SECTION 238313 - RADIANT-HEATING ELECTRIC CABLES

PART 1 - GENERAL

1.1 SECTIONS INCLUDES

A. Low-voltage Electric Snow and ice heating elements "under" finished roof materials (shingles or metal), gutters, and downspouts. This pertains to the following electric heating mat and cable: Self-regulating, parallel resistance, RoofHeat deicing heating elements.

B. Controls, Accessories

C. Associated installation materials.

1.2 Related Requirements:

A. Section 15770 “Floor Heating and Snow Melting Equipment”
B. Section 15773 “Electric Heating Cables, Mats, Modules, Panels and Controls”
C. Section 16855 “Heating Cables (Electrical)”
D. Section 260520 “Heating Cables”
E. Section 260523 “Electric Cables”
F. Section 260620.16 “Electrical”
G. Section 260620.23 “Electrical”
H. Section 262200 “Low Voltage”
I. Section 268313 “Radiant Heating Electric Cables”
J. Section 268313 “Radiant Heating Electric Mats”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, and furnished specialties and accessories.
2. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable.

1. Include scaled plans, sections, details, and attachments to other work.
2. Include diagrams for power, signal, and control wiring.
3. Include electrical panel schedules for load centers.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For electric heating cable/mat to include in operation and maintenance manuals.

1.5 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period, STEP RoofHeat Deicing Heating Elements and Transformer Power Supplies (excluding circuit breakers): 10 years from date of Substantial Completion, and 2 years on internal electronics provided that resistance readings are taken before, during, and after installation; and sent to Manufacturer.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR ELECTRIC HEATING CABLE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 PLASTIC, SELF-REGULATING FLEXIBLE SHEET HEATING ELEMENT - STEP ROOFHEAT FLEXIBLE DEICING HEATING ELEMENT

A. Basis-of-Design Product: Subject to compliance with requirements, provide STEP RoofHeat Snowmelt / Deicing Heating Element by:

Warmzone
12637 S. 265 W., Suite 100, Draper, UT 84020
Phone: 888-488-9276 / Fax: 801-948-7599
Web: www.warmzone.com

B. Compliance: UL 1693, ETL Listed, having CE marking, and conforming to ANSI/UL.

C. Heating Element: [12 inch (305 mm)] [9 inch (229 mm)][3 inch (76mm)] wide, 3/64 inch (1.2 mm) thick heating element made from a homogenous semi-conductor self-regulating polymer, utilizing PTC Nano-Technology allowing elements to heat at maximum power in cold environments.

D. Electrical Insulating Jacket: Mylar.

E. Maximum Survival Temperature: 380 deg F (193 deg C).

F. Maximum Operating Temperature: 248 deg F (120 deg C).

G. Maximum Obtainable Operating Temperature: 86 deg F (30 deg C).

H. Capabilities and Characteristics:

1. Heating Element Construction: [12 inch (305 mm)] [9 inch (229 mm)][3 inch (76mm)] wide, parallel-resistive, self-regulating conductive polymer.
2. Heating Element Thickness: 3/64 inch (1.2 mm).
3. Heating Element: PTC (positive temperature coefficient) semi-conductive polymer.

4. Heating Element Bus Braid: Two-tinned-copper, 15 AWG.
5. Heating Element Insulation: Mylar.
6. Heating Element Outer Jacket: Mylar.
7. Cold Lead: 10 AWG MTW, insulation provided my manufacturer.
8. Splice: Field connected to cold lead.
9. Maximum Heat Output (flexible sheet): [11.3 W/ft. (37.1 W/m), 21.3 W/ft. (69 W/m), 24 W/ft. (78.7 W/m), 9 W/ ft. (29.5 W/m) at 68 deg F (20 deg C)].
10. Minimum Installation Temperature: N/A.
11. Minimum Spacing: 0 inch (0 mm).
12. Electrical Characteristics:

    a. Volts: [**12**] [**24**] Volts AC
    b. Phase: Single-phase
    c. Hertz: 0-60 Hz

I. Power Supply (Power Pack): [**Model EPI-LX**] [**Model EPI-LX-R**], Class I Power Supply with metal enclosure, line and load terminal blocks with line and load circuit-breakers.

1. Power Supply Characteristics:

    a. [**500 W**] [**1000 W**] [**1500 W**].
    b. Transformer Type: Toroidal (low noise) transformer.
    c. Transformer Winding: Isolated primary and secondary winding.
    d. Primary Voltage: [**120**] [**208**] [**230**] [**240**] [**277**].
    e. Secondary Voltage: [**12 V**] [**24 V**].
    f. Each primary input protected by metal oxide varistor.
    g. Each output having a load active LED indicator.
    h. Enclosure: NEMA I rated, aluminum.

2. Control Board Characteristics: For LX-R Series:

    a. Soft Starts Transformer(s): For elimination of inrush.
    b. Multiple Power Pack Staging: To allow more wattage per unit.
    c. Allows single controller to operate multiple power packs.

2.3 CONTROLS

A. Comply with requirements in Section 230900 "Instrumentation and Control for HVAC" and Section 230993 "Sequence of Operations for HVAC Controls" for control devices and sequence of operations for radiant-heating electric cables.

