SECTION 230533 - HEAT TRACING FOR HVAC PIPING

Revise this Section by deleting and inserting text to meet Project-specific requirements.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section includes heat tracing for HVAC piping with the following electric heating cables:

Plastic insulated, series resistance.

Self-regulating, parallel resistance.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 210533 "Heat Tracing for Fire-Suppression Piping."

Section 220533 "Heat Tracing for Plumbing Piping."

* + - 1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Product Data: For each type of product.

Include rated capacities, operating characteristics, and furnished specialties and accessories.

Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

* + - * 1. Shop Drawings: For electric heating cable.

Include plans and attachment details.

Include diagrams for power, signal, and control wiring.

* + - * 1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions

Retain "Field quality-control reports" paragraph below if Contractor is responsible for field quality-control testing and inspecting.

* + - * 1. Field quality-control reports.
				2. Sample Warranty: For special warranty.
				3. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.
			1. WARRANTY

When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

* + - * 1. Special Warranty: Manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

Verify available warranties and warranty periods for electric heating cable. Special warranties often exclude labor.

Warranty Period: [**Three**] [**Five**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 016000 "Product Requirements."

* + - 1. PLASTIC-INSULATED, SERIES-RESISTANCE HEATING CABLES

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=5866) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Easy Heat](http://www.specagent.com/Lookup?uid=123456828046).

[nVent (RAYCHEM)](http://www.specagent.com/Lookup?uid=123456828049).

[Watts Radiant; A WATTS Brand](http://www.specagent.com/Lookup?uid=123456828050).

Approved equivalent.

* + - * 1. Comply with IEEE 515.1.
				2. Heating Element: Single- or dual-stranded resistor wire. Terminate with waterproof, factory-assembled, nonheating leads with connectors at both ends.
				3. Electrical Insulating Jacket: Minimum 4.0-mil Kapton with silicone, Tefzel, or polyolefin.

Outer jacket in "Cable Cover" Paragraph below is optional feature and is required for waterproof applications; verify availability with manufacturer.

* + - * 1. Cable Cover: Aluminum braid[ and silicone or Hylar outer jacket].
				2. Maximum Operating Temperature (Power On): [**150 deg F**] <**Insert temperature**>.

Verify temperature of circulated media in freeze-protected piping in "Maximum Exposure Temperature (Power Off)" Paragraph below.

* + - * 1. Maximum Exposure Temperature (Power Off): [**185 deg F**] <**Insert temperature**>.
				2. 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.

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 sample schedule.

* + - * 1. Capacities and Characteristics:

Maximum Heat Output: [**6 W/ft.**] [**7.5 W/ft.**] maximum <**Insert value**>.

Piping Diameter: <**Insert NPS**>.

Number of Parallel Cables: <**Insert number**>.

Spiral Wrap Pitch: <**Insert inches**>.

Electrical Characteristics for Single-Circuit Connection:

Verify available voltages and heat-output ratings with manufacturer.

Volts: [**120**] [**208**] [**240**] [**277**] [**480**] <**Insert value**>.

Phase: <**Insert value**>.

Hertz: <**Insert value**>.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

* + - * 1. [Manufacturers:](http://www.specagent.com/Lookup?ulid=5867) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Chromalox, Inc](http://www.specagent.com/Lookup?uid=123456828052).

[Easy Heat](http://www.specagent.com/Lookup?uid=123456828054).

[nVent (RAYCHEM)](http://www.specagent.com/Lookup?uid=123456828056).

Approved equivalent.

* + - * 1. Comply with IEEE 515.1.
				2. Heating Element: Pair of parallel [**No. 16**] [**No. 18**] AWG, [**tinned**] [**nickel-coated**], 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.
				3. Electrical Insulating Jacket: Flame-retardant polyolefin.

Outer jacket in "Cable Cover" Paragraph below is optional feature and is required for waterproof applications; verify availability with manufacturer.

* + - * 1. Cable Cover: [Tinned-copper] [Stainless-steel] braid[ and polyolefin outer jacket with ultraviolet inhibitor].
				2. Maximum Operating Temperature (Power On): [**150 deg F**] <**Insert temperature**>.

