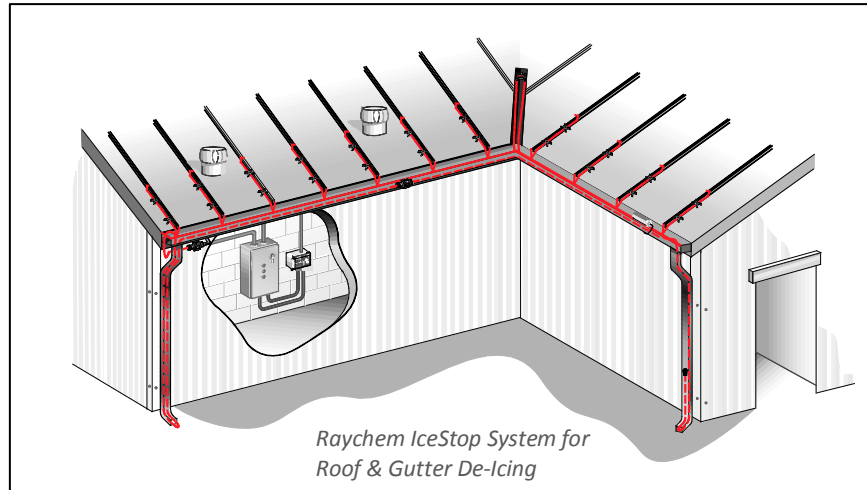


CSI Master Format 2004 Guide Specification for: Roof and Gutter De-Icing



System for de-icing of roofs and gutters with ambient and moisture sensing control, monitoring, integrated ground-fault circuit protection and BMS communication capabilities.

Scope

This specification describes an energy efficient de-icing system for roofs, gutters and downspouts, various attachment methods and control systems. Depending on the system design and size of application, one of the three control options listed should be selected.

This page gives a general overview of the system and the CSI formatted specification begins on page 4. The specification can be modified to better suit individual projects.

System Description

Self-Regulating Heating Cable

120-277 V, Raychem IceStop heating cable with a fluoropolymer protective outer jacket. The heating cable shall be part of a UL Listed, CSA Certified and FM Approved system.

System Connection Kits

Raychem RayClic or FTC connection kits for power connections, tees/splices and end seals.

Accessories

GMK-RC: Roof clips

GMK-RAKE: Downspout hanger

Controller

Single Circuit Control

APS-3C or APS-4C automatic snow/ice melting controller with:

Individual circuit control

- Up to six (6) ambient or moisture sensor inputs.
- Integrated ground-fault (APS-4C only)
- Adjustable hold-on timer (0 – 10 hours)
- Integrated high-limit temperature sensor
- Operating Voltages
 - APS-3C: 120 V, 208 – 240 V, single phase
 - APS-4C: 277 V single phase
- Switching Capacity
 - APS-3C: 24 A
 - APS-4C: 40 A
- NEMA 3R enclosure

Group Control

DigiTrace SMPG1 snow melting and de-icing power distribution and control panel

Single controller, multiple circuits, group contactor

- Integrated EUR-5A snow/ice controller
- Up to six (6) ambient or moisture sensor inputs
- Adjustable hold-on timer (0 – 10 hours)
- Integrated high-limit temperature sensor
- Operating Voltages: 208 V or 277 V, single phase
- 6, 12, or 18 ground-fault circuit breakers up to 50 A
- Optional main circuit breaker
- Multiple configurations available

Distributed Group Control

DigiTrace ACS-30 Multi-circuit digital control system plus external snow/ice melting controller:

Single controller, multiple circuits, individual circuit contactors

- Pre-programmed application based heat-tracing controller.
- Touch-screen user interface (ACS-UIT2) communicates with up to 52 ACS-PCM2-5 modular control panels. The DigiTrace C910-485 digital controller may be added to the ACS-30 Network for single circuit extensions.
- BMS interface.
- Controls up to 260 heat-tracing circuits with up to 388 temperature inputs (RTDs).
- Proportional Ambient Sensing Control (PASC).
- 30 A switching capacity rating.
- Enclosure:
 - ACS-UIT2: NEMA 4
 - ACS-PCM2-5: NEMA 4/12

Device Server

DigiTrace ProtoNode: A multi-protocol device server to interface the ACS-30 with a building management system (BMS).

