished with a bronze or stainless steel container for holding chemical briquets (see 6.7). The container shall be designed and located to allow the chemicals to go into solution at a rate suitable for minimizing the precipitation of scale-forming salts.

### 3.7.3 Details of components.

3.7.3.1 Cabinet. As a minimum, coolers up to 6,500 cfm (3.07 m<sup>3</sup>/s) shall be constructed of 20 gage galvanized sheet steel. Units larger than 6,500 cfm (3.07 m<sup>3</sup>/s) shall be 18 gage. Tolerances of ASTM A 525 shall apply.

3.7.3.2 Water level control valve. Type I and type II coolers shall be furnished with a float-type control valve to maintain the proper water level in the water reservoir. The valve shall be designed to insure that the prescribed water level is maintained when the water supply pressure is 40 pounds per square inch gage (psig) (275.79 kilopascals (kPa (gage))). The valves shall be capable of closing against a supply pressure of 100 psig (689.47 kPa (gage))). The valve and float shall be constructed of bronze, stainless steel, or materials of equivalent corrosion-resistant properties. When specified (see 6.2), a packless type, corrosion-resistant solenoid valve, designed to close against a water supply pressure of 100 psig (689.47 kPa (gage))), shall be installed in the water supply line ahead of the water level float control valve. The solenoid valve shall be normally closed and shall be energized only when the cooler electrical circuit is energized.

3.7.3.3 Automatic flush valve. Type II coolers shall be equipped with an externally-mounted flush valve to automatically discharge a predetermined quantity of water from the water reservoir each hour during operation to prevent salt precipitation and to effect removal of sludge and sediment from the reservoir. The valve shall include an electric timer and an electric solenoid. The overflow connection and manual draining facility specified in 3.7.2.1 may be integral with the valve. All metal parts of the valve, coming in direct contact with water, shall be bronze. Other working parts of the valve shall be suitably isolated from the fluid. Ferrous parts of the valve shall be either zinc-coated or cadmium-plated. The electric timer shall provide for draining once every hour for a period adjustable from 0.1 to 2.5 minutes. Unless otherwise specified (see 6.2), this feature shall be designed to provide a minimum discharge of one gallon per hour (gph) (0.001 liters per second) per 1,000 cfm (0.47 m<sup>3</sup>/s) rated capacity.

3.7.3.4 Disk or drum rotor shafts. Shafts of type II coolers shall be cadmium-plated steel, stainless steel, or a nickel-copper alloy and have replaceable stainless steel bushings at points of contact. The shaft shall be mounted on prelubricated, sealed, anti-friction bearings or sintered-bronze

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sleeve bearings. Power for rotating the disk or drum shall be provided by a directly-connected gear motor.

3.7.3.5 Fans. The fans for type I and type II coolers shall be of the centrifugal type and shall be complete with motor, motor mounting, drive equipment, and vibration isolation supports with seismic restraints to Seismic Zones 3 and 4, in accordance with SMIF Guidelines for Seismic Restraints of Mechanical Systems. The fans shall be rated in accordance with AMCA Standard 210 and sized to provide the specified capacity against the internal resistance of the cooler, as determined by the manufacturer, plus the external resistance specified (see 3.6.1). The maximum allowable outlet velocity shall be as specified (see 6.2). The impeller shall be of the multiblade, forward-curve type and shall be statically or dynamically balanced. Impeller shafts shall be supported with two bearings, one on each side of the impeller. The bearings shall be self-oiling with oil reservoirs adequate for not less than 4 months continuous operation. The fan shaft shall be stainless steel, a nickel-copper alloy, or an alloy steel which has been suitably coated to resist corrosion. The shaft shall be connected to the motor by means of a V-belt and grooved pulleys. The drive pulley shall be of the variable pitch type and shall be adjustable to allow for a 20 percent variation in fan speed. The V-belt drive shall be designed for not less than 50 percent overload capacity based on the operating conditions specified in 3.6.1. The fan unit shall be isolated from the cooler cabinet by suitable vibration-isolating mountings. The shaft bearings and motor shall be isolated from the fan housing by vibration-isolating mounts and seismic restraints.