Verify temperature of circulated media in freeze-protected piping in "Maximum Exposure Temperature (Power Off)" Paragraph below.

* + - * 1. Maximum Exposure Temperature (Power Off): [**185 deg F**] <**Insert temperature**>.
				2. 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.

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 sample schedule.

* + - * 1. Capacities and Characteristics:

Maximum Heat Output: [**3 W/ft.**] [**5 W/ft.**] [**8 W/ft.**] [**10 W/ft.**] [**12 W/ft.**] <**Insert value**>.

Piping Diameter: <**Insert NPS**>.

Number of Parallel Cables: <**Insert number**>.

Spiral Wrap Pitch: <**Insert inches**>.

Electrical Characteristics for Single-Circuit Connection:

Verify available voltages and heat-output ratings with manufacturer.

Volts: [**120**] [**208**] [**240**] [**277**] [**480**] <**Insert value**>.

Phase: <**Insert value**>.

Hertz: <**Insert value**>.

Full-Load Amperes: <**Insert value**>.

Minimum Circuit Ampacity: <**Insert value**>.

Maximum Overcurrent Protection: <**Insert amperage**>.

* + - 1. CONTROLS
				1. Remote bulb unit with adjustable temperature range from [**30 to 50 deg F**] <**Insert temperature range**>.
				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.
			2. ACCESSORIES
				1. 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.

Retain "Warning Labels" or "Warning Tape" Paragraph below.

* + - * 1. Warning Labels: Refer to Section 230553 "Identification for HVAC Piping and Equipment."
				2. Warning Tape: Continuously printed "Electrical Tracing"; vinyl, at least 3 mils thick, and with pressure-sensitive, permanent, waterproof, self-adhesive back.

Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.

Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

1. EXECUTION
	* + 1. EXAMINATION
				1. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

Ensure surfaces and pipes in contact with electric heating cables are free of burrs and sharp protrusions.

* + - * 1. Proceed with installation only after unsatisfactory conditions have been corrected.
			1. INSTALLATION

Indicate location of controls on Drawings.

* + - * 1. Install electric heating cable across expansion joints according to manufacturer's written instructions; use slack cable to allow movement without damage to cable.
				2. Install electric heating cables after piping has been tested and before insulation is installed.
				3. Install electric heating cables according to IEEE 515.1.
				4. Install insulation over piping with electric cables according to Section 230719 "HVAC Piping Insulation."
				5. Install warning tape on piping insulation where piping is equipped with electric heating cables.
				6. Set field-adjustable switches and circuit-breaker trip ranges.
			1. CONNECTIONS
				1. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
				2. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
			2. FIELD QUALITY CONTROL

Retain "Testing Agency," "Manufacturer's Field Service," and "Perform the following tests and inspections" paragraphs below to identify who shall perform tests and inspections. If retaining second option in "Testing Agency" Paragraph or if retaining "Manufacturer's Field Service" or "Perform the following tests and inspections" Paragraph, retain "Field quality-control reports" Paragraph in "Informational Submittals" Article.

Retain "Manufacturer's Field Service" Paragraph below to require a factory-authorized service representative to perform tests and inspections.

* + - * 1. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

Retain "Perform the following tests and inspections" Paragraph below to require Contractor to perform tests and inspections.

* + - * 1. Perform the following tests and inspections [**with the assistance of a factory-authorized service representative**]:

Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.

Test cables for electrical continuity and insulation integrity before energizing.

Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

Supply all equipment necessary for system adjustment and testing.

* + - * 1. Repeat tests for continuity, insulation resistance, and input power after applying thermal insulation on pipe-mounted cables.

See Section 014000 "Quality Requirements" for retesting and reinspecting requirements and Section 017300 "Execution" for requirements for correcting the Work.

* + - * 1. Cables will be considered defective if they do not pass tests and inspections.
				2. Prepare test and inspection reports.
			1. PROTECTION
				1. Protect installed heating cables, including nonheating leads, from damage during construction.
				2. Remove and replace damaged heat-tracing cables.

END OF SECTION 230533