

SECTION 07 70 00 ROOF AND WALL SPECIALTIES AND ACCESSORIES

ICESTOP ROOF & GUTTER DE-ICING SYSTEM

This specification is dated 03/01/2019 and supersedes all previous versions.

Any text in RED indicates a choice the user needs to decide upon to suit project requirements and deleted prior to incorporating into final contract documents. For detailed design information, please contact your local representative, our website www.nventthermal.com or nVent Thermal Technical Support 800-545-6258.

PART 1 GENERAL

1.1. SUMMARY

- A. Section includes a UL Listed, CSA Certified and FM Approved roof & gutter de-icing system that consists of a self-regulating trace heater, connection kits and electronic controller.
- B. Related Requirements
 - 1. Section 02 58 00 – Snow Control
 - 2. Section 07 20 00 – Thermal Protection
 - 3. Section 07 30 00 – Steep Slope Roofing
 - 4. Section 07 40 00 – Roofing and Siding Panels
 - 5. Section 07 50 00 – Membrane Roofing
 - 6. Section 07 60 00 – Flashing and Sheet Metal
 - 7. Section 07 71 23 – Manufactured Gutters and Downspouts
 - 8. Section 25 12 16 – Direct-Protocol Integration Network Gateways
 - 9. Section 25 51 00 – Integrated Automation Control of Facility Equipment
 - 10. Section 26 00 00 – Electrical

1.2. REFERENCES

- A. 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 Standard C22.2 No. 130-03 Requirements for Electrical Resistance Heating Cables & Heating Device Sets
 - 4. NFPA 70 - National Electrical Code
 - 5. CSA Standard C22.1 – Canadian Electrical Code

1.3. SYSTEM DESCRIPTION

- A. System includes a complete roof and gutter de-icing system that consists of self-regulating trace heater, connection kits, and ambient, surface, and moisture sensing control, monitoring, integrated ground-fault circuit protection and Building Management System (BMS) communication capabilities.

1.4. ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- A. Product Data
 - 1. Heating cable data sheet
 - 2. UL Listed, CSA Certified, or FM Approved certificates for roof and gutter de-icing
 - 3. Roof and gutter design sheet
 - 4. System installation and operation instructions
 - 5. System installation details
 - 6. Connection kits and accessories data sheet
 - 7. Controller wiring diagram
- B. Shop Drawings
 - 1. Provide engineered isometric drawings showing layouts for roof, indicating power connections, splice, end seals, circuit layout, and circuit cable length.

1.5. QUALITY ASSURANCE

- A. Source Limitations: All system components [heating cable, connection kits, 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.
- B. Qualifications
 - 1. Manufacturers
 - a. Manufacturer to show minimum of forty (40) years of experience in manufacturing electric self-regulating heating cables.
 - b. Manufacturer will be ISO-9001 registered.
 - c. Manufacturer to provide heating cable consistent with IEEE 515.1 and CSA 22.2 No 130-03 requirements.
 - d. The self-regulating heating cable shall be qualified and tested to demonstrate a useful lifetime in excess of 20 years.
 - e. 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
 - a. 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.

C. Certifications

1. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified, or FM Approved for roof and gutter de-icing.

1.6. DELIVERY, STORAGE, AND HANDLING

A. 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:
 - a. Product and Manufacturer
 - b. Length/Quantity
 - c. Lot Number
 - d. Installation and Operation Manual
 - e. MSDS (if applicable)

B. 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.

1.7. WARRANTY

A. 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.
 - a. Heating cables, connection kits and accessories
 - b. Thermostats, controllers, panels, contactors, sensors and accessories

B. 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 standard limited warranty applies. See Limited Product Warranty Extension details (H57397) at www.nventthermal.com.
 - a. Heating Cable and Components shall be Ten (10) Years from Date of Purchase

C. 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.

PART 2 PRODUCTS

2.1. HEAT TRACING SYSTEM

A. 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;
Email: thermal.info@nvent.com Website: www.nventthermal.com

Specifier: Retain one of the two paragraphs below based upon Project requirements.

2. Submit comparable products of one of the following for approval by the specifier:
 - a. [Specifier: Insert name of manufacturer with comparable products]
 - b. Submit request for substitutions in accordance with Instructions to Bidders and Division 01 General Requirements.
3. Provide specified product; Owner will not consider substitution requests.