3.7.3.6 Electric motors. Electric motors for fans on type I and type II coolers shall be general-purpose motors, rated in accordance with the requirements of NEMA MG 1. Motors shall be furnished with drip-proof enclosures. Fan motors shall be furnished with voltage and frequency ratings to suit the specified electrical service (see 6.2). When specified (see 6.2), fan motors shall be two-speed to provide full-rated cooler capacity of the cooler. The rated brake horsepower (hp) of the fan motors shall be adequate to insure operation under the conditions specified in 3.6.1 and 3.7.3.5 without overload.

3.7.3.6.1 Recirculating pump motors. On type I coolers, the recirculating pump motor shall be designed in accordance with the manufacturer's standard practice. All parts in contact with water shall be corrosion-resistant.

3.7.3.6.2 Disk or drum motors. On type II coolers, power for rotating the disk or drum shall be furnished by a gear motor directly connected to the rotor shaft. The gear motor shall be totally enclosed. Unless the impedance of the motor winding is such that it can indefinitely stall on-line without damage, built-in thermal overload protection shall be provided. The gear motor shall have all precision-machined gears with the output shaft supported with anti-friction or sleeve bearings. The gear enclosure shall be filled to the proper level with suitable lubricating oil.

3.7.4 Electrical wiring and components. All wiring and electrical components such as controllers, switches, armored cable, wires, and cords shall have Underwriters Laboratories, Inc., approval, with installation to be in accordance with the applicable requirements of NFPA No. 70. Wiring between electrical components shall be completed through appropriate terminal boards or junction boxes so that only one point of connection to the power supply is



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required. Coolers with motors rated at one hp or less shall be furnished with a suitable starting switch, mounted integrally with the unit or furnished separately for remote installation, as specified (see 6.2). Coolers with motors rated more than one hp shall be furnished with magnetic, across-the-line contactors with thermal overload and under-voltage protection and when specified (see 6.2), a suitable manual reset control. A wiring diagram shall be furnished with each cooler.

3.7.5 Air inlet filters. When specified (see 6.2), the air inlet on type II coolers shall be equipped with air filters. Filters shall be cleanable conforming to ASTM F 872, type I, or replaceable conforming to ASTM F1040, type I, as specified (see 6.2).

3.8 Cleaning, treatment, and painting. Surfaces normally painted in good commercial practice shall be cleaned, treated, and painted as specified herein. The color of the finish coat shall be as specified (see 6.2). Surfaces to be painted shall be cleaned and dried to insure that they are free from contaminants such as oil, grease, welding slag and spatter, loose mill scale, water, dirt, corrosion product, or any other contaminating substances. As soon as practicable after cleaning, and before any corrosion product or other contamination can result, the surfaces shall be prepared or treated to insure the adhesion of the coating system. The painting shall consist of at least one coat of primer and one finish coat. The primer shall be applied to a clean, dry surface as soon as practicable after cleaning and treating. Painting shall be with manufacturer's current materials according to manufacturer's current processes and the total dry film thickness shall be not less than 2.5 mils over the entire surface. The paint shall be free from runs, sags, orange peel, or other defects.

3.9 Electromagnetic interference suppression. When specified (see 6.2), the coolers shall conform to the electromagnetic interference suppression requirements in MIL-STD-461, class C3, group 1.

3.10 Fungus resistance. When specified (see 6.2), electrical components and circuit elements, including terminal and circuit connections, shall be coated with varnish conforming to MIL-V-173, except that:

- a. Components and elements inherently inert to fungi or hermetically-sealed enclosures need not be treated.
- b. Current-carrying contact surfaces, such as relay contact points, shall not be coated.

3.11 Lubrication. Unless otherwise specified (see 6.2), means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic lubrication fittings shall be in accordance with SAE J534. Where use of high-pressure lubricating equipment, 1,000 pound-force per square inch (psi) (6894.3 kPa) or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location. The unit shall be lubricated prior to delivery with type of lubricant specified in the operator's manual and grade of lubricant recommended for ambient temperature at the delivery point. The unit shall be conspicuously tagged to identify the lubricants and their temperature range.

