

**SECTION XXXXXX**

**PIPE TEMPERATURE MAINTENANCE HEAT TRACING SYSTEM**

1. GENERAL
	1. SECTION INCLUDES
		1. Factory fabricated and terminated Mineral Insulated (MI) heating cable assembly.
		2. Field terminated Self Regulating (SR) heating cable.
		3. Field terminated Constant Wattage (CW) heating cable.
		4. Thermostats
		5. Monitor/Control panels
		6. Pipe heat tracing accessories and installation material for a complete operating system.
	2. REFERENCES
		1. Canadian Standards Association (CSA).
		2. Factory Mutual (FM).
		3. National Electric Code (NEC).
		4. Underwriters Laboratories (UL).
	3. SUBMITTALS
		1. Submit under provisions of Section XXXXXX
		2. Product Data: Manufacturer's data sheets on each product to be used, including:
			1. Preparation instructions and recommendations.
			2. Storage and handling requirements and recommendations.
			3. Installation methods.
	4. QUALITY ASSURANCE
		1. Manufacturer Qualifications:
			1. Minimum 50 years of experience in design, engineering, manufacture and support of specified system and components.
		2. Product Requirements:
			1. Pipe Trace or Tank Trace - Temperature Maintenance: Consult the Manufacturers Pipe Tracing Design Guide to determine recommended w/ft. for installation. Design shall consider maintenance temperature, ambient temperature, pipe size, insulation type and thickness, and environmental conditions.
			2. Heating equipment furnished under this section shall be supplied by a single manufacturer.
			3. UL Listed or CSA Certified Mineral Insulated (MI) pipe or tank tracing cable assemblies:
				1. MI pipe or tank tracing cable assembly shall be factory assembled, immersed in water for a minimum of 12 hours, and then tested for insulation resistance, high potential breakdown and continuity before leaving the factory.
			4. UL Listed, CSA Certified or FM Approved Self-Regulating cable.
			5. FM Approved Constant Wattage cable.
			6. UL Listed Thermostat and Contactor panel.
			7. UL Listed, CSA Certified or FM Approved Control/Monitor Panel.
	5. DELIVERY, STORAGE, AND HANDLING
		1. Store products in manufacturer's unopened packaging until ready for installation.
		2. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
	6. PROJECT CONDITIONS
		1. Coordinate installation of heating cable with Electrical Contractor and Mechanical Contractor.
		2. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer. Do not install products under environmental conditions outside manufacturer's limits.
2. PRODUCTS
	1. MANUFACTURERS
		1. System shall be manufactured by:

Delta-Therm Corporation, 6711 Sands Rd Suite A, Crystal Lake, IL 60014, Phone: 800-526-7887, Fax: 847-526-4456, Email: info@Delta-Therm.com, Web: www.Delta-Therm.com

* + 1. Substitutions: No substitutions are permitted.
	1. HEATING CABLE
		1. Factory Terminated Mineral Insulated (MI) Cable assembly:
			1. UL Listed Mineral-Insulated, copper or stainless steel sheathed, series resistance heating cable.
			2. Single conductor or dual conductor configuration.
			3. Insulator shall be Magnesium Oxide.
			4. Fiberglass insulator is not permitted.
			5. No combustible materials between conductor wire and ground sheath.
			6. Cross section of heated portion of cable not to exceed 0.4 inch (10 mm).
			7. Cable heater construction shall consist of factory termination stranded connection leads.
			8. Connection leads shall be of enough length to reach junction boxes or power panel as shown on detailed drawings. Connection leads shall be of stranded wire to provide maximum flexibility for ease in pulling to junction boxes or panel. Only connection leads in conduit shall exit from heated zone.
			9. Cable rating shall be:
				1. 120 VAC
				2. 208 VAC
				3. 240 VAC
				4. 277 VAC
				5. 480 VAC
		2. Field Terminated Self Regulating (SR) Cable assembly:
			1. Self-Regulating cable construction shall consist of two 16 AWG, stranded, nickel plated copper bus wires between which a positive temperature coefficient conductive polymer heating element is placed.
			2. Cable shall have tinned copper braid and:
				1. Non-organic corrosive resistant jacket (CBT).
				2. Organic corrosive resistant jacket (CBF).
			3. Cable shall be terminated using approved Manufacturer’s power connection and end termination kits.
			4. Cable rating shall be:
				1. 120 VAC
				2. 208 VAC
				3. 240 VAC
				4. 277 VAC
		3. Field Terminated Constant Watt (CW) Cable assembly:
			1. The constant watt cable construction shall be parallel resistance 12 AWG stranded nickel-plated copper bus wires individually encased in:
				1. Extruded FEP Teflon™ jacket (type PF High Temp cable).
				2. Sintered PTFE Teflon™ jacket (type PT Ultra High Temp cable).
			2. A nichrome wire heating element shall be wrapped around the jacket and fastened to alternating bus wires at 24” or 48” (zone lengths vary between models).
			3. The jacket and nichrome wire construction shall be encased in a color-coded insulated jacket and identified with a marker.
			4. Cable shall be terminated using approved Manufacturer’s power connection and end termination kits.
			5. The Stainless- Steel ground braid shall be used as a ground path per NEC requirements as stated in article 427-23.
			6. Cable shall have a maximum maintenance temperature of 200° F and a maximum exposure temperature of 400° F (if encased in extruded FEP Teflon™ jacket-type Delta-Therm PF cable).
			7. Cable shall have a maximum maintenance temperature of 400° F and a maximum exposure temperature of 550° F (if encased in sintered PTFE Teflon™ jacket-type Delta-Therm PT cable).
			8. Cable rating shall be:
				1. 120 VAC
				2. 208 VAC
				3. 240 VAC
				4. 277 VAC
				5. 480 VAC
	2. CONTROLS
		1. UL Listed Single Circuit type PowerTrace Monitoring Thermostat:
			1. Thermostat input voltages shall be 120VAC, 208VAC, 240VAC, or 277VAC.
			2. Enclosure shall be NEMA 4X FRP.
			3. Thermostat shall have setpoint range from 32o F to 800o F
			4. Thermostat shall have standard RTD rated at 400° F. (When maintaining temperatures above 400° F, contact Manufacturer for more information).
			