SECTION 238313- RADIANT-HEATING ELECTRIC CABLES / MATS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Electric radiant snow melting mats or cables embedded in concrete or asphalt slabs, or embedded under brick or stone pavers with sand, stone dust or mortar bed. This pertains to the following electric heating mat and cable: Plastic, insulated series resistance.

B. Controls, sensors and relay (contactor) panels.

C. Electric radiant snow melting system components, accessories and associated installation materials.

1.2 RELATED SECTIONS

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”
K. Section 321313 “Concrete Paving”
L. Section 321216 “Asphalt Paving”
M. Section 321400 “Unit Paving”
N. Section 312300 “Excavation / Fill”

1.3 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 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, ClearZone: 10 years from date of Substantial Completion, provided that resistance readings are taken before, during, and after installation; and sent to Manufacturer

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications and Services:
1. 10 years of experience (minimum) with electric radiant snow melting systems.
2. Snow melting cables / mats, controls, sensors, relays and related items shall be provided by Warmzone.
3. Must provide free design assistance, online “LIVE” training and installation support.

B. Regulatory Requirements and Approvals – Electric Snow Melting Systems. Provide an electric snow melting system that complies with the following requirements:
1. Snow melting cables / mats for installation in concrete, asphalt or under pavers shall be Listed to: CSA-C22.2 No. 130-03 (R2013), ANSI/IEEE 515.1-2012, UL 515 (First Edition), UL 1673 (Second Edition)

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR ELECTRIC HEATING CABLE / MAT

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-INSULATED, SERIES RESISTANCE HEATING CABLE - SNOWMELT CABLES / MATS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Warmzone ClearZone Snowmelt Cable or Mat by:

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

B. Comply with UL 1673, CSA, and CSA/US standards.

C. Heating Element: Dual conductor resistive wire. Powered with a waterproof, factory-assembled splice to a 16.4 ft. (5 m) cord (Power supply lead "cold lead"). The dual element is terminated in a factory assembled water proof terminator.

D. Maximum Operating Power on Operating temperature: 220°F (105°C).

E. Capabilities and Characteristics:

1. Cable Construction: Series heating cable (mat), dual conductor.
2. Cable Diameter: 1/4 inch (6.4 mm) nominal round cable both flexible and UV protected.
3. Cable Conductor: Copper.
4. Cable Conductor Insulation: Fluoropolymer.
5. Cable Outer Jacket: Polyolefin
6. Cold Lead: Standard 16.4 ft. (5 m), single-point connection.
7. Splice: Factory assembled, waterproof, UV rated.
8. Minimum Bending Radius: 1.5 inch (38.1 mm).
9. Maximum Heat Output: 12 W/ ft (40 W/ m).
10. Minimum Installation Temperature: 5°F (-15°C).
11. Maximum install Temperature: 220°F (105°C).
12. Minimum Spacing: 2 in (51 mm).
13. Cable Spacing: [**2 inch (51 mm) = 72 W/sq. ft.(775 W/sq. m)**] [**3 inch (76 mm) = 48 W/sq. ft. (517 W/sq. m)**] [**4 inch(102 mm) = 36 W/sq. ft. (387.5 W/sq. m)**] [**5 inch (127 mm) = 29 W/sq. ft. (312 W/sq. m)**].

F. Electrical Characteristics (choose one):
1. Volts: [**208**] [**240**] [**277**] [**347**] [**480**] [**600**].
2. Phase: [Single-phase] [3-phase].
3. Hertz: 0-60 Hz.
4. 12W/ft (40W/m)- Total Wattage and amperage by Cable Length
5. Minimum Circuit Capacity: 15 amps.
6. Maximum Overcurrent Protection: Per NEC Code (NFPA 70) or CSA Standards.

G. Cable-Heated Mats: Factory-fabricated cable with **2.9 inch spacing (73 mm) = 50 W/sq. ft. (538 W/sq. m)** or **3.8 inch spacing (97 mm) = 37W/sq. ft. (398 W/sq. m)**, with **1.83 ft. (22") (.610 m)** mat widths.