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3.12 Identification marking. Identification shall be permanently and legibly marked directly on the evaporative air cooler or on a corrosion-resisting metal plate securely attached to the evaporative air cooler at the source of manufacture. Identification shall include the manufacturer's model and serial number, name and trademark to be readily identifiable to the manufacturer.

3.13 Weather covers. When specified (see 6.2), coolers shall be furnished with suitable weather covers to keep out dirt, leaves, and other foreign material during the noncooling season or during sand storms. Covers shall be made of a suitable waterproof, milder-resistant material and shall have adequate strength to resist tearing during high winds. Means shall be provided for securing covers to the coolers.

3.14 Repair parts and maintenance tools. Repair parts and maintenance tools shall be furnished as specified (see 6.2).

### 3.15 Workmanship.

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

3.15.2 Bolted connections. All bolt holes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided. All nuts, bolts, and screws shall be tight.

3.15.3 Riveted connections. All rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall completely fill the hole. Rivet heads shall be concentric with the rivet and shall make full contact with the intended surface. The rivets shall be so fabricated as to develop a joint strength not less than the design value.

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

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

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor

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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 ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Material inspection. The contractor is responsible for ensuring that supplies and materials are inspected for compliance with all the requirements specified herein and in applicable referenced documents.

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

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

4.2.1 First article inspection. The first article inspection shall be performed on one cooler of each type ordered when a first article is required (see 3.2 and 6.2). This inspection shall include the examination of 4.5 and the tests of 4.6. The first article may be either a first production item or a standard production item from the supplier's current inventory provided the item meets the requirements of the specification and is representative of the design, construction, and manufacturing technique applicable to the remaining items to be furnished under the contract.

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.5, the tests of 4.6, and the packaging inspection of 4.7. This inspection shall be performed on the samples selected in accordance with 4.4.

4.2.3 Field inspection. When specified (see 6.2), field inspection shall be performed at the site of installation. The inspection shall consist of all tests deemed necessary by the procuring activity to verify compliance with the requirements of this specification. Field inspection shall be performed either by the Government, in which case the contractor shall have the privilege of representation, or by the contractor, as specified (see 6.2). Deficiencies revealed during such tests shall be corrected at the contractor's expense. Any required retesting shall be at the contractor's expense.

4.3 Inspection lot. All units of the same type, style, class, capacity, and mounting offered to the Government at one time shall be considered a lot for purposes of inspection. The sample unit shall be one complete cooler.

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4.4 Sampling. Sampling and inspection procedures shall be in accordance with ANSI Z1.4. The unit of product shall be one cooler. All coolers offered for delivery at one time shall be considered a lot for the purpose of inspection.

4.4.1 Sampling for examination. (See 6.5.1.)

4.4.2 Sampling for tests. (See 6.5.2.)

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

4.6 Tests. The first article shall be tested as specified in 4.2.1. Each production unit shall be tested as specified in 4.4.2 and 4.6.1. Failure to pass any test shall constitute cause for rejection.

4.6.1 Operational tests. Each cooler shall be operated for a length of time sufficient to verify that individual components, such as the fan, motors, controls, and valves, function in a manner to insure overall satisfactory cooler operation.

4.6.2 Performance tests. The requirements of 3.6 and 3.6.1 shall be verified by tests conducted in accordance with AMCA Standard 210. Such tests may be conducted by the fan manufacturer, in which case the cooler manufacturer shall have fan performance curves for the particular model fan available for Government inspection. Fan performance curves shall indicate the total pressures, static pressures, power input, and total and static efficiency of the fan at a stated speed and air density. If the stated air density is other than as specified in 3.6.1, results shall be corrected for the specified conditions. Tests to verify compliance with the efficiency requirements of 3.6.2 and the requirement of 3.6 for no entrainment of moisture shall be conducted in accordance with the manufacturer's standard practice, subject to the approval of the Government.

4.6.3 Electromagnetic interference tests. When electromagnetic interference control is specified (see 3.9), the first article shall be tested in accordance with MIL-STD-462, to verify compliance with the pertinent provisions of MIL-STD-461.

