

SECTION 220533 – HEAT TRACING FOR PLUMBING PIPING

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(Engineer shall edit specifications and blue text in header to meet project requirements. This includes but is not limited to updating Equipment and/or Material Model Numbers indicated in the specifications and adding any additional specifications that may be required by the project. Also turn off all “Underlines”.)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section and all other sections of Division 22.

1.2 SUMMARY

- A. This section includes the requirements for heat tracing for freeze prevention, domestic hot-water-temperature maintenance, and snow and ice melting on roofs and in gutters and downspouts with the following electric heating cables:
 - 1. Self-regulating, parallel resistance.
 - 2. Controls.
 - 3. Accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each product specified, include manufacturers cut sheets, dimensional data, performance data, installation instructions, wirings diagrams, power requirements, specified options, and warranty information.
- B. Shop Drawings: For electric heating cable include:
 - 1. Heat tracing system shop drawings shall include elevations, sections, and attachment details. Include diagrams for power, signal, and control wiring.
 - 2. Scheduled information shall include heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.
 - 3. Engineering data sheets for manufactured materials shall include dimensions, rated capacities, operating characteristics, and furnished specialties and accessories.

1.4 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: Include a copy of the approved submittal for each product and material along with any applicable maintenance data in the project operation and maintenance manual.

1.6 WARRANTY/GUARANTEE

- A. See Division 22, Specification Section “Basic Mechanical Requirements – Plumbing” for warranty and guarantee requirements.
- B. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT REQUIREMENTS

- A. Equipment Design and Selection: Heat tracing and specialties shall be designed and selected, for the intended use, in accordance with the scheduled capacities on the drawings and the requirements of this specification.
- B. Acceptable Manufacturers: Subject to compliance with requirements, provide products by one (1) of the following:
 - 1. Heat Trace System and Accessories:
 - a. Brisk Heat.
 - b. Chromalox.
 - c. Delta-Therm Corporation.
 - d. Easy Heat; a division of EGS Electrical Group LLC.
 - e. Nelson Heat Trace; a division of EGS Electrical Group LLC.
 - f. Pyrotenax; a brand of Tyco Thermal Controls LLC.
 - g. Raychem; a brand of Tyco Thermal Controls LLC.
 - h. Thermon Americas Inc.

2.2 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

- A. Comply with IEEE 515.1.
- B. Heating Element: Pair of parallel No. 16 AWG, tinned, stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled, nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

- C. Electrical Insulating Jacket: Flame-retardant polyolefin.
- D. Outer jacket in "Cable Cover" Paragraph below is optional feature and is required for waterproof applications; verify availability with manufacturer.
- E. Cable Cover: Tinned copper braid and polyolefin outer jacket with ultraviolet inhibitor.
- F. Maximum Operating Temperature (Power On): 150°F.
- G. Verify temperature of circulated media in freeze-protected piping in "Maximum Exposure Temperature (Power Off)" Paragraph below.
- H. Maximum Exposure Temperature (Power Off): 185°F.
- I. 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.
- J. If Project has more than one type or configuration of electric heating cable, delete "Capacities and Characteristics" Paragraph below and schedule on Drawings. See Evaluations for a sample schedule.
- K. Capacities and Characteristics:
 - 1. Maximum Heat Output: Five (5) Watts/ft.
 - 2. Electrical Characteristics for Single-Circuit Connection:
 - a. Volts: One hundred twenty (120)
 - b. Phase: Single (1) phase
 - c. Hertz: Sixty (60)

2.3 CONTROLS

- A. Pipe-Mounted Thermostats for Freeze Protection:
 - 1. Remote bulb unit with adjustable temperature range from 30°F to 50°F.
 - 2. Snap action; open-on-rise, single-pole switch with minimum current rating adequate for connected cable.
 - 3. Remote bulb on capillary, resistance temperature device, or thermistor for directly sensing pipe-wall temperature.
 - 4. Corrosion-resistant, waterproof control enclosure.
- B. Precipitation and Temperature Sensor for Snow Melting on Roofs and in Gutters:
 - 1. Microprocessor-based control with manual on, automatic, and standby/reset switch.

2. Precipitation and temperature sensors shall sense the surface conditions of roof and gutters and shall be programmed to energize the cable as follows:
 - a. Temperature Span: 34°F to 44°F.
 - b. Adjustable Delay-Off Span: Zero (0) to ninety (90) minutes.
 - c. Energize Cables: Following two (2) minute delay if ambient temperature is below set point and precipitation is detected.
 - d. De-Energize Cables: On detection of a dry surface plus time delay.
3. Corrosion-proof and waterproof enclosure suitable for outdoor mounting, for controls and precipitation and temperature sensors.
4. Minimum Thirty (30)-A contactor to energize cable or close other contactors.
5. Precipitation sensor shall be freestanding.
6. Provide relay with contacts to indicate operational status, on or off, for interface with central HVAC control-system workstation.

C. Programmable Timer for Domestic Hot-Water-Temperature Maintenance:

1. Microprocessor based.
2. Minimum of four separate schedules.
3. Minimum twenty four (24) hour battery carryover.
4. On-off-auto switch.
5. Three hundred sixty five (365) day calendar with twenty (20) programmable holidays.
6. Relays with contacts to indicate operational status, on or off, and for interface with central HVAC control-system workstation.

2.4 ACCESSORIES

- A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.
- B. Warning Labels: Refer to Division 22 Specification Section "Identification for Plumbing Piping and Equipment" for requirements.
- C. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.
 1. Width for Markers on Pipes with OD, Including Insulation, Less Than six (6) Inches: Three quarter (3/4) inch minimum.
 2. Width for Markers on Pipes with OD, Including Insulation, six (6) Inches or Larger: One and one half (1-1/2) inches minimum.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.
- 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. Temperature Maintenance for Domestic Hot Water: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

- A. Install electric heating cable across expansion, construction, and control joints according to manufacturer's written instructions; use cable-protection conduit and slack cable to allow movement without damage to cable.
- B. Electric Heating-Cable Installation for Snow and Ice Melting on Roofs and in Gutters and Downspouts: Install on roof and in gutters and downspouts with clips furnished by manufacturer that are compatible with roof, gutters, and downspouts.
- C. Electric Heating-Cable Installation for Freeze Protection for Piping:
 - 1. Install electric heating cables after piping has been tested and before insulation is installed.
 - 2. Install electric heating cables according to IEEE 515.1.
 - 3. Install insulation over piping with electric cables according to Division 22 Specification Section "Insulation for Plumbing Piping and Equipment."
 - 4. Install warning tape on piping insulation where piping is equipped with electric heating cables.
- D. Set field-adjustable switches and circuit-breaker trip ranges.

3.4 CONNECTIONS

- A. Ground equipment according to Division 26 Specification Section "Grounding and Bonding for Electrical Systems."

- B. Connect wiring according to Division 26 Specification Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.
 - 2. Test cables for electrical continuity and insulation integrity before energizing.
 - 3. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.
- D. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.
- E. Cables will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

3.6 PROTECTION

- A. Protect installed heating cables, including nonheating leads, from damage during construction.
- B. Remove and replace damaged heat-tracing cables.

END OF SECTION 220533