Designer Notes

1. For proper cable selection, refer to the IceStop Roof and Gutter De-icing Design Guide (H56070) and Installation and Operation Manual (H58067).
2. Ground-fault circuit protection is integrated in the APS-4C and ACS-30 controllers, and SMPG1 control panel, and does not need to be provided separately.
3. Multiple sensors can be integrated into all controllers.
4. The ACS-30 may be connected to the BMS through the ProtoNode using two conductor twisted pair shielded RS-485 cable (PTM Catalog Number: MONI-RS485-WIRE). The ProtoNode is connected to the BMS by Ethernet or RS-485. The installation of the communication wiring is included in specification section 25 50 00.
5. The APS-3C or APS-4C is a wall mounted controller with a NEMA 3R rated enclosure and can be mounted indoors or outdoors.
6. The SMPG1 control panel can be installed indoors (NEMA 1/12) or outdoors (NEMA 3R/4).
7. ACS-UIT2 should be centrally located in the building connected to the remote ACS-PCM2-5 control panels using RS-485 cable. The ACS-PCM2-5 control panels may be located indoors or outdoors throughout the installation.
8. The location of the controller, power connection, tees/splices and end seals must be shown on the drawings.

Drawing Details

Installation details can be found at CADdetails.com under Fire Sprinkler Pipe Freeze Protection folder.

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes a UL Listed, CSA Certified and FM Approved roof and gutter de-icing heat tracing system consisting of self-regulating heating cable, connection kits and electronic controller.

1.2 RELATED SECTIONS

- A. Section 02 58 00 – Snow Control
- B. Section 07 20 00 – Thermal Protection
- C. Section 07 30 00 – Steep Slope Roofing
- D. Section 07 40 00 – Roofing and Siding Panels
- E. Section 07 50 00 – Membrane Roofing
- F. Section 07 60 00 – Flashing and Sheet Metal
- G. Section 07 71 23 – Manufactured Gutters and Downspouts
- H. Section 25 12 16 – Direct-Protocol Integration Network Gateways
- I. Section 25 51 00 – Integrated Automation Control of Facility Equipment

1.3 SYSTEM DESCRIPTION

- A. System for roof and gutter de-icing with ambient and moisture sensing control, monitoring, integrated ground-fault circuit protection and Building Management System (BMS) communication capabilities.

1.4 SUBMITTALS

- A. Product Data
 - 1. Heating cable data sheet
 - 2. UL, CSA, FM approval certificates for roof and gutter de-icing
 - 3. Roof and gutter de-icing design guide
 - 4. System installation and operation manual
 - 5. System installation details
 - 6. Connection kits and accessories data sheet
 - 7. Controller/Power Panel data sheet
 - 8. Controller/Power Panel wiring diagram

1.5 QUALITY ASSURANCE

- A. Manufacturers' Qualifications
 - 1. Manufacturer to show minimum of thirty (30) years experience in manufacturing electric self-regulating heating cables.
 - 2. Manufacturer will be ISO-9001 registered.
 - 3. Manufacturer to provide products consistent with IEEE 515.1 and CSA 22.2 No 130-03 requirements.
- B. Installer Qualifications
 - 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.
- C. Regulatory Requirements and Approvals
 - 1. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified and FM Approved for roof and gutter de-icing
- D. 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.

1.6 DELIVERY, STORAGE AND HANDLING

- A. General Requirements: Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminants or other causes.
- B. Delivery and Acceptance Requirements: 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

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3. Lot Number
 4. Installation and Operation Manual
 5. MSDS (if applicable)
- C. 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. Extended Warranty
1. Manufacturer shall provide ten (10) year limited warranty for GM-1XT **OR** GM-2XT **[Select one]** heating cables and components. Provide one (1) year warranty for all heat trace controllers.
 2. Contractor shall submit to owner results of installation tests required by the manufacturer.

END OF PART 1

PART 2 - PRODUCTS

2.1 MANUFACTURERS AND PRODUCTS

- A. Contract Documents are based on manufacturer and products named below to establish a standard of quality.
- B. Basis of Design
1. Basis of Design Product Selections
 - a. Manufacturer
 1. Manufacturers shall have more than thirty (30) years' experience with manufacture & installation self-regulating heating cables.
 2. Manufacturer shall provide UL, CSA, FM approval certificates for roof and gutter de-icing
 3. Manufacturer shall be Pentair Thermal Management, LLC, located at, 7433 Harwin Drive, Houston, TX 77036 94025 Tel: (800) 545-6258 www.thermal.pentair.com
 - b. Roof and Gutter De-icing System
 1. Raychem IceStop self-regulating heating cable with fluoropolymer (-XT) outer jacket
 2. Raychem RayClic or FTC connection kits **[Select one]** and accessories
 3. APS-3C/APS-4C snow/icing melting controller **OR** DigiTrace SMPG1 control panel **OR** DigiTrace ACS-30 with snow/ice melting controller **[Select one]**
 4. DigiTrace ProtoNode multi-protocol device server

2.2 PRODUCTS, GENERAL

- A. Single Source Responsibility: Furnish heat tracing system for roof and gutter de-icing from a single manufacturer.
- B. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified and FM Approved for roof and gutter de-icing. No parts of the system may be substituted or exchanged.

