

NON-MEASUREMENT SENSITIVE

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MILITARY SPECIFICATION

UNIT HEATER, AIR-CIRCULATING,
STEAM - HOT WATER

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1.1 Scope. This specification covers unit air heaters using steam or hot water as the heating medium.

1.2 Classification. The unit heaters shall be of the following types and classes as specified (see 6.2 and 6.5):

Type I - Propeller fan.
Type II - Centrifugal fan.

Class 1 - Steam heater.
Class 2 - Hot water heater.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

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

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SPECIFICATIONS

MILITARY

- MIL-V-173 - Varnish, Moisture and Fungus Resistant (for Treatment of Communications, Electronics, and Associated Electrical Equipment).
- MIL-B-3180 - Boilers and Related Equipment, Packaging of.

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference.
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement.

2.1.2 Other Government documents and publications. The following other Government documents and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issue shall be those in effect on the date of the solicitation.

DEPARTMENT OF LABOR (DoL)
OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

Title 29, Code of Federal Regulations, Chapter XVII, PART 1910,
Occupational Safety and Health Standards.

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

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

2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS shall be the issue of the non-Government documents which is current on the date of the solicitation.

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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

- B1.1 - Unified Inch Screw Threads (UN and UNR Thread Form).
- B1.20.1 - Pipe Threads, General purpose (Inch).
- B1.20.3 - Dryseal Pipe Threads (Inch).

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

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS INC., (ASHRAE)

Standard 33 - Methods of Testing for Rating Forced Circulation Air Cooling and Air Heating Coils.

(Application for copies should be addressed to the American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1791 Tullis Circle, NE Atlanta, GA 30329.)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels.

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

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

- ICS 1 - General Standards for Industrial Control and Systems.
- ICS 2 - Industrial Control Devices, Controllers and Assemblies.
- ICS 4 - Terminal Blocks for Industrial Use.
- ICS 6 - Enclosures for Industrial Controls and Systems.
- MG 1 - Standards for 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)

70 - National Electrical Code.

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

RUBBER MANUFACTURERS ASSOCIATION (RMA)

Engineering Standards for Multiple V-Belt Drives.

(Application for copies should be addressed to the Rubber Manufacturers Association, 1901 Pennsylvania Avenue, N.W., Washington, DC 20006.)

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(Non-Government standards and other publications are normally available from the organizations which prepare or which 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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Description. The unit heater shall be a self-contained, factory-assembled unit consisting of a heating element, a fan(s), an electric motor, a housing, and outlet vanes or diffusers. The heater shall be ready for connections to a source of electricity and to steam or hot water piping. When specified (see 3.11.2, 6.1.1, and 6.2), the equipment shall include operating controls. The heater shall operate with minimum noise consistent with its capacity, velocity, and fan speed. Type I heaters shall be designed for horizontal or vertical air delivery, as specified (see 6.2). Type II heaters shall be designed for floor- or wall-mounting, or ceiling suspension, as specified (see 6.2).

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

3.3 Standard commercial product. The unit heater 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 unit heater 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 advertisement or manufacturer's catalogs, or brochures, and represents the latest production model.

3.3.1 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 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

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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 are allowed under this specification unless otherwise specified.

3.5 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.

3.6 Design. The unit heater shall be designed to withstand strains, jars, vibrations, and other conditions incidental to shipping, storage, and installation, and to permit easy accessibility for maintenance and service in the field. The design shall be such as to prevent conditions hazardous to personnel or deleterious to equipment. The unit heater shall be designed to meet or exceed the conditions indicated in table I as specified (see 6.2). Unless otherwise specified (see 6.1.2 and 6.2), the maximum design pressure shall be 150 pound-force per square inch gage (psig) at 366 degrees Fahrenheit (°F), for steam and 150 psig at 250°F for hot water. Screw threads shall conform to the requirements of ANSI B1.1, B1.20.1, and B1.20.3 as applicable.

TABLE I. Design conditions.