4.7 Preparation for delivery inspection. The preservation, packaging, packing, and marking of the item shall be inspected to verify conformance to the requirements of section 5.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing. Preservation, packaging, and

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packing shall be in accordance with the requirements of MIL-R-3593 with the levels of preservation, and level of packing as specified (see 6.2).

## 5.2 Marking.

5.2.1 Military agencies. Shipments to military agencies shall be marked in accordance with MIL-STD-129.

5.2.2 Civil agencies. Shipments to civil agencies shall be marked in accordance with FED-STD-123.

## 6. NOTES

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

6.1 Intended Use. The coolers covered by this specification are intended for use in areas where normal ambient, dry-bulb temperatures are 20oF (-6.67oC) or more in excess of the normal, wet-bulb temperatures. Successful cooling can be anticipated in areas with dry-bulb temperatures in excess of 85oF (29.44oC) and concurrent wet-bulb temperatures below 70oF (21.11oC). Moderate success can be expected with wet-bulb temperatures as high as 76oF (24.44oC). For general practice, use of the coolers when prevailing wet-bulb temperatures are above 72oF (22.22oC) is not recommended. The relationship between effective evaporative cooling and the spread between the dry-bulb and wet-bulb temperatures or the ambient air is as follows:

Wet-bulb depression		Cooling effect
(oF)	(oC)	
30 to 40	-1.11 to 4.44	Excellent
20 to 30	-6.67 to -1.11	Good
15 to 20	-9.44 to -6.67	Fair
10 to 15	-12.22 to -9.44	Marginal

6.1.1 Capacity. Single cooler units are generally available with capacities ranging from 1,000 to 4,000 cfm (0.47 to 0.188 m<sup>3</sup>/s). For installations requiring greater capacities, multiple units may be required.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Type required (see 1.2)
- c. Issue of DoDISS to be cited on the solicitation, and if required, the specific issue of individuals documents referenced (see 2.1.1 and 2.2)
- d. When first article is required for inspection and approval (see 3.2, 4.2.1, and 6.4)
- e. Capacity required in cfm and static pressure external to the cooler in water gage inches (see 3.6.1)
- f. When cooler should discharge other than through a vertical side (see 3.7)
- g. When automatic flush valves are required for type I coolers (see 3.7.1.1)

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- h. When either disk or drum type coolers are specifically required for type II coolers (see 3.7.2)
- i. When a solenoid valve is required in the water supply line on type II coolers (see 3.7.3.2)
- j. When the minimum discharge capacity should be other than as specified (see 3.7.3.3)
- k. Maximum allowable outlet velocity (see 3.7.3.5)
- l. Voltage and frequency of electrical power supply at the site of installation and when two-speed fan motors are required (see 3.7.3.6)
- m. Whether starting switches for coolers with motors rated at one hp or less should be integrally mounted or separately furnished (see 3.7.4)
- n. When a manual reset control should be furnished for coolers having motors rated greater than one hp (see 3.7.4)
- o. When air filters should be furnished for type II coolers and the type of filters required (see 3.7.5)
- p. Required finish color (see 3.8)
- q. When electromagnetic interference control is required (see 3.9)
- r. When treatment for moisture and fungus resistance is required (see 3.10)
- s. When means for lubrication should be other than the manufacturer's standard practice (see 3.11)
- t. When weather covers are required (see 3.13)
- u. Repair parts and maintenance tools required (see 3.14)
- v. When field inspection is required, and by whom (see 4.2.3)
- w. Level of preservation and level of packing required (see 5.1)

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

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

#### 6.5 Sampling procedures.

6.5.1 Sampling for examination. Recommended inspection level is II and AQL is 1.5 (see 4.4.1).

6.5.2 Sampling for tests. Recommended inspection level is S-2 and AQL is 2.5 (see 4.4.2).

6.6 Definitive specification part number. The specification part number is a definitive part number which corresponds to the type, style, and class of air conditioner covered by this specification and defines the requirements of the options presented under this specification. The specification number