2.3 PRODUCTS

- A. Self-Regulating Heating Cable
1. Heating cable shall be Raychem IceStop self-regulating heating cable manufactured by Pentair Thermal Management.
 2. The heating cable shall consist of a continuous core of conductive polymer that is radiation cross-linked, extruded between two (2) 16 AWG nickel-plated copper bus wires that varies its power output in response to temperature changes.
 3. The heating cable shall have a modified polyolefin inner jacket and a tinned-copper braid to provide a ground path and enhance the cables ruggedness.

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4. The heating cable shall have a fluoropolymer (XT) outer jacket for enhanced mechanical and chemical protection.
 5. The heating cable shall have an inherently UV-resistant outer jacket (fluoropolymer).
 6. The heating cable shall have a self-regulating factor of at least 75 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 roof temperature.
 7. The heating cable shall operate on line voltages of 120, 208, 240 **OR** 277 volts **[Select one]** without the use of transformers.
 8. The heating cable power output shall be 12 W/ft at 32°F in ice or snow.
 9. The heating cable shall be part of a UL Listed, CSA Certified and FM Approved system.
 10. The outer jacket of the heating cable shall have the following markings:
 - a. Heating cable model number
 - b. Agency listings
 - c. Meter mark
 - d. Lot/Batch ID
- B. Heating Cable Connection Kits
1. Heating cable connection kits shall be Raychem RayClic **OR** FTC connection kits **[Select one]**.
 2. Manufacturer shall provide power connection, splice/tee and end seal kits compatible with selected heating cable.
 3. Installation shall not require the installing contractor to cut into the heating-cable core to expose the bus wires. **[for RayClic connection kits only]**
 4. Connection kits shall be rated NEMA 4X to prevent water ingress and corrosion. All components shall be UV stabilized.
 5. Connection kits shall be UL Listed, CSA Certified and FM Approved.
- C. Heating Cable Installation Accessories
1. 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. (PTM Catalog Number: GMK-RC)
 2. 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. (PTM Catalog Number: GMK-RAKE)
- D. Control Methodology **[Select one option]**
1. **[Option 1] Single Circuit Control**
 - a. Single circuit snow/ice melting controller shall be APS-3C **OR** APS-4C **[Select one]**.
 - b. Heating cable manufacturer shall provide a single circuit snow/ice melting controller with built-in GFPD compatible with selected heating cable. **(APS-4C only)**
 - c. Electronic snow/ice melting controller shall have a GFPD with adjustable trip levels of 30, 60, 120 mA. **(APS-4C only)**
 - d. Electronic snow/ice melting controller shall have 24-A (APS-3C) **OR** 40-A (APS-4C) **[Select one]** switching capacity rating.
 - e. Electronic snow/ice melting controller shall be capable of operating with supply voltages of 120, 208 – 240 V (APS-3C) **OR** 277 V (APS-4C) **[Select one]**.
 - f. Electronic snow/ice melting controller shall be capable of supporting up to six (6) aerial or gutter mounted temperature/moisture sensors.
 - g. Enclosure type shall be NEMA 3R polycarbonate.
 - h. Electronic snow/ice melting controller shall have an adjustable hold-on timer (0 – 10 hours).
 - i. Electronic snow/ice melting controller shall have an integrated high-limit temperature sensor.
 - j. Electronic snow/ice melting controller shall have contacts to interface with an Energy Management Computer (EMC).
 - k. Digital controller shall have c-UL-us approvals.