1. System activation shall be controlled by WS Snowmelt controller with external temperature and/or moisture sensors. Control of the system shall be achieved by the use of one or two remote mounted sensors which will collectively sense the outdoor temperature and the presence of falling snow.

    a. System shall be capable of responding to the input from both a temperature and moisture sensor.
    b. Controller will be capable of controlling one zone.
    c. Control device shall be CSA, ETL, UL or equivalent Approved.

2. WS-2C, WS-5 or WS-8C Aerial mounted sensors with integral or remote temperature and moisture sensors. Appropriate contactor / relay enclosures shall be NEMA 3R minimum rated, suitable for outdoor mounting. Control of the system shall be achieved by the use of an Aerial Controller with integrated snow and temperature sensors which will collectively sense the outdoor temperature and the presence of falling snow.

    a. System shall be capable of responding to the input from both a temperature and moisture sensor.
    b. Controller will be capable of controlling one zone.
    c. Controller will remain energized for an adjustable duration following the end of snowfall, so that slush and ice formation are prevented or evaporated.
    d. Controller shall feature a device to permit Manual Override. The manual feature shall self-disconnect after a time delay to prevent system run-away.
    e. Controller shall have remote auxiliary control unit (WS-AUX) that mimics Aerial Sensor for easy visibility and ground access.
    f. The control device shall be CSA, ETL, UL or equivalent Approved.

2.4 ACCESSORIES

A. WS Interconnect Cable: To go between Aerial Snow Sensor and the remote auxiliary (WS-AUX) control unit. Cable should be stranded, shielded 6 conductor, 22 AWG.

1. Length: [**50 ft. (15.2 m)**] [**100 ft. (30.5 m)**] [**200 ft. (61 m)**].

PART 3 - EXECUTION

3.1 EXAMINATION

A. For all products, examine surfaces and substrates to receive electric heating cables or cable-heated mats for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces in contact with electric heating cables or cable-heated mats are free of burrs and sharp protrusions.
2. Measure and verify square footages (square meters) for areas to be heated.
3. Verify available supply voltages for project.
4. Identify location of any required junction box(s). Ensure that the maximum cold lead distance for each product is not exceeded.
5. Ensure that environmental requirements for required controls are not violated.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Install the following types of electric heating cable for the applications described:

1. Snow and Ice Melt for **metal**/**shingle** roofs, gutters and downspouts: Mylar-insulated, parallel-resistance heating element.

3.3 INSTALLATION

A. Low-Voltage and Self-Regulating STEP RoofHeat Snow Melting Systems Installation Guidelines.

1. Comply with manufacturer's product data, including product technical bulletins, installation instructions, and design drawings. Complete installation must conform to manufacturer's installation instructions, NEC Code, and any appropriate local electric codes.
    a. Choose qualified personnel who are either trained or are willing to be trained by Warmzone.
    b. This is an electric heating system and requires personnel trained in the National Electric Code that understands the importance of preventing mistakes that can cause an electrical fire.
    c. Make sure that all materials used are approved for the specific application and have no adverse compatibility with the heating elements.
    d. Use only components supplied by or recommended by the manufacturer.
    e. STEP RoofHeat elements should not touch, cross, or overlap at any point.
    f. Do not energize rolled up heating elements.
    g. Make sure to note and identify the locations of the electrical bus braid wires for each heating element, to avoid fastening (nail) through bus braids.
    h. Installation shall be made in accordance with NEC 424.90 through 424.99 with the following exceptions on 424.93 and 424.99 described in (a) and (b) respectively:
        1) PTC Polymer Heating Panel Sets: Nailing or stapling of PTC polymer heating panel shall be done through the polymer material but at least 1 inch from the bus braid conductors. Nails, staples or other fasteners shall not penetrate the current-carrying bus braid conductor wires.
        2) Fault Protection: A current limiting device is provided by the manufacturer to protect the un-grounded conductors supplying the heating panel sets. The device shall function when a short circuit occurs such as a result of penetration of both bus conductors or extension wires with a metal device.

2. Fixed Outdoor Electric Roof Deicing and Snow Melting Equipment. Installation shall be made in accordance with NEC Article 426 with the exceptions of grounding and ground-fault protection requirements described under 426.22, 426.27 and 426.28. Secondary circuit shall not be grounded according to grounding requirements.

3.4 CONNECTIONS

A. Ground the transformer housing and primary according to NFPA 70 (NEC) Class 1 wiring.

B. The secondary circuit is ungrounded and floating.

3.5 FIELD QUALITY CONTROL

A. Testing: **Owner will engage** a qualified electrician to perform tests and inspections.

B. Manufacturer's Field Service: Engage a qualified service representative to test and inspect components, assemblies, and equipment installations, including connections.

C. Perform the following tests and inspections [**with the assistance of a qualified service representative**]:

1. Perform tests before, during, and after heating element installation - before application of coverings such as roofing material.
2. Test heating element for electrical continuity and insulation integrity before energizing.
3. Test heating element to verify rating and power input. Energize and measure voltage and current simultaneously according to instructions.

D. Repeat tests for continuity, insulation resistance, and input power after applying finished surface on heating element.

E. Radiant-heating electric elements will be considered defective if they do not pass tests and inspections.

F. Prepare test and inspection reports for warranty purposes, and send to manufacturer.

3.6 PROTECTION

A. Protect installed heating elements, including non-heating leads, from damage during construction.

B. Remove and replace damaged heating elements according to instructions.

END OF SECTION 238313