B. Materials

1. Heating cables shall be RAYCHEM IceStop self-regulating heating cables specifically designed for the intended application, tested and approved to UL 515, CSA 22.2 No 130-03 and IEEE 515.1 requirements.
 - a. The construction of the self-regulating heating cable shall consist of a continuous core of conductive polymer that is radiation crosslinked, extruded between two (2) 16 AWG nickel-plated copper bus wires that varies its power output in response to temperature changes.
 - b. The heating cable shall have a modified polyolefin inner jacket for dielectric integrity and long life expectancy.
 - c. The heating cable shall have a tinned copper braid with minimum 70% coverage for ground path and mechanical ruggedness.
 - d. The heating cable shall have a **FLUOROPOLYMER (-XT)** outer jacket printed with cable model number, agency listings, batch number and meter marks (for ease of installation within maximum circuit length)
 - e. The heating cable shall have a self-regulating factor of at least 70 percent. The self-regulating factor is defined as the percent reduction of the heating cable power output going from a 0°F to 80°F temperature.
 - f. The heating cable shall operate on voltages of 120, 208, 240, or 277 volts without the use of transformers. **[Select one]**.
 - g. The heating cable shall be part of a UL Listed, CSA Certified, and FM Approved system.
 - h. Constant wattage cables are not acceptable.
2. Heating Cable Connection Kits
 - a. Heating cable connection kits shall be nVent RAYCHEM RayClic or FTC connection kits. **[Select one]**.
 - b. Manufacturer shall provide power connection, splice/tee and end seal kits compatible with selected heating cable.

- c. Installation shall not require the installing contractor to cut into the heating-cable core to expose the bus wires. [for RayClick connection kits only]
- d. Connection kits shall be rated NEMA 4X to prevent water ingress and corrosion. All components shall be UV stabilized
- e. Connection kits shall be UL Listed, CSA Certified and FM Approved.
- 3. Heating Cable Installation Accessories [Select all that apply]
 - a. Roof clips – Used to secure IceStop heating cables to roofs and gutters. The clips may be attached with mechanical fasteners (screws or nails) on shake roofs or using adhesive on metal, slate or composite roofing. (Catalog Number: GMK-RC)
 - b. Downspout Hangers - Used to provide mechanical protection and strain relief to the IceStop heating cable as it goes over sharp edges and to hold the heating cable in place at the top of downspouts. (Catalog Number: GMK-RAKE)
 - c. Cable cover bracket shall be used to enhance the heat transfer from the heating cable to the snow and create larger drain paths
 - d. RIM-DRAINTRACE (RIM-DT) shall be used on all flat roof drains to keep the roof drains free of ice and snow.
- 4. Energy Efficient Control System [Select One Option]
 - a. [Option 1] Single Circuit Local Digital Control System
 - 1. Single circuit snow/ice melting controller shall be APS-3C or APS-4C [Select one].
 - 2. Heating cable manufacturer shall provide a single circuit snow/ice melting controller with built-in GFPD compatible with selected heating cable. (APS-4C only)
 - 3. Electronic snow/ice melting controller shall have a GFPD with adjustable trip levels of 30, 60, 120 mA. (APS-4C only)
 - 4. Electronic snow/ice melting controller shall have 24-A (APS-3C) or 40-A (APS-4C) [Select one] switching capacity rating.
 - 5. Electronic snow/ice melting controller shall be capable of operating with supply voltages of 120, 208 – 240 V (APS-3C) or 208, 240, 277 V (APS-4C) [Select one].
 - 6. Electronic snow/ice melting controller shall be capable of supporting up to six (6) aerial or gutter mounted temperature/moisture sensors.
 - 7. Enclosure type shall be NEMA 3R polycarbonate.
 - 8. Electronic snow/ice melting controller shall have an adjustable hold-on timer (0 – 10 hours).
 - 9. Electronic snow/ice melting controller shall have an integrated high-limit temperature sensor.
 - 10. Electronic snow/ice melting controller shall have contacts to interface with an Energy Management Computer (EMC).
 - 11. Digital controller shall have c-UL-us approvals.
 - b. [Option 2] Multi-Circuit, Group Control System
 - 1. Group controller shall be RAYCHEM SMPG1 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 6, 12, or 18 **[Select one]** ground-fault circuit breakers rated up to 50 A.
 5. Group snow/ice melting controller shall have a main circuit breaker **[Select if applicable]**
 6. Group snow/ice melting controller shall be capable of operating with supply voltages of 208 V or 277 V **[Select one]**.
 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 **[Select one]**.
 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).
 12. Digital controller shall have c-UL-us approvals
- c. **[Option 3] Multi-Circuit, Distributed Digital Control System**
1. All roof and gutter de-icing circuits shall be controlled and monitored using a distributed digital control system, known as ACS-30, manufactured by nVent.
 2. Multi-application: Distributed digital control system shall have pre-programmed parameters to provide concurrent control for heating cables used for pipe freeze protection, flow maintenance, hot water temperature maintenance, surface snow melting, roof and gutter de-icing, freezer frost heave prevention and floor heating applications.
 3. All programming shall be done through the central User Interface Terminal (ACS-UIT2).
 4. The ACS-UIT2 shall be a color LCD touch-screen display with password protection to prevent unauthorized access to the system.
 5. The ACS-UIT2 shall communicate with up to fifty-two (52) ACS Power Control Panels (ACS-PCM2-5) where each panel can control up to five (5) circuits and accept up to five (5) temperature inputs. C910-485 controllers may also be added to the ACS-30 system for single circuit extensions.
 6. Digital control system shall be capable of assigning up to four (4) RTD temperature inputs per heat-tracing circuit.
 7. The ACS-UIT2 shall communicate with up to sixteen (16) Remote Monitoring Modules (RMM2), where each module can accept up to eight (8) temperature inputs.
 8. The ACS-UIT2 shall have a USB port to allow for quick and easy software update.
 9. The ACS-UIT2 shall have three (3) programmable alarm contacts including an alarm light on the enclosure cover.
 10. A separate offline software tool shall be made available to allow users to pre-program the digital control system and transfer program via a USB drive or Ethernet.
 11. The ACS-UIT2 enclosure shall be NEMA 4 for indoor or outdoor locations.
 12. The ACS-PCM2-5 panel shall be in a NEMA 4/12 enclosure approved for nonhazardous indoor and outdoor locations.

