SECTION 238300 - RADIANT HEATING UNITS

This Section includes electric heating cables, as units and as assembled into mats.

Manufacturers found in SpecAgent for this Section were identified as representative and not as an endorsement for meeting the requirements of this specification.

This Section includes performance, proprietary, and descriptive type specifications. Edit to avoid conflicting requirements.

This Section includes the term Architect/Engineer. "Architect" is used in AIA contract documents; "Engineer" is used in EJCDC contract documents. Retain appropriate term.

See the Drawing Coordination Considerations for information needed to coordinate this specification Section with the Drawings.

1. GENERAL
	* + 1. SUMMARY
				1. Section includes heating cable, heating cable mat and temperature controllers for heating cable and mat.
				2. Related Sections:

Section 031000 - Concrete Forming and Accessories: Execution requirements for inserts for wiring specified by this section.

Section 073113 - Asphalt Shingles: Execution requirements for fasteners penetrating roofing holding wiring specified by this section.

Section 073129 - Wood Shingles and Shakes: Execution requirements for fasteners penetrating roofing holding wiring specified by this section.

Section 077100 - Roof Specialties: Execution requirements for fasteners for downspout and gutter heating cables specified by this section.

* + - 1. PERFORMANCE REQUIREMENTS

Use this article carefully; restrict statements to identify system performance requirements or function criteria only.

* + - * 1. Pipe Trace Heating: Freeze protection with outside temperature at <\_\_\_\_\_\_\_\_> degrees F.
				2. Snow Melting Installations: **[45]** <\_\_\_\_\_\_\_\_> W/sq ft, minimum, in protected areas.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).

Only request submittals needed for Project requirements.

* + - * 1. Section 013300 - Submittal Procedures: Submittal procedures.
				2. Shop Drawings: Indicate **[heating cable] [and] [mat]** layout, locations of terminations, thermostats, and branch circuit connections.
				3. Product Data: Submit data for **[heating cable,] [mat,]** and control components.
				4. Design Data: Indicate calculations demonstrating performance requirements are met.
				5. Manufacturer's Installation Instructions: Submit support details, and connection requirements.
				6. Manufacturer's Certificate: Certify products meet or exceed specified requirements.
			1. CLOSEOUT SUBMITTALS
				1. Section 017716 - Contract Closeout
				2. Project Record Documents: Record actual locations of **[heating cable,] [mat,] [temperature sensors,] [thermostats,]** and branch circuit connections.
				3. Operation and Maintenance Data: Submit description of controls and repair methods and parts list of components.
			2. QUALITY ASSURANCE

Include the following paragraph only when cost of acquiring specified standards is justified.

* + - * 1. Maintain one copy of each document on site.
			1. QUALIFICATIONS
				1. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years **[documented]** experience.
				2. Installer: Company specializing in performing Work of this section with minimum three years **[documented]** experience **[approved by manufacturer]**.
			2. PRE-INSTALLATION MEETINGS
				1. Section 013000 - Administrative Requirements: Pre-installation meeting.
				2. Convene minimum **[one]** <\_\_\_\_\_\_\_\_> week prior to commencing work of this section.
			3. DELIVERY, STORAGE, AND HANDLING
				1. Section 016500 - Materials and Equipment.
				2. Accept mats and cable on site in factory wrapping. Inspect for damage.
			4. ENVIRONMENTAL REQUIREMENTS
				1. Section 016500 - Materials and Equipment.
				2. Do not install on roofing until roofing is complete.
				3. Maintain mat and cable electric continuity during installation of concrete.
			5. FIELD MEASUREMENTS
				1. Verify field measurements prior to fabrication.
			6. SEQUENCING
				1. Section 011000 - Summary: Work sequence.
				2. Sequence Work to prevent damage to heating system before concrete is poured or insulation installed.
			7. COORDINATION
				1. Section 013000 - Administrative Requirements: Coordination and project conditions.
				2. Coordinate Work with installation of **[concrete formwork,] [concrete placement,] [roofing [and gutters],] [piping,] [and] [.] [piping insulation.]**
			8. WARRANTY

This article extends warranty period beyond one year. Extended warranties increase construction costs and Owner enforcement responsibilities. Specify warranties with caution.