Class 1 Steam heater	Class 2 Hot water heater
British thermal units per hour (Btu/h).	Btu/h.
Operating steam pressure (psig) actual.	Operating water temperature °F.
Entering air temperature °F.	Operating water pressure psig.
Air delivery cubic feet per minute (ft ³ /min), at 70°F.	Water flow, gallons per minute.
Fan speed, in revolutions per minute (r/min).	Entering air temperature °F.
Air discharge velocity, feet per minute (ft/min).	Air delivery, ft ³ /min at 70°F.
Final air temperature, °F.	Fan speed in r/min.
Condensate, pounds per hour.	Air discharge velocity, ft/min.
For type II heater, air pressure drop through heater, inches of water.	Final air temperature °F.
	For type II heater, air pressure drop through heater, inches of water.

3.7 Capacity. When steam or hot water, as specified herein, is used as the heating medium, and when the entering air is at the temperature specified in 3.6, the capacity of the unit heater in Btu/h shall be not less than that specified (see 6.2).

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3.8 Construction. The unit shall be so constructed as to be complete and ready for operation after it has been installed and connected to the specified steam or hot water piping (see 3.6), to the source of electricity (see 3.11.1), and when specified herein to the operating controls (see 3.1 and 3.11.2).

3.8.1 Housing. Housing for the unit heater shall be of steel or aluminum and shall support the unit heater with a minimum of vibration during the operation. When mounted as specified in 3.1, the type II unit heater shall have an easily removable panel conveniently located to provide access to the heater parts. Supporting members and braces shall be furnished as required to insure rigidity.

3.8.2 Deflectors, diffusers, and outlets.

3.8.2.1 Type I heaters. Unless otherwise specified (see 6.2), the horizontal heater shall be equipped with an adjustable louver-type deflector to direct heated air that covers an area subtended by a minimum angle of 45°. The louvers shall be steel, each individually adjustable, and shall not rattle during heater operation. Unless otherwise specified (see 6.2), the vertical heater shall be equipped with a cone discharge.

3.8.2.2 Type II heaters. Unless otherwise specified (see 6.2), heater outlets shall be provided with nozzles or louvers. Heater outlets shall have an air flow discharge direction, as specified (see 6.2). When specified (see 6.2), the housing for the type II unit heater shall have a rigid flange for connection to an air intake duct.

3.8.3 Heating element. The heating element shall be a tube-and-fin type. Unless otherwise specified (see 6.1.2 and 6.2), tubes shall be copper, copper-alloy, or hot dipped galvanized steel. Fins for copper or copper-alloy tubes shall be aluminum, copper, or copper-alloy. Fins for tubes of other compositions shall be made of the same material as the tubes. Fins shall be mechanically bonded, silver soldered, brazed, or welded to the tubes or the tubes hydraulically expanded into the fins or the entire tube and fin assembly may be hot dip galvanized to ensure tight, rigid metal-to-metal contact under the design conditions specified in 3.6. Headers shall be made of steel, malleable iron, to insure tight, rigid metal-to-metal contact under the design conditions specified in 3.6. Headers shall be made of steel, malleable iron, copper, or copper-alloy. The heating element, while submerged in water under pneumatic pressure, shall withstand 1.25 times the maximum allowable operating pressure multiplied by the lowest ratio of the allowable stress value for the test temperature of the heater test material to the allowable stress value at the design temperature specified in 3.6 or 250 psig, whichever is greater. The allowable stress values for the material used shall be as given in ASME Boiler and Pressure Vessel Code, Section VIII, Pressure Vessels.

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3.9 Fan and drive. The propeller and centrifugal fans shall be made of aluminum or steel and shall be rigidly constructed to minimize vibration. Propeller fans shall be statically balanced; the centrifugal fan wheels shall be statically and dynamically balanced. The fan wheel and shaft assembly shall be dynamically balanced within the limits of the formula:

$$\text{Maximum unbalance in ounce-inches} = \frac{10 \times \text{fan wheel weight in pounds}}{\text{r/min}}$$

Propeller fans shall be direct-driven. Centrifugal fans shall either be direct or V-belt driven. V-belt drives shall conform to the Engineering Standards for Multiple V-Belt Drives of the RMA, shall have a service factor of 1.3, and shall provide for adjustment of belt tensions. When the fan is belt driven, the motor shall be provided with an adjustable base and guard conforming to OSHA 1910.219 or enclosed in the unit casing. The centrifugal fan shaft shall be sized for maximum speed of the size of fan involved and shall operate at not more than 80 percent of the first critical speed.

