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## UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated January 2009

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### SECTION 23 82 43

#### ELECTRIC DUCT HEATERS 08/08

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NOTE: This specification covers the requirements for electric duct heaters. Drawings should indicate capacity, voltage, rating, control-circuit voltage, heating stages, cfm, sizes, and other pertinent data.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

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).

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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; Rev Dec 2006) Standard for Electric Duct Heaters

## 1.2 GENERAL REQUIREMENTS

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NOTE: If Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS 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 20 BASIC ELECTRICAL MATERIALS AND METHODS applies to work specified in this section.

Submit [Fabrication Drawings](#) for duct heaters consisting of fabrication and assembly details to be performed in the factory.

Submit [Equipment and Performance Data](#) for duct heaters including use life, system functional flows, safety features, and mechanical automated details.

Submit [Manufacturer's Instructions](#) for duct 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

Submit [Fabrication Drawings](#) for duct heaters in accordance with paragraph entitled, "General Requirements," of this section.

Submit installation drawings for duct heaters in accordance with the paragraph entitled, "Installation," of this section.

#### SD-03 Product Data

Submit [Equipment and Performance Data](#) for duct heaters in accordance with paragraph entitled, "General Requirements," of this section.

Submit manufacturer's catalog data for the following items:

[Duct Heaters](#)  
[Heating Elements](#)  
[Enclosures](#)  
[Controls](#)

#### SD-08 Manufacturer's Instructions

Submit [Manufacturer's Instructions](#) for duct heaters in accordance with paragraph entitled, "General Requirements," of this section.

## PART 2 PRODUCTS

### 2.1 PRODUCT STANDARDS

[Duct heaters](#) shall conform to the requirements of [UL 1996](#).

### 2.2 DESCRIPTION

[Duct heaters](#) shall have the capacity indicated, plus or minus 5 percent.

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

[Base capacity on [\_\_\_\_\_] [16] degrees C [60] degrees F entering air and [\_\_\_\_\_] [30] degrees C [85]-degree F discharge air at [\_\_\_\_\_] [8.5] cubic meter [300] cubic feet per minute.]

## 2.3 HEATING ELEMENTS AND ENCLOSURES

Install heating elements with a framework complete with terminal, and construct junction boxes of mill-aluminized or galvanized carbon steel. A magnetic contactor shall be provided in a separate enclosure insulated from the duct at duct heater location or at a separate, remote location.

Gasketing shall be 1.6 millimeter 1/16-inch thick non-asbestos woven-cloth tape.

Flange depth shall be suitable for duct insulation provided. Insulate terminal junction box to prevent elevated temperatures.

[Sheathed heating-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 a helix-wound alloy approximately 80 percent nickel and 20 percent chromium.

Refractory insulation shall be magnesium oxide. Subject element to a dielectric test of twice the element rated voltage plus 1,000 volts applied between terminal and sheath for a period of 1 minute.

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 or corrosion-resistant steel sheath containing refractory insulation and resistance wire and with all external surfaces porcelainized.

Wattage density shall not exceed 90 watts per 25 linear millimeter linear inch of heated element length or not greater than 22 watts per 645 square millimeter square inch.]

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**NOTE: Do not specify an open heating element when  
it will be exposed to salt air.**  
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[Open heating-element construction shall consist of a helix-wound resistance wire alloy approximately 80 percent nickel and 20 percent chromium. Wattage density shall not exceed 50 watts per 25 linear millimeter linear inch of heated element. Element support shall minimize abrasion and sagging. Safety screens shall be provided on both upstream and downstream sides of heater elements.

Provide dummy elements or include other provisions similar to open area perforated screens if required to uniformly distribute airflow across heater face.]

## 2.4 CONTROLS

Furnish units with integral overheat cutouts for primary and secondary protection. Automatic-reset primary cutout shall be the disk type and suitable for 277-volt, 60-hertz service.

[Disk type manual-reset secondary cutouts shall be provided and wired in series with each circuit.]

[Bulb type manual-reset secondary cutouts shall be provided and actuate integral magnetic backup contactors.]

[Bulb type manual-reset secondary cutouts shall be provided and deenergize each circuit directly.]

Provide indicating light(s) to show:

Heater on

Each circuit on

[Locally provide pilot switch to cut off heater through integral magnetic contactors.]

Heater assemblies rated at 45 amperes and larger shall have the heater assembly subdivided and fused. Fuse each subdivided 45-ampere heater load section. In circuits of less than 45 amperes, fuse appropriate sections.

Magnetic contactors other than integral overheat-cutout associated units shall be remotely located as indicated and shall be UL-approved.

[Construct step controllers for sequencing heater loads of UL-approved components and include the following:

Delay to prevent line surge when energizing loads

Individual fusing of each step

Intercomponent wiring to terminals for field connection

Cabinet]

[Wall-mounted thermostats shall be [single-] [two-] [three-] stage type.]

[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 13 and 40 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. Provide any necessary transformers, wiring, and devices to meet this requirement. Finish cases in brushed or satin chrome.]

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NOTE: Supplement the following paragraph if  
solid-state step controller is selected.  
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[Power to unit shall be controlled by a UL-listed solid-state silicon-controlled rectifier (SCR) system such that voltage is continuously

impressed and varied in minute increments over a range of zero to rated voltage or to 105 percent of rated voltage maximum.]

### PART 3 EXECUTION

#### 3.1 INSTALLATION

Install duct heaters in accordance with the manufacturer's instructions and locate duct heaters to permit access to the heater after installation.

#### 3.2 FIELD TESTING

Demonstrate that duct heaters operate satisfactorily in the presence of the Contracting Officer.

Conduct an operational test for a minimum of 6 hours.

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

-- End of Section --