H. Capacities and Characteristics:
1. Maximum Heat Output (Cable): Cable Spacing: [**2 inch(51 mm) = 72 W/sq. ft.(775 W/sq. m)**] [**3 inch(76 mm) = 48 W/sq. ft.(517 W/sq. m)**] [**4 inch(102 mm) = 36 W/sq. ft. (387.5 W/sq. m)**] [**5 inch(127 mm) = 29 W/sq. ft.(312 W/sq. m)**]
2. Maximum Heat Output (Mat): [**50 W/sq. ft.(538 W/sq. m)**][**37 W/sq. ft. (398 W/sq. m)**]

2.3 PLASTIC-INSULATED, TEMPERATURE AND PRESSURE RESISTANT, SERIES RESISTANCE HEATING CABLE - SNOWMELTING CABLES/MATS SNOWMELT CABLE/MAT FOR ASPHALT

A. Basis-of-Design Product: Subject to compliance with requirements, provide Warmzone ClearZone Asphalt Snowmelt Cable or Mat by:

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

B. Comply with UL 1673, CSA, and CSA/US standards.

C. Heating Element: Dual conductor resistive wire. Powered with a waterproof, factory-assembled splice to a 16.4 ft. (5 m) cord (Power supply lead "cold lead"). The dual element is terminated in a factory assembled water proof terminator.

D. Maximum Power Operating Temperature: 220°F (105°C)

E. Maximum Power off Survival temperature 392°F (200°C)

F. Capabilities and Characteristics:
1. Cable Construction: Series heating cable (mat), dual conductor.
2. Cable Diameter: .28 inch (7.0 mm) nominal round cable both flexible and UV protected.
3. Cable Conductor: Copper.
4. Cable Conductor Insulation: Fluoropolymer.
5. Cable Outer Jacket: Polyolefin
6. Cold Lead: Standard 16.4 ft. (5 m), single-point connection.
7. Splice: Factory assembled, waterproof, UV rated.
8. Minimum Bending Radius: 1.5 inch (38.1 mm).
9. Maximum Heat Output: 12 W/ ft. (40 W/ m).
10. Minimum Installation Temperature: 5°F (-15°C).
11. Maximum install Temperature: 460° (240°C) for up to 10 mins.
12. Minimum Spacing: 2 in (51 mm).
13. Cable Spacing: [**2 inch (51 mm)** = **72 W/sq. ft. (775 W/sq. m)**] [**3 inch (76 mm)** = **48 W/sq. ft.(517 W/sq. m)**] [**4 inch (102 mm)** = **36 W/sq. ft. (387.5 W/sq. m)**] [**5 inch(127 mm)** = **29 W/sq. ft. (312 W/sq. m)**].
14. Electrical Characteristics (choose one):
    a. Volts: [120] [**208**] [**240**] [**277**] [**347**] [**480**] [**600**].
    b. Phase: [**Single-phase**] [**3-phase**].
    c. Hertz: 0-60 Hz.
    d. 12W/ft (40W/m)- Total Wattage and amperage by Cable Length
    e. Minimum Circuit Capacity: 15 amps.
    f. Maximum Overcurrent Protection: Per NEC (NFPA 70) or CSA standards

G. Cable-Heated Mats: Factory-fabricated cable with **2.9 inch spacing (73 mm)** = **50 W/sq. ft. (538 W/sq. m)** or **3.8 inch spacing (97 mm)** = **37 W/sq. ft. (398 W/sq. m)**, with **1.83 ft**. (22") (**.610 m**) mat widths.