3.10 Bearings. Fan bearings on belt-drive units shall be of the self-aligning type. Vertically mounted motors shall have bearings suitable for any developed end thrust during heater operation and, on motors over 1/8 horsepower shall be of the ball type. Horizontal motors may have sleeve bearings. Bearings requiring periodic lubrication shall have accessible lubricating provisions.

3.11 Electrical system.

3.11.1 Electric motors. The fan motor shall be designed for satisfactory operation on an electrical current supply having characteristics as specified (see 6.2). The motor shall conform to the requirements of NEMA MG 1 and shall be single- or multi-speed with number of speeds as specified (see 6.2). The motor shall be Class B per NEMA MG 1 insulated and have the capacity to operate fan continuously in an ambient temperature from 50°F to 100°F without exceeding the allowable temperature rise. When specified (see 6.1.3 and 6.2), the motor shall be totally enclosed, fan cooled (TEFC).

3.11.2 Operating controls. When operating controls are required in 3.1, the unit heater shall be controlled manually or automatically, as specified (see 6.2). Automatic controls shall be pneumatic or electrical powered devices as specified (see 6.2). In accordance with NEMA ICS 1, ICS 2 and ICS 4, electrical controls shall have the required capacities and electrical characteristics to operate the fan motor. Electrical control circuits shall not exceed 120 volts (V). Fan motor switch shall either be mounted as an integral part of the heater or furnished as a separate switch with the unit. The motor starter shall be manual or magnetic across-the-line type as specified (see 6.2). Both types shall include thermal-overload protection for the motor windings and each type shall be equipped with a manual reset push-button; the magnetic type shall also include under voltage protection. All controls with electrical components shall be listed in the UL Recognized Component Directory. Unless otherwise specified (see 6.2), electrical

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enclosures shall be NEMA type I in accordance with NEMA ICS 6. When the control voltage is other than line voltage, the necessary control transformer shall be furnished.

3.11.2.1 Manual. Manual control of the heater shall be by means of the motor-starter switch which shall be furnished.

3.11.2.2 Automatic. The system for automatic control shall be of the modulating or on-off type, as specified (see 6.2). The modulating system equipped with thermostat and control valve, shall automatically throttle the heating medium and provide means for continuous fan operation. The on-off system shall control the starts and stops of the fan-motor by a furnished thermostat. The modulating or on-off system thermostat shall have the characteristics as specified (see 6.1.1 and 6.2). Both automatic systems shall be equipped with limit controllers to prevent fan operation when the supply line is below a predetermined temperature. A 3-position selector switch shall be furnished for use with both systems. This switch shall provide manual fan-motor operation without temperature control, provide an off-position, and accomplish automatic control.

3.11.3 Wiring. Wiring shall be in accordance with NFPA 70. Provisions shall be made to ground all electrical equipment.

3.12 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 in hermetically sealed enclosures need not be coated.
- b. Current-carrying contact surfaces, such as relay contact points, shall not be coated.

3.13 Lubrication. Unless otherwise specified (see 6.2), means for lubrication shall be provided in accordance with the manufacturer's standard practice. Parts requiring lubrication shall be so located as to make the lubricating points easily visible and accessible. All parts requiring lubrication shall be properly lubricated before delivery.

3.14 Electromagnetic interference suppression. When specified (see 6.2), the equipment shall conform to the electromagnetic interference suppression requirements and test limits for class C3 equipment as specified in MIL-STD-461.

3.15 Lifting attachments. When specified (see 6.2), for type II unit heaters, suitable lifting attachments shall be provided to enable the equipment to be lifted in its normal position as recommended by the manufacturer. Attachments shall withstand any handling conditions encountered, such as rapid lowering and braking of the load. When

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practicable, only one attachment shall be used. Where more than one is required, each attachment shall be of sufficient capacity to carry the total weight. Information as to the lifting capacity of each attachment shall be stenciled with a contrasting color enamel in a suitable location near the attachment.

3.16 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.

3.17 Identification marking. Unless otherwise specified (see 6.2), the unit heater shall be marked for identification in accordance with manufacturer's standard practice. When specified (see 6.2), the contracting officer will furnish to the Government inspector the required identification plates. The contractor will be required to stamp the necessary data in the blank spaces thereon and securely affix said plates in a conspicuous place on each unit, assembly and subassembly, and parts as directed by the Government inspector. Brass screws, rivets, or bolts not less than 1/8 inch in diameter shall be used to affix the plates. Nomenclature shall be "UNIT HEATER, AIR-CIRCULATING, STEAM-HOT WATER."

