1. GENERAL

1.01 SUMMARY

.1 Section includes UL Listed, CSA Certified snow melting heat tracing systems that consists of a mineral insulated (MI) trace heater, accessories, and electronic controller.

.2 Related Requirements

.1 Section 23 83 13 – Radiant-Heating Electric Cables.

.2 Section 25 56 00 – Integrated Automation Control of Electrical Systems

.3 Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

.4 Section 26 05 26 – Grounding and Bonding for Electrical Systems.

.5 Section 26 05 33 – Raceway and Boxes for Electrical Systems.

1.02 REFERENCES

.1 Reference Standards

.1 UL515 – Electrical Resistance Heat Tracing for Commercial Applications.

.2 IEEE 515.1-2012 Standard for the Testing, Design, Installation & Maintenance of Electric Resistance Trace Heating for Commercial Applications.

.3 CSA C22.2 No. 130-16, Requirements for Electrical Resistance Heating Cables and Heating Device Sets.

.4 NFPA 70 - National Electrical Code.

.5 CSA C22.1 – Canadian Electrical Code.

1.03 SYSTEM DESCRIPTION

.1 System for snow melting of concrete, asphalt, and under pavers with temperature and moisture sensing control, monitoring, integrated ground-fault circuit protection and BMS communication capabilities.

.2 System spacing requirements based on supply voltage, application, and location. Generally, the required watt density for a snow melting application in the Northeast US will be 35 Watts to 45 Watts per square foot. This system will operate on voltages 120 V-600 V.

1.04 SUBMITTALS

.1 Product Data

.1 Heating cable data sheet.

.2 UL Listed and CSA Certified certificates for surface snow melting.

.3 Snow melting design sheet.

.4 System installation and operation instructions.

.5 System installation details.

.6 Connection kits and accessories data sheet.

.7 Controller wiring diagram.

.2 Shop Drawings

.1 Project-Specific Heating Cable System Installation Details.

.2 Project-Specific System Power Wiring Schematic.

.3 Project-Specific System Control Wiring Schematic.

.4 Project-Specific Heating Cable Layout Drawing.

1.05 QUALITY ASSURANCE

.1 Source Limitations: All system components heating cable, accessories, and controller] shall be sourced from a single manufacturer, under no circumstances shall any components be installed other than those supplied by the cable manufacturer, to ensure system integrity and to meet warranty requirements.

.2 Qualifications

.1 Manufacturers

.1 Manufacturer to show minimum of forty (40) years of experience in manufacturing electric mineral-insulated heating cables.

.2 Manufacturer will be ISO-9001 registered.

.3 Manufacturer to provide heating cable consistent with IEEE 515.1 and CSA C22.2 No. 130 requirements.

.4 The MI heating cable shall be qualified and tested to demonstrate a useful lifetime in excess of 20 years.

.5 The manufacturer shall provide an extensive global reference list for this application, including installations that have been in operation for over 15 years.

.2 Installers

.1 System installer shall have complete understanding of product and product literature from manufacturer or authorized representative prior to installation. Electrical connections shall be performed by a licensed electrician.

.3 Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100, by a Nationally Recognized Testing Laboratory (NRTL), and marked for intended use.

.3 Certifications

.1 The system (heating cable, connection kits, and controller) shall be UL Listed and CSA Certified for snow melting of concrete surfaces and pavers.

1.06 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements

.1 Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminates or other causes.

.2 Deliver products to site in original, unopened containers or packages with intact and legible manufacturers' labels identifying the following:

.1 Product and Manufacturer.

.2 Length/Quantity.

.3 Lot Number.

.4 Installation and Operation Manual.

.5 MSDS (if applicable).

.2 Storage and Handling Requirements

.1 Store the heating cable in a clean, dry location with a temperature range 0°F (-18°C) to 140°F (60°C).

.2 Protect the heating cable from mechanical damage.

