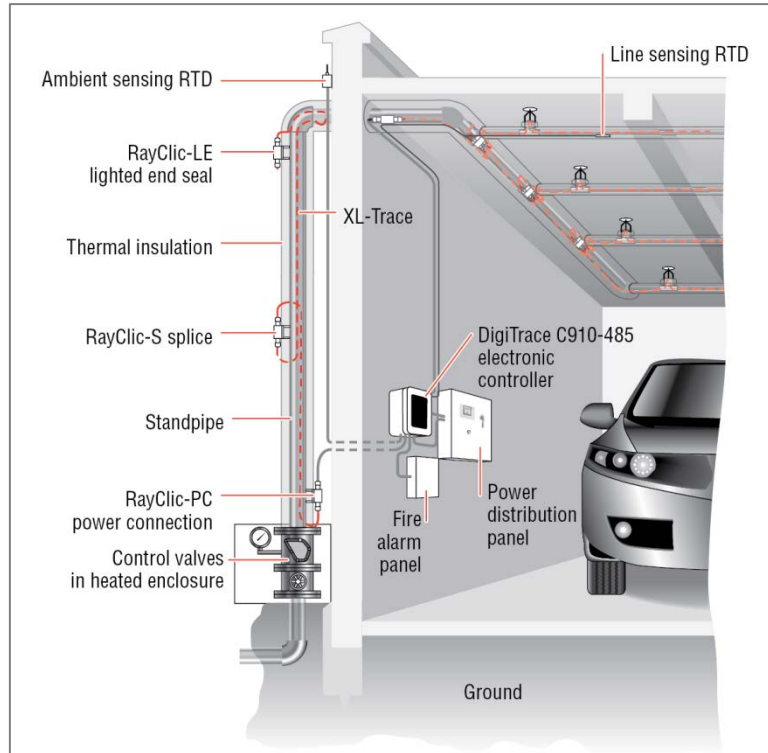


CSI Master Format 2004 Guide Specification for: Fire Sprinkler Freeze Protection



System for freeze protection of fire sprinkler piping with Proportional Ambient Sensing Control (PASC), monitoring, integrated ground-fault circuit protection and BMS communication capabilities.

Scope

The purpose of this specification is to provide an energy efficient freeze protection system for fire sprinkler piping including standpipes, mains and branch lines with sprinklers. The system must be compliant with NFPA-13 requirements.

The first page gives a general overview of the system and the CSI formatted specification begins on page 4.

System Description

Self-Regulating Heating Cable

5/8/12 W/ft, 120-277 V, Raychem XL-Trace heating cable systems are c-CSA-us Certified for fire sprinkler piping including sprinklers. *NOTE: 12XL2-CR/CT is Certified for use on fire supply and standpipes only.*

5/8/12 W/ft, 120-277 V, Raychem XL-Trace heating cable systems are UL Listed for fire standpipes and supply piping.

System Connection Kits

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

Controller

Single Circuit Control

DigiTrace C910-485 digital controller with:

- Proportional Ambient Sensing Control (PASC).
- BMS interface.
- Two (2) temperature inputs.
- 30 A switching capacity rating.
- Selectable fail safe mode, either ON or OFF.
- NEMA 4X enclosure

Distributed Group Control

DigiTrace ACS-30 Multi-circuit digital control system with:

- 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 controller may be connected to the ACS-30 network for single circuit extinctions.
- 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 C910-485 or ACS-30 with a building management system (BMS).

Thermal Pipe Insulation

Flame retardant insulation (closed-cell or fiberglass) with waterproof covering is required.