3.18 Workmanship.

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

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

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

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

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

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements 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 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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

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

4.2.2 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.4, the tests of 4.5.1 and 4.5.3, and the packaging inspection of 4.7. This inspection shall be performed on the samples selected in accordance with 4.3.

4.3 Sampling. Sampling and inspection procedures shall be in accordance with MIL-STD-105. The unit of product shall be unit heaters. All unit heaters offered for delivery at one time shall be considered a lot for the purpose of inspection. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for a complete reinspection. Resubmitted lots shall be reinspected using tightened inspection. If the rejected lot was screened, reinspection shall be performed for all defects. Rejected lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.3.1 Sampling for examination. Examination shall be based on inspection Level II and an Acceptable Quality Level (AQL) of 1.5 percent for major defects and 2.5 percent defective of minor defects.

4.3.2 Sampling for tests. Test shall be based on inspection Level S-4 and an AQL of 2.5 percent defective.

4.4 Examination. Each unit heater shall be examined for defects listed in table II. Each attribute within each classification of multiple defects shall constitute one defect.

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TABLE II. Classification of defects.

Categories	Defects	Requirement Paragraph
Critical:	None defined.	
Major:		
101	Unit heater not type or class specified.	1.2
102	Operating controls not included as specified.	3.1
103	Air delivery of type I heater not as specified.	3.1
104	Type II heater suspension not as specified.	3.1
105	Heater design not as specified.	3.6
107	Parts not interchangeable.	3.5
108	Materials not as specified.	3.4
109	Housing not as specified.	3.8.1
110	Rigid flange connection not furnished as specified.	3.8.1
111	Deflectors, diffusers, and outlets not as specified.	3.8.2
112	Heating element not as specified.	3.8.3
113	Fan and drive not as specified.	3.9
114	Bearings not as specified.	3.10
115	Electric motors not as specified.	3.11.1
116	Electric current supply characteristics other than specified.	3.11.1
117	Electric controls not as specified.	3.11.2
118	Control circuits operate at supply voltages exceeding 120 V.	3.11.2
119	Provisions not made to ground all electrical equipment.	3.11.3
120	Lubrication not as specified.	3.13
122	Lifting attachments not as specified.	3.15
123	Workmanship not as specified.	3.18
Minor:		
201	Fungus resistance not as specified.	3.12
202	Treatment and painting not as specified.	3.16
203	Identification plates not as specified.	3.17

4.5 Tests. Tests shall be conducted as outlined in the referenced documents specified herein.

4.5.1 Pressure tests. Each heating element, while submerged in water, shall be tested by being subjected to the pneumatic pressure specified in 3.8.3 or 300 psig, whichever is greater. The test temperature shall be 70°F \pm 10°F. The test pressure shall be applied for a period of not less than manufacturers normal time. Failure of any pressure-containing part, permanent deformation, or leakage shall be cause for rejection of the heating element.

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4.5.2 Performance test. The unit shall be subjected to a performance test to verify compliance with the capacity requirements specified in 3.7. The test shall be conducted and reported in accordance with ASHRAE Standard 33. The test apparatus and instruments shall be of the types and accuracy, including the test methodology, specified in the above standards. Failure of the unit heater to meet the minimum capacity requirements shall be cause for rejection.

4.5.3 Operation test. The unit heater shall be connected to the specified electrical power source and operated for 15 minutes. The propeller (fan wheel), motor, controls, when applicable, and accessories, shall be inspected during the test. Any excessive vibration, overheating, or loose parts shall be cause for rejection of the unit.

4.6 Measurement of electromagnetic suppression. To determine conformance to the electromagnetic interference suppression of 3.14, electromagnetic radiation shall be measured in accordance with MIL-STD-462 UMO5.

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

5. PACKAGING

5.1 Preservation, packing, and marking. The preservation, packing, and marking of the unit heaters shall be in accordance with MIL-B-3180. The level of preservation and packing shall be as specified (see 6.2).

6. NOTES

6.1 Intended use. Unit heaters are intended for the heating of air to balance heat losses in rooms or buildings. Compared with other types of heating systems unit heaters (a) are usually lower in first cost, (b) are more easily controlled, either manually or thermostatically, (c) provide air circulation without heating during summer months.