1.07 WARRANTY

.1 Manufacturer Warranty

.1 nVent warrants all goods listed below for two (2) years from date of purchase against faulty workmanship and use of defective materials when such goods are properly installed, operated, and maintained according to product documentation. See Limited Product Warranty (H57396) at www.nventthermal.com.

.1 Heating cables, connection kits and accessories

.2 Thermostats, controllers, panels contactors, sensors, and accessories

.2 Special Warranty

.1 Contractor shall provide the owner an extended product warranty for the heat tracing products listed below. The contractor must complete and forward to owner the Installation, Inspection or Commissioning Record(s), and complete the online warranty registration form within thirty (30) days from the date of installation, otherwise only the standard limited warranty applies. See Limited Product Warranty Extension details (H57397) at www.nventthermal.com

.1 Heating Cable and Components warranty shall be Ten (10) Years from Date of Purchase

.3 Heating cables, connection kits and accessories not automatically offered with a 10 year manufacturer's warranty, as a standard matter of course, will not be allowed. Warranty information must be published on the manufacturer's website.

2. PRODUCTS

2.01 MANUFACTURERS

.1 Basis of Design Manufacturer: Subject to the compliance with requirements, provide nVent RAYCHEM heat tracing products of nVent Thermal Management, LLC Redwood City 94063, 800-545-6258;

.2 Email: thermal.info@nvent.com Website: www.nventthermal.com

.3 Submit comparable products of one of the following for approval by the specifier:

.1 TRM Heating Cables.

.4 Submit request for substitutions in accordance with Instructions to Bidders and Division 01 – General Requirements.

2.02 MATERIALS

.1 Heating cables shall be RAYCHEM LSZH Jacketed, Copper Sheathed MI heating cables specifically designed for snow melting in concrete, asphalt, and pavers, tested, and approved to UL 515, CSA C22.2 No. 130, and IEEE 515.1 requirements.

.1 The construction of the MI heating cable shall consist of a single conductor surrounded by magnesium oxide insulation with a solid, seamless copper sheath.

.2 The heating cable shall have an extruded low-smoke zero halogen (LSZH) jacket to protect the cable from corrosive elements that can exist in the concrete. The heating cable shall be supplied with an identification tag that contains the heating cable catalog number, length, power output, operating voltage, agency listings, serial number and temperature code.

.3 Heating cable core materials shall be inorganic and not deteriorate with age.

.4 Heating cables shall be factory-fabricated to the length required and shall not be altered at site. Heated-section shall be joined to cold-lead section with factory-made joint. Cold-lead length shall be ordered as per site requirements.

.5 Heating cables shall be selected to deliver sufficient heat to melt snow under regional or site-specific conditions (refer to construction documentation) and circuit zoning shall comply with construction documentation.

.6 The heating cable shall operate on line voltages of 600 volts without the use of transformers.

.7 The heating cable shall be part of a UL Listed and CSA Certified system.

.2 Heating Cable Accessories

.1 Fasteners - depending on slab construction, use one of the following:

.1 For single-pour concrete installations, fasten cable to reinforcing steel mesh at prescribed spacing, using nylon (or other non-metallic) tie-wraps.

.2 For slab constructions where topping is applied over cables on a set surface (e.g. two-pour concrete slabs or stairs, road asphalt, or mastic asphalt), fasten cables at prescribed spacing, using pre-punched galvanized steel strapping, type HARD-SPACER-GALV-25MM-25M.

.2 Snow-Melt Caution Sign

.3 Mark each snow-melting area with a brass identification plate embedded in the slab, type SMCS

.3 Snow and Slab Sensors

.4 Energy Efficient Control System

.1 Multi-Circuit, Group Control System – 3 Phase

.1 Group controller shall be RAYCHEM SMPG3 snow melting and de-icing power distribution and control panel.

.2 Heating cable manufacturer shall provide a group snow/ice melting controller with built-in GFPD compatible with selected heating cable.

.3 Group snow/ice melting controller shall have an integrated 30 mA ground-fault circuit breaker.