Designer Notes

1. For proper cable selection refer to the XL-Trace freeze protection design guide or the online design tool [XL-ERATE](#).
2. Ground-fault circuit protection (adjustable) is integrated in the controller and does not need to be provided separately.
3. The controller requires two temperature sensors, one ambient for control and one mounted directly to the fire sprinkler piping for monitoring the line.
4. NFPA-13 requires that the controller alarm output/relay is connected to the Fire Control Panel using two conductor twisted pair shielded RS-485 cable (PTM Catalog Number: MONI-RS485-WIRE). The installation of the communication wiring is included in specification section 25 50 00.
5. The C910-485 or 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.
6. The C910-485 is a wall mounted controller with a NEMA 4X rated enclosure and can be mounted indoors or outdoors.
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 c-CSA-us Certified or UL Listed system to prevent the freezing of fire sprinkler piping consisting of self-regulating heating cable, connection kits and electronic controller which complies with NFPA-13 requirements. This Section includes a c-CSA-us Certified or UL Listed system to prevent the freezing of fire sprinkler piping consisting of self-regulating heating cable, connection kits and electronic controller which complies with NFPA-13 requirements.

1.2 RELATED SECTIONS

- A. Section 21 10 00 – Water-based Fire-Suppression Systems
- B. Section 21 12 00 – Fire-Suppression Standpipes
- C. Section 21 13 13 – Wet-pipe Sprinkler Systems
- D. Section 25 33 00 – Integrated Automation Instrumentation and Terminal Devices for Fire-Suppression Systems
- E. Section 25 53 00 – Integrated Automation Control of Fire-Suppression Systems
- F. Section 28 31 33 – Fire Detection and Alarm Interfaces

1.3 SYSTEM DESCRIPTION

- A. System for freeze protection of fire sprinkler piping using self-regulating heating cables with proportional ambient sensing control (PASC), monitoring, integrated ground-fault circuit protection & Building Management System (BMS) communication capabilities.

1.4 SUBMITTALS

- A. Product Data
 - 1. Heating cable data sheet
 - 2. c-CSA-us Certificate of Compliance for freeze protection of fire suppression systems including branch lines or UL Listing Certificate for freeze protection of fire standpipes and supply piping. **[Select one]**
 - 3. Fire sprinkler freeze protection design guide
 - 4. System installation and operation manual
 - 5. System installation details
 - 6. Connection kits and accessories data sheet
 - 7. Controller data sheet
 - 8. Controller 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 meet NFPA-13 and NFPA-14 requirements by carrying c-CSA-us Certification for freeze protection of fire suppression branch lines or UL Listing for fire standpipes and supply piping. **[Select one]**
- 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

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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)
- 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 warranty for all 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 c-CSA-us Certificate of Compliance for freeze protection of fire suppression branch lines or UL Certificate of Compliance for freeze protection of fire standpipes and supply piping. **[Select one]**
 3. Manufacturer shall be Pentair Thermal Management, LLC, located at, 7433 Harwin Drive, Houston, TX 77036 Tel: (800) 545-6258 www.pentair.thermal.com
 - b. Freeze Protection System
 1. Raychem XL-Trace self-regulating heating cable
 2. Raychem RayClic connection kits and accessories
 3. DigiTrace C910-485 or ACS-30 **[Select one]** digital controller
 4. DigiTrace ProtoNode multi-protocol device server

2.2 PRODUCTS, GENERAL

- A. Single Source Responsibility: Furnish heat tracing system for fire-suppression piping from a single manufacturer.
- B. The system (heating cable, connection kits, and controller) shall meet NFPA-13 requirements by carrying a c-CSA-us system certification for freeze protection of fire suppression branch lines or UL system listing for freeze protection of fire standpipes and supply piping. **[Select one]**. No parts of the system may be substituted or exchanged.

2.3 PRODUCTS

- A. Self-Regulating Heating Cable
1. Heating cable shall be Raychem XL-Trace self-regulating heating cable manufactured by Pentair Thermal Management.
 - a. Model Numbers **[Select one]**
 1. 5XL1-CR/CT, 5XL2-CR/CT
 2. 8XL1-CR/CT, 8XL2-CR/CT
 3. 12XL2-CR/CT (for supply and standpipes only)
 2. The heating cable shall consist of a continuous core of conductive polymer that is radiation cross-