* + - * 1. Section 017716 - Contract Closeout.
				2. Furnish **[five]** <\_\_\_\_\_\_\_\_> year manufacturer warranty for floor-heating and snow-melting equipment.
				3. Correct defective Work within **[five]** <\_\_\_\_\_\_\_\_> year period after Date of Substantial Completion.
1. PRODUCTS
	* + 1. HEATING CABLE AND MAT

In this article, list manufacturers acceptable for this project.

* + - * 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Chromalox, Inc.

Delta-Therm Corporation.

EasyHeat; Emerson Electric Co., Commercial and Residential Solutions.

Nelson Heat Trace; a division of Emerson.

PYROTENAX; brand of nVent Electrical plc.

RAYCHEM; brand of nVent Electrical plc.

Trasor Corp.

Watts Radiant; A WATTS Brand.

Approved equivalent.

Edit the following descriptive specifications to identify project requirements and to eliminate conflicts with manufacturers specified above.

* + - * 1. Heating Cable: Mineral-insulated, copper-sheathed, series resistance heating cable in **[single] [two]** conductor configuration with **[one] [two]** cold ends.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Heating Cable: Thermoplastic-insulated, parallel resistance heating cable.

\*\*\*\*\*\* [OR] \*\*\*\*\*\*

* + - * 1. Heating Cable: Self-limiting, parallel resistance heating cable.
				2. Ratings: <\_\_\_\_\_\_\_\_> W/lineal ft.
				3. Heating cable mat. Heating cable with characteristics above assembled into pre-spaced unit. **[36]** <\_\_\_\_\_\_\_\_> inch width; <\_\_\_\_\_\_\_\_> ft; length. Furnish mat with non-heating leads **[10]** <\_\_\_\_\_\_\_\_> ft in length.
				4. Ratings: <\_\_\_\_\_\_\_\_> W/sq ft.
			1. ACCESSORIES
				1. Thermostat: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.> **[Manufacturer and model: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>]**
				2. Snow Detector: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.> **[Manufacturer and model: <\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.>]**
			2. ELECTRICAL CHARACTERISTICS AND COMPONENTS

Select one or more of the following subparagraphs appropriate to equipment requirements.

* + - * 1. Electrical Characteristics:

**[<\_\_\_\_\_\_\_\_> rated load amperes.]**

<\_\_\_\_\_\_\_\_> volts, **[single] [three]** phase, 60 Hz.

<\_\_\_\_\_\_\_\_> amperes maximum **[fuse size] [circuit breaker size] [overcurrent protection]**.

<\_\_\_\_\_\_\_\_> minimum circuit ampacity.

1. EXECUTION
	* + 1. EXAMINATION
				1. Section 013000 - Administrative Requirements: Coordination and project conditions.
				2. Verify **[piping] [ceiling framing] [concrete formwork]** is ready to receive Work.
				3. Verify field measurements are as shown on **[shop drawings.] [Drawings.]**
				4. Verify required utilities are available, in proper location, and ready for use.
			2. INSTALLATION
				1. Install Work in accordance with (authority) **[State] [Municipality]** of <\_\_\_\_\_\_\_\_> **[Highways] [Public Work's]** standards.
				2. Avoid pinching and making sharp bends in cable.
				3. Prevent damage by sharp rocks, metal, or other objects during installation.
				4. Do not cross heating cable over itself.
			3. INTERFACE WITH OTHER PRODUCTS
				1. Do not install **[heating cable] [and] [mat]** across expansion or construction joints.
			4. ERECTION TOLERANCES
				1. Cable Spacing in Concrete: **[3]** <\_\_\_\_\_\_\_\_> inch centers, minimum; **[9]** <\_\_\_\_\_\_\_\_> inch centers, maximum.
				2. Depth in Concrete: **[2]** <\_\_\_\_\_\_\_\_> inches below finished surface.
				3. Bending Radius: Six times cable diameter, minimum.
			5. FIELD QUALITY CONTROL
				1. Inspect for breaks in cable insulation.
				2. Test for continuity of heating cable.

Use the following paragraph for mineral-insulated cable installations.

* + - * 1. Measure insulation resistance to manufacturer's recommended values. Use test instruments in accordance with manufacturer's instructions.
				2. Perform continuity and insulation resistance test on completed cable installation. For cables embedded in concrete, perform tests immediately before and after concrete placement.
				3. Measure voltage and current at each unit.
				4. Submit written test report showing values measured on each test for each cable.
			1. DEMONSTRATION AND TRAINING
				1. Demonstrate operation of heating cable controls.

END OF SECTION 238300