.4 Group snow/ice melting controller shall have 1, 2, or 3 3-pole, Shunt trip circuit breakers with external ground-fault sensors. Custom SMPG panel designs are available if standard configurations are not suitable. Please contact your nVent sales representative for more information and pricing].

.5 Group snow/ice melting controller shall have a main circuit breaker.

.6 Group snow/ice melting controller shall be capable of operating with 3 phase supply voltages of 600 V.

.7 Group snow/ice melting controller shall be capable of supporting up to six (6) aerial or gutter mounted temperature/moisture sensors.

.8 Group snow/ice melting controller enclosure shall be NEMA 1/12 or NEMA 3R/4.

.9 Group snow/ice melting controller shall have an adjustable hold-on timer (0 – 10 hours).

.10 Group snow/ice melting controller shall have an integrated high-limit temperature sensor.

.11 Electronic snow/ice melting controller shall have contacts to interface with an Energy Management Computer (EMC).

.1 Inputs: Override On, Override Off

.2 Outputs: Supply, Snow, Heat, High Temp, Alarm

.12 Digital controller shall have c-UL-us approvals

.5 Approvals

.1 The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified for surface snow melting of concrete and asphalt, and under pavers.

.2 The snow melting system shall have a design, installation and operating manual specific to surface snow melting.

3. EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions

.1 Prior to installation of heating cables, the installation area shall be swept clear of construction equipment and other debris, and passage through the area of unrelated personnel or equipment shall be halted for the duration of the installation. If applicable, trench Drain cutting shall be complete, and electrical service holes shall be in place prior to installation of heating cable.

.2 Pre-installation Testing

.1 Upon receipt of the heating cables, continuity (conductor resistance) and “megger” (insulation resistance) tests shall be performed. Records shall be kept for each cable in the test results table provided at the back of the installation manual. Detailed test instructions shall be included in the heating cable installation manual.

.2 Continuity Test

.1 Using a standard multimeter, resistance from one end of the heating conductor to the other shall be measured and recorded. Expected resistance for each heating cable

reference shall be indicated on manufacturer's data sheet and noted on said report.

.3 "Megger" Test

.1 Using a megohmmeter, Insulation Resistance between the heating conductor and copper cable sheath shall be measured and recorded. It is recommended that the test be performed at 1000 VDC, however 500 VDC is acceptable in the absence of capable equipment. Upon receipt, minimum acceptable insulation resistance shall be 100 MΩ.

3.02 PREPARATION

.1 Protection of In-Place Conditions

.1 If there is any delay between installation of the heating cables and placement of the topping course, take the following precautions to protect the installation:

.1 Record post-installation test results immediately.

.2 Do not energize the cables.

.3 Mechanically protect the cables so that they cannot be damaged by pedestrian or vehicular traffic, paint, welding, falling objects, inclement weather, or other inappropriate exposure.

3.03 INSTALLATION

.1 Cable:

.1 Heating cable shall be installed according to national and local electrical codes, manufacturer's recommendations, and the instructions supplied with heating cable and components.

.2 Cables shall be laid such that sheaths shall not touch or cross one another. Concrete expansion and/or crack-control joints shall be crossed in accordance with specific procedures provided by the manufacturer.

.3 Cables shall be laid at the spacing specified in construction documentation. As a general rule, spacing shall be wider than 75 mm (3") and must not exceed 250 mm (10") in concrete or 150 mm (6") in asphalt, to promote equal heat distribution at the surface.

.4 All junction boxes shall be located in accessible areas, above grade (unless indoors). Junction boxes shall not be located in the heated slab. Covers shall be kept on enclosures at all times when not working therein.

.5 All terminations shall be protected from the weather and from mechanical damage. The gland assembly shall be bonded to the system ground. When fishing cable cold-leads through conduit, cold-lead tails shall not be pulled.

.6 Field-alterations or deviations shall proceed only after authorization has been issued by the project engineering team. All changes shall be accurately recorded by the contractor and shall be provided to engineering upon completion of that phase of work.