6.1.1 Operating controls. Normally, operating controls are obtained separately from the basic unit in order to be procured at lower cost (see 3.1 and 6.2). Characteristics of thermostats include such items as electric voltage, pneumatic pressure range, on-off control, proportional control, heating and ventilation, heating only, temperature range, night set back.

6.1.2 Heating element. When an extremely saline atmosphere exists, manufacturers should be consulted for the availability of suitable corrosion-resistant material (see 3.8.3 and 6.2). Cast iron elements are available that resist external corrosion and are rated at 250 psig pressure.

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6.1.3 Motors. Totally enclosed motors fan cooled TEFC should be used only in dirt- or grease-laden atmosphere. Drip proof motors are lower in cost, and normally are designed to run cooler than the TEFC type (see 3.11.1 and 6.2).

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of unit heater (see 1.2).
- c. When unit heater is to include operating controls (see 3.1 and 6.1.1).
- d. Direction for air delivery on type I heater (see 3.1).
- e. Style of mounting required for type II heater (see 3.1).
- f. When first article sample is required for first article inspection and approval (see 3.2, 4.2.1, and 6.4).
- g. When maximum design pressure shall be other than 150 psig (see 3.6).
- h. The specific design conditions and capacity listed in table I (see 3.6 and 3.7).
- i. Deflectors, diffusers, and outlets for type I heater, if different (see 3.8.2.1).
- j. When vertical heater discharge is different (see 3.8.2.1).
- k. When nozzles or louvers need not be furnished on type II heater, but when furnished, specific air flow discharge direction required (see 3.8.2.2).
- l. When housing for type II heater is required to have a rigid flange for connection to an air intake duct (see 3.8.2.2).
- m. Tubes and fins for heating element, if different (see 3.8.3 and 6.1.2).
- n. Electrical supply volts, phase, frequency (see 3.11.1).
- o. When motor is to be single speed or multi-speed with number of speeds (see 3.11.1).
- p. When motor is to be totally enclosed fan cooled type (see 3.11.1 and 6.1.3).
- q. Whether manual or automatic control is required, and if automatic, whether modulating or on-off control is required (see 3.11.2 and 3.11.2.2).
- r. Whether automatic control is to be pneumatic powered or electrical powered (see 3.11.2).
- s. Whether manual or magnetic starter is required (see 3.11.2).
- t. NEMA type enclosures, if different (see 3.11.2).
- u. Supply thermostat characteristics (see 3.11.2.2 and 6.1.1).
- v. When fungus-resistance is required (see 3.12).
- w. Lubrication, if different (see 3.13).
- x. When electromagnetic interference suppression is required (see 3.14).
- y. When lifting attachments are required (see 3.15).
- z. Treatment and painting and color of finish coat, if different (see 3.16).

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- aa. When identification marking is required (see 3.17).
- bb. When contracting officer will furnish the required identification plates (see 3.17).
- cc. Level of preservation and level of packing required (see 5.1).

6.3 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DOD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data shall be delivered by the contractor in accordance with the contract or purchase order requirements.

6.4 First article. When a first article inspection is required, the item will be tested and should be a sample selected from the first unit heater production items, 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 Definitive specification part number. The specification part number is a definitive part number which corresponds to the types and class of unit heater covered by this specification and defines the requirements of the options presented under this specification. The specification number, and the type and class code number are combined to form the definitive specification part number.

6.5.1 Cataloging data. For cataloging purposes, part numbers for the unit heater are assigned as follows:

	M17691 - 11
Specification part number _____	
Type and class code number (see 6.5.2) _____	

6.5.2 Type and class. The type and class of the unit heater (see 1.2) are identified by a two-digit number (see table III).

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TABLE III. Code number to type and class.

Type and class	Code number
Type I Class 1	11
Type I Class 2	12
Type II Class 1	21
Type II Class 2	22

6.6 Subject term (key word) listing.

Unit air heaters
 Steam heater
 Hot water heater
 Electric-motor-driven

6.7 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.

Custodians:
 Navy - YD
 Air Force - 99

Preparing Activity:
 Navy - YD

(Project 4520-0301)

Review Activities:
 DLA - CS
 Air Force - 84