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- linked, extruded between two (2) 16 AWG nickel-plated copper bus wires that varies its power output in response to pipe 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.
 4. The heating cable shall either have a modified polyolefin outer jacket (-CR) or a fluoropolymer outer jacket (-CT). **[Select one]**
 5. The heating cable shall have a self-regulating factor of at least 90 percent for 5/8XL or at least 70 percent for 12XL. The self-regulating factor is defined as the percent reduction of the heating cable power output going from a 40°F pipe temperature to 150°F pipe temperature.
 6. The heating cable shall operate on line voltages of 120, 208, 220, 240 or 277 volts without the use of transformers. **[Select one]**
 7. The heating cable shall be part of a UL Listed or c-CSA-us Certified system.
 8. The heating cable shall be compatible CPVC sprinkler piping as verified by independent testing laboratory if required.
 9. 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 connection kits.
 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.
 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 and CSA Certified.
- C. Heating Cable Installation Accessories
1. High temperature, glass filament tape for attachment of heating cable to fire sprinkler piping. Cable ties are not permitted. (PTM Catalog Number: GT-66)
 2. Plastic Piping – provide an aluminium self-adhesive tape over the heating cable on all plastic piping if required. (PTM Catalog Number: AT-180)
 3. Labels – Provide warning labels every 10 feet on exterior of insulation, opposite sides of pipe. (PTM Catalog Number: ETL)
- D. Digital Temperature Controller with built-in Ground-Fault Protection Device (GFPD) **[Select one option]**
1. **[Option 1]** Single Circuit Local Digital Controller
 - a. Local digital controller shall be DigiTrace C910-485.
 - b. Heating cable manufacturer shall provide a local digital controller with built-in GFPD compatible with selected heating cable.
 - c. Digital controller shall be capable of supporting up to two (2) RTD temperature sensors (one for ambient control and one for pipe temperature monitoring) per control point using 18 AWG, 3-wire, shielded cable.
 - d. Enclosure type shall be NEMA 4X fiberglass reinforced plastic (FRP).
 - e. Digital controller shall have an integrated adjustable GFPD (10 – 200 mA).
 - f. Digital control system can be configured for line-sensing, ambient sensing and PASC modes. PASC control proportionally energizes the power to the heating cable to minimize energy based on ambient sensed conditions.
 - g. Digital controller shall be capable of operating with supply voltages from 100 V to 277 V.
 - h. Digital controller will have a built-in self-test feature to verify proper functionality of heating cable system.

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- i. Digital controller 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]**
 - j. Digital controller will also supply an isolated triac alarm relay and a dry contact relay for alarm annunciation back to the BMS.
 - k. 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
 - l. Digital controller shall have c-CSA-us approvals.
2. **[Option 2]** Multiple Circuit Distributed Digital Control System
- 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.
 - 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.
 - 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 On/Off, ambient sensing, PASC and timed duty cycle control (HWAT only) modes based on the application. PASC control proportionally energizes the power to the heating cable to minimize energy based on ambient sensed conditions.

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- s. Digital control system will have a built-in self-test feature to verify proper functionality of heating cable system.
 - t. 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]**
 - u. 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
 - v. The ACS-UIT2 shall be c-CSA-us Certified. The ACS-PCM2-5 panel shall be c-UL-us Listed.
- E. Thermal Pipe Insulation
- 1. Pipes must be thermally insulated in accordance with the XL-Trace design guide requirements.

2.4 SYSTEM LISTING

- A. The freeze protection system (heating cable, connection kits, and control) shall specifically be c-CSA-us certified for fire suppression branch lines.
- B. The freeze protection system shall have a design, installation and operating manual specific to fire suppression piping.

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 XL-Trace System Installation and Operation Manual.
- B. Apply the heating cable linearly on the pipe after piping has successfully completed any pressure tests. Secure the heating cable to piping with fiberglass tape.
- 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 Division 26 05 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connection of all electrical wiring shall be according to Division 26 05 26 Section "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.
- 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

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- 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 C910-485 or ACS-30 **[Select one]** control parameters are set to the application requirements.
 - 4. The technician shall verify that the C910-485 or ACS-30 **[Select one]** alarm contacts are corrected connected to the fire alarm panel.
 - 5. The technician shall verify that the C910-485 or ACS-30 **[Select one]** 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 XL-Trace System Installation and Operation Manual.

END OF SECTION



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