.7 After the heating cable is laid, the same tests outlined above shall be performed and results recorded in the same results table. Continuity test reading should be the same; Insulation Resistance test reading should exceed 20 MΩ. In the event that test results are unsatisfactory, the construction team shall be notified, and work in the area stopped, until the issue is rectified. The cable manufacturer shall be capable of assisting with troubleshooting.

.2 Sensors and Controller

.1 Sensor shall be mounted securely in upright position in an area clear of overhead trees, wires, eaves, and the like, and not at risk from falling debris. Exposure to artificial heat sources and shock or vibration shall be avoided.

.2 Location shall be selected so as to be representative of anticipated precipitation conditions in the area(s) where snow-melting system has been installed.

.3 Sensor shall be powered in accordance with Electrical Codes and standards.

.3 Slab Temperature Sensor

.1 For Group Control and Power Distribution Panel

.1 Metallic conduit for accommodation of the slab thermistor (minimum 19 mm (3/4") nominal) shall be installed between runs of heating cable prior to topping course pour. The conduit shall not cross runs of heating cable, and shall end no less than 450 mm (18") within the heated section of the slab. The conduit shall be sealed at its extent to prevent ingress of paving material during pour and moisture after.

.2 After topping course work is complete, the slab temperature sensor (thermistor) shall be inserted to the end of the previously-installed conduit. It is recommended that fish-tape (or similar) be used to push the thermistor in, and abandoned in place, for the dual purpose of ensuring it gets to the end and allowing future retrieval.

.4 Energy Efficient Control System

.1 Group Control and Power Distribution Panel

.1 Panel shall be mounted in accordance with manufacturer's installation and operating manuals applicable codes and standards.

.2 All power and control wiring connections shall be made safe prior to energizing the panel.

3.04 FIELD QUALITY CONTROL

.1 Initial start-up and field testing (commissioning) of the system shall be performed by factory technician or factory representative per the owner's requirements.

.2 Field Tests and Inspections

.1 The system shall be commissioned in accordance to the MI System Installation and Operation manual. (H57754)

.2 The heating cable circuit integrity shall be tested using a 1000 Vdc megohmmeter at the following intervals below. Minimum acceptable insulation resistance shall be 20 megohms or greater (100 megaohms upon receipt).

.1 Before installing the heating cable.

.2 After heating cable has been installed.

.3 After installing accessories.

.4 Before the concrete is poured.

.5 During the concrete pour.

.6 Prior to initial start-up (commissioning).

.7 As part of the regular system maintenance.

.3 If a fault is indicated during the pour, the affected area shall be immediately identified, cleaned, and protected for the duration of

the pour so that a repair can be made before it is encased in concrete.

.4 The technician shall verify that the controller parameters are set to the application requirements.

.5 The technician shall verify that the ACS-30 and ProtoNode device server (if applicable) are configured correctly with the BMS.

.6 All commissioning results will be recorded and presented to the owner.

.3 Non-Conforming Work

.1 Any heat tracing circuit which fails the any of the above tests must be corrected prior to commissioning or startup of the system.

.4 Retain the services of nVent RAYCHEM Management to provide factory design build and inspection services to prepare submittals for complete design layouts, wiring diagrams, installation details for all heat trace equipment including heating cable, connection kits, controllers, and sensors. nVent shall supply 11"x17" isometric drawings for every circuit for a complete heat tracing system.

.5 Provide factory inspection report as part of a complete manufacturer approved installation that is compliant to Code.

.6 Start-up – Start-up of system shall be performed by factory technician or factory representative per the owner's requirements.

3.05 SYSTEM STARTUP

.1 Provide a factory-certified technician or manufacturer's representative for startup and commissioning of the heat tracing system and controller.

.2 Coordinate all controller settings with engineer prior to programming the controller.

.3 Provide commissioning report in submittals package to owner.

3.06 MAINTENANCE

.1 Maintenance Service

.1 Comply with manufacturer's recommendations in MI System Installation and Operation Manual. (H57754)

End of Section