H. Capacities and Characteristics:
1. Maximum Heat Output (Cable): Cable Spacing[**2 inch (51 mm)** = **72 W/sq. ft. (775 W/sq. m)**] [**3 inch (76 mm)** = **48 W/sq. ft.(517 W/sq. m)**] [**4 inch(102 mm)** = **36 W/sq. ft. (387.5 W/sq. m)**] [**5 inch(127 mm)** = **29 W/sq. ft.** (312 W/sq. m)]
2. Maximum Heat Output(Mats): [**50 W/sq. ft.(538 W/sq. m)**][**37 W/sq. ft**. (**398 W/sq. m)**]

2.4 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.

B. Precipitation and Temperature Sensor for Snow Melting on Pavement (choose one):
   1. System activation shall be controlled by WS Snowmelt Controller with external digital temperature and moisture sensors and appropriate contactor / relay. 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 inputs from more than one sensor.
      b. Controller will be capable of controlling two zones when used with two sensors.
      c. Controller to remain energized for an adjustable duration following the end of the 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 user adjustable time delay to prevent system run-away.
      e. Control device shall be CSA or equivalent Approved.
   2. WS-2C, WS-5C 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.

2.5 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)**].

B. Embedded Heating-Cable Identification:
   1. Surface mounted metal signage to denote embedded electrical cable according to NFPA 70.

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 Melting in Concrete Pavement: series-resistance heating cable with Fluoropolymer cable conductor insulation and Polyolefin outer jacket.
   2. Snow and Ice Melting in Asphalt: series-resistance heating cable with Fluoropolymer cable conductor insulation and Polyolefin outer jacket.
   3. Snow and Ice Melting under Pavers/Stone or Brick: series-resistance heating cable with Fluoropolymer cable conductor insulation and Polyolefin outer jacket.

3.3 INSTALLATION

A. Electric Pavement Snow Melting System Installation.
   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. ALWAYS measure, verify and record the actual resistance throughout the installation process. All testing records shall be given to owner and manufacturer to establish warranty. The installer is to use an ohm meter to test the heating element resistance and a Meg Ohm meter to test the insulation resistance at the following times:
         1) Before the heating element is removed from the box (document readings).
         2) During installation (document readings).
         3) Before pouring the surface embedment material (document readings).
         4) After surface embedment material has been applied (document readings).
         5) Send documentation to Manufacturer.
      b. Embed cable and or cable/mat with heat-conductive fill materials, such as concrete, asphalt, sand, or other cementitious material to ensure direct contact and proper heat transfer to finished surfaces.
      c. Maintain cable/mat spacing in accordance to manufacturer's requirements.

d. DO NOT energize cable embedded in concrete or pavement surface until embedded material is cured.
e. Install manufacturer-supplied metal marker plate(s) in surface to denote embedded electrical system, per NEC 426-13.
f. DO NOT cut, cross, or allow the heating cable to overlap or touch.
g. Power lead/heating cable connection and at least 1 ft. (30 cm) of power lead must be embedded.
h. Remaining power lead cable connection must run through conduit.
i. Power lead may be extended by qualified and trained personnel (consult manufacturer).
j. Check and verify the supply voltage matches supplied product.
k. Metal structures or materials used for the support of, or on which the cable/mat is installed (wired mesh), must be grounded in accordance with CSA Standard C 22.1, Section 10 and Article 250 of the NEC.
l. Heating cable braid must be grounded in accordance with local codes and Article 250 of the NEC.
m. Connection of the heating cable/mat must be carried out by an authorized electrician.
n. Cable/Mat shall not cross an expansion joint (surface to ground). Heating cable must be completely covered or embedded after installation. Ensure no air pockets exist in the surface material as this can result in damage to the cable and can limit proper heat transfer.
o. Install an upstream disconnect to ensure a means of de-energizing the cable or mat.
p. Embed cable/mat 2 inch (51 mm) below surface per NEC, Article 426.20.
q. Asphalt Installation: Consult manufacturer for instructions.

3.4 CONNECTIONS

A. Ground all equipment according to NFPA 70 (NEC) Class 1 wiring.

3.5 FIELD QUALITY CONTROL

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

B. 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 insulation, concrete, asphalt or paver 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.

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

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

E. 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