2. **[Option 2] Group Control**
- a. Group controller shall be DigiTrace SMPG1 snow melting and de-icing power distribution and control panel.
 - b. Heating cable manufacturer shall provide a group snow/ice melting controller with built-in GFPD compatible with selected heating cable.
 - c. Group snow/ice melting controller shall have an integrated 30-mA ground-fault circuit breaker.
 - d. Group snow/ice melting controller shall have 6, 12, or 18 **[Select one]** ground-fault circuit breakers rated up to 50 A.
 - e. Group snow/ice melting controller shall have a main circuit breaker **[Select if applicable]**
 - f. Group snow/ice melting controller shall be capable of operating with supply voltages of 208 V **OR** 277 V **[Select one]**.
 - g. Group snow/ice melting controller shall be capable of supporting up to six (6) aerial or gutter mounted temperature/moisture sensors.
 - h. Group snow/ice melting controller enclosure shall be NEMA 1/12 or NEMA 3R/4 **[Select one]**.
 - i. Group snow/ice melting controller shall have an adjustable hold-on timer (0 – 10 hours).
 - j. Group snow/ice melting controller shall have an integrated high-limit temperature sensor.
 - k. Electronic snow/ice melting controller shall have contacts to interface with an Energy Management Computer (EMC).
 - l. Digital controller shall have c-UL-us approvals
3. **[Option 3] Distributed Control**
- a. Distributed digital control system shall be DigiTrace ACS-30 heat-trace control system.
 - b. Heating cable manufacturer shall provide a distributed digital control system with 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.
 - c. All programming shall be done through the central User Interface Terminal (ACS-UIT2).
 - d. The ACS-UIT2 shall be a color LCD touch-screen display with password protection to prevent unauthorized access to the system. The DigiTrace C910-485 digital controller may be added to the ACS-30 Network for single circuit extensions.
 - e. 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.
 - f. Digital control system shall be capable of assigning up to four (4) RTD temperature inputs per heat-tracing circuit.
 - g. The ACS-UIT2 shall communicate with up to sixteen (16) Remote Monitoring Modules (RMM2), where each module can accept up to 8 temperature inputs.
 - h. The ACS-UIT2 shall have a USB port to allow for quick and easy software update.
 - i. The ACS-UIT2 shall have three (3) programmable alarm contacts including an alarm light on the enclosure cover.
 - j. 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.
 - k. The ACS-UIT2 enclosure shall be NEMA 4 for indoor or outdoor locations.
 - l. The ACS-PCM2-5 panel shall be in a NEMA 4/12 enclosure approved for nonhazardous indoor and outdoor locations.
 - m. The ACS-PCM2-5 panel shall provide ground-fault and line current sensing, alarming, switching and temperature inputs for five (5) heat tracing circuits.
 - n. Each ACS-PCM2-5 panel shall have five (5) 3-pole, 30 A contactors (EMR type).
 - o. The ACS-PCM2-5 panel shall be capable of operating at 120 V to 277 V.

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- p. The ACS-PCM2-5 shall have an alarm contact including an alarm light on the panel cover.
- q. Digital controller shall have an integrated adjustable GFPD (10 – 200 mA).
- r. Digital control system can be configured for ambient sensing, surface temperature and external device control modes for the roof and gutter de-icing application. External control mode requires a separate snow/ice melting controller with aerial or gutter mounted temperature/moisture sensors.
- s. Digital control system shall have power off delay, manual forced on/off override and high temperature override.
- t. Digital control system will have a built-in self-test feature to verify proper functionality of heating cable system.
- u. Digital control system will also be able to communicate with BMS by one of the following protocols using the DigiTrace ProtoNode multi-protocol gateway. **[Select one]**
 - 1. Modbus®
 - 2. LonWorks® **[Select ProtoNode-LER]**
 - 3. BACnet® **[Select ProtoNode-RER]**
 - 4. Metasys® N2 **[Select ProtoNode-RER]**
- v. The following variables will be monitored by the digital controller and reported back to the BMS.
 - 1. Temperature
 - 2. Ground-fault
 - 3. Current draw
 - 4. Power consumption
 - 5. Associated alarms
- w. The ACS-UIT2 shall be c-CSA-us Certified. The ACS-PCM2-5 panel shall be c-UL-us Listed.

2.4 SYSTEM LISTING

- A. The system (heating cable, connection kits, and controller) shall be UL Listed, CSA Certified and FM Approved for roof and gutter de-icing.
- B. The roof and gutter de-icing system shall have a design, installation and operating manual.

END OF PART 2

PART 3 - EXECUTION

3.1 INSTALLERS

- A. Acceptable Installers
 - 1. Subject to compliance with requirements of Contract Documents, installer shall be familiar with installing heat-trace cable and equipment.

3.2 INSTALLATION

- A. Comply with manufacturer's recommendations in the IceStop System Installation and Operation Manual (H58067).
- B. Install and secure the heating cable in accordance with the IceStop System Installation and Operation Manual (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 controller shall be equipment according to Section 26 05 26 "Grounding and Bonding for Electrical Systems."
- E. Connection of all electrical wiring shall be according to Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

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

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- B. Field Testing and Inspections
1. The system shall be commissioned in accordance to the XL-Trace 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 onto the pipe
 - c. After installing connection kits
 - d. After the thermal insulation is installed onto the pipe
 - e. Prior to initial start-up (commissioning)
 - f. As part of the regular system maintenance
 3. The technician shall verify that the APS-3C/APS-4C snow/icing melting controller **OR** DigiTrace SMPG1 control panel **OR** DigiTrace ACS-30 with snow/ice melting controller **[Select one]** control parameters are set to the application requirements.
 4. The technician shall verify that the APS-3C/APS-4C snow/icing melting controller **OR** DigiTrace SMPG1 control panel **OR** DigiTrace ACS-30 with snow/ice melting controller **[Select one]** alarm contacts are corrected connected to the BMS.
 5. The technician shall verify that the ACS-30 and ProtoNode-RER/-LER **[Select one]** are configured correctly with the BMS.
 6. All commissioning results will be recorded and presented to the owner.

3.4 MAINTENANCE

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

END OF SECTION



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