13. The ACS-PCM2-5 panel shall provide ground-fault and line current sensing alarming, switching and temperature inputs for five (5) heat tracing circuits.
 14. Each ACS-PCM2-5 panel shall have five (5) 3-pole, 30 A contactors (EMR type).
 15. The ACS-PCM2-5 panel shall be capable of operating at 120 V to 277 V.
 16. The ACS-PCM2-5 shall have an alarm contact including an alarm light on the panel cover.
 17. Digital controller shall have an integrated adjustable GFPD (10 – 200 mA).
 18. Digital control system will have a built-in self-test feature to verify proper functionality of heating cable system.
 19. Digital control system will also be able to communicate with BMS by one of the following protocols. **[Select one]**
 - a. Modbus®
 - b. BACnet® or Metasys® N2 **[Select RAYCHEM ProtoNode-RER multi-protocol gateway as accessory]**
 20. The following variables will be monitored by the digital controller and reported back to the BMS.
 - c. Temperature
 - d. Ground-fault
 - e. Current draw
 - f. Power consumption
 - g. Associated alarms
 21. The ACS-UIT2 shall be c-CSA-us Certified. The ACS-PCM2-5 panel shall be c-UL-us Listed.
5. Approval
- a. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified and FM Approved for roof & gutter de-icing.
 - b. The roof & gutter de-icing system shall have a design in accordance with the IceStop Design Guide requirements. (H56070)

PART 3 EXECUTION

3.1. EXAMINATION

A. Verification Of Conditions

1. Prior to installing heating cable on the roof, an insulation resistance test shall be performed by the installing contractor to ensure integrity of heating cable as described in the installation and maintenance manual.

3.2. PREPARATION

A. Protection Of In-Place Conditions

1. All heating cable ends shall be protected from moisture ingress until cable is terminated.

3.3. INSTALLATION

- A. Comply with manufacturer's recommendations in the IceStop System heating cable and connection kits Installation and Operation manuals. (H58067)
- B. Install and secure the system in accordance with the IceStop System Installation and Operation Manuals. (H58067)
- C. Install electric heating cable according to the drawings and the manufacturer's instructions. The installer shall be responsible for providing a complete functional system, installed in accordance with applicable national and local requirements.
- D. Grounding of the system shall be done according to Section 26 05 26 "Grounding and Bonding for Electrical Systems." Heating cable braid must be connected to appropriate ground.
- E. Connection of all electrical wiring shall be according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.4. FIELD QUALITY CONTROL

- A. Initial start-up and field testing (commissioning) of the system shall be performed by factory technician or factory representative per the owner's requirements.
- B. Field Tests And Inspections
 - 1. The system shall be commissioned in accordance to the IceStop System Installation and Operation manual.
 - 2. The heating cable circuit integrity shall be tested using a 2500 Vdc megohmmeter at the following intervals below. Minimum acceptable insulation resistance shall be 1000 megohms or greater.
 - a. Before installing the heating cable
 - b. After heating cable has been installed on roof
 - c. After installing connection kits
 - d. Prior to initial start-up (commissioning)
 - e. As part of the regular system maintenance
 - 3. The technician shall verify that the controller parameters are set to the application requirements.
 - 4. The technician shall verify that the ACS-30 and ProtoNode device server (if applicable) are configured correctly with the BMS.
 - 5. All commissioning results will be recorded and presented to the owner.
- C. Non-Conforming Work
 - 1. Any heat tracing circuit which fails the any of the above test must be corrected prior to commissioning or startup of the system.
- D. 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.

- E. Provide factory inspection report as part of a complete manufacturer approved installation that is compliant to Code.
- F. Start-up – Start-up of system shall be performed by factory technician or factory representative per the owner's requirements.

3.5. 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.

3.6. MAINTENANCE

A. Maintenance Service

- 1. Comply with manufacturer's recommendations in IceStop System Installation and Operation Manual.

END OF SECTION