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USACE / NAVFAC / AFCEA / NASA                      UFGS-40 41 13.13 40 (April 2006)  
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Preparing Activity:    NASA                      Superseding  
    NASA-15767S (December 2005)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are NOT in agreement with UMRL dated 01 April 2006

Revised throughout - changes not indicated by CHG tags

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### SECTION 40 41 13.13 40

#### ELECTRIC RESISTANCE HEATING 04/06

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers electric unit heaters. Drawings should indicate capacity, voltage, rating, control-circuit voltage, cfm, sizes, mounting height, and other pertinent data.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).

Use of electronic communication is encouraged.

Brackets are used in the text to indicate designer choices or locations where text must be supplied by the designer.

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## PART 1    GENERAL

### 1.1    REFERENCES

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NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature

when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

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The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

UNDERWRITERS LABORATORIES (UL)

UL 1996 (2004) Standard for Electric Duct Heaters

## 1.2 GENERAL REQUIREMENTS

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NOTE: If Section 26 00 00.00 40 GENERAL ELECTRICAL PROVISIONS is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.

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Section 26 00 00.00 40 GENERAL ELECTRICAL PROVISIONS applies to work specified in this section.

**Fabrication Drawings** shall be submitted for electric heaters consisting of fabrication and assembly details to be performed in the factory.

**Equipment and Performance Data** shall be submitted for electric heaters including life, test, system functional flows, safety features, and mechanical automated details.

**Manufacturer's Instructions** shall be submitted for electric heaters including special provisions required to install equipment components and system packages. Special notices shall detail impedances, hazards and safety precautions.

## 1.3 SUBMITTALS

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NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's

Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

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Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.] [for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

#### SD-02 Shop Drawings

[Fabrication Drawings](#) shall be submitted in accordance with paragraph entitled, "[General Requirements](#)," of this section.

Installation drawings shall be submitted for electric heaters in accordance with the paragraph entitled, "[Installation](#)," of this section.

#### SD-03 Product Data

[Equipment and Performance Data](#) shall be submitted in accordance with paragraph entitled, "[General Requirements](#)," of this section.

Manufacturer's catalog data shall be submitted for the following items:

[Electric Heaters](#)  
[Heating Element](#)  
[Controls](#)  
[Casings](#)  
[Propellers and Motors](#)

#### SD-08 Manufacturer's Instructions

[Manufacturer's Instructions](#) shall be submitted in accordance with paragraph entitled, "[General Requirements](#)," of this section.

## PART 2 PRODUCTS

### 2.1 PRODUCT STANDARDS

Unit electric heaters shall conform to the requirements of UL 1996.

### 2.2 DESCRIPTION

Unit electric heaters shall be suspended type and shall be arranged for discharge of air as indicated.

Unit electric heaters shall have not less than indicated capacity and shall conform to requirements specified herein.

Unit electric heaters shall be factory prewired, ready for field terminal connections.

### 2.3 CASINGS

Casings with smoothly contoured propeller orifice rings shall be constructed of not less than 1.0 millimeter 20-gage cold-rolled carbon steel. Casing surface finish shall include phosphate pretreatment, prime coating, and baked-enamel finish.

### 2.4 AIR DISTRIBUTION

[Vertical discharge units shall be fitted with louver-cone diffusers.]

[Horizontal units shall be provided with adjustable single- or double-deflection louvers.]

### 2.5 HEATING ELEMENT

Element construction shall consist of a resistance wire insulated by highly compacted refractory insulation protected by a sealed metallic-finned sheath. Component materials shall be as follows:

Resistance wire shall be not less than 20-helix wound alloy approximately 80-percent nickel and 20-percent chromium.

Refractory insulation shall be magnesium oxide with a resistance of not less than 50,000-ohms after exposure to an ambient temperature and humidity of 32 degrees C 90 degrees F and 85 plus or minus 5-percent relative humidity, respectively, for not less than 24 hours.

Sheathing shall consist of aluminum fins cast around an internal steel sheath containing refractory insulation and resistance wire or carbon-steel fins permanently attached to a tubular carbon-steel sheath containing refractory insulation and resistance wire and with external surfaces porcelainized.

[Maximum surface temperature of porcelain-protected steel sheathing shall be [370] [ ] degrees C [700] [ ] degrees F.]

[Maximum surface temperature of cast-aluminum sheathing shall be [260] [ ] degrees C [500] [ ] degrees F.]

## 2.6 CONTROLS

[Units up to and including 5 kilowatts shall be fitted with integral controls including thermal overload cutout switches, necessary transformers, liquid-vapor system, and low-mass bimetal thermostat as required. Cutout switch shall be automatically resettable.]

[Unit shall be provided with a remote unfused disconnect switch that opens ungrounded conductors in the OFF position and a thermostat with integral controls including thermal overload cutout switches, magnetic contactors, necessary transformers, and thermostat protection as required. Cutout switches shall be automatically resettable.]

Wall-mounted thermostats shall be complete with thermometer, mechanical high-limit stop, calibrated operator, and an adjustable heater to effect anticipation and to prevent override of space temperature. Range shall be between 12 and 41 degrees C 55 and 105 degrees F. Differential shall not exceed 1 degrees C 1.5 degrees F. Thermostat shall be rated for operation at 24 volts, 60 hertz. Transformers, wiring, and devices necessary to meet this requirement shall be provided. Cases shall be finished in brushed or satin chrome.

## 2.7 PROPELLERS AND MOTORS

Propellers shall have [mill-aluminized] [galvanized-steel] [all-aluminum blades] and shall be statically and dynamically balanced to within 0.5 percent. Units shall be provided with fan-inlet safety guards.

Propellers and motors shall be certified by the AMCA for air performance and noise level.

Motors shall be protected against damage by the heating element and shall be resiliently mounted.

Motors shall conform to Section 26 18 39.00 40 MOTORS except that load-matched and custom-designed motors may be used and shall be so identified on the shop drawings. Motors not so identified shall conform to the requirements specified.

Subfractional and fractional custom-designed or applied motors may deviate from the preceding motor requirements as follows:

Shaded-pole motors rated less than 125 watt 1/6-horsepower may be used for direct-drive service.

Permanent split-capacitor, split-phase, and capacitor-start motors rated 185 watt 1/4-horsepower and less may be used for direct-drive service.

Split-phase and capacitor-start motors, rated 185 watt 1/4-horsepower and less, may be used for belt-drive service.

Motor bearings may be manufacturer's standard prelubricated sleeve type except that motors shall have antifriction thrust bearings, when specified. Lubricant provisions shall be extended service requiring replenishment not more than twice per year of continuous operation.

Motor identification plate shall be manufacturer's standard.

Motor speed and control shall be unit-heater manufacturer's standard.

## PART 3 EXECUTION

### 3.1 INSTALLATION

Unit heaters shall be installed in accordance with the manufacturer's instructions at the mounting heights indicated.

### 3.2 FIELD TESTING

Unit heaters shall be demonstrated to operate satisfactorily in the presence of the Contracting Officer.

Unit heaters shall be cycled five times, from start to operating thermal conditions to off, to verify adequacy of construction, system controls, and component performance.

An operational test shall be conducted for a minimum of 6 hours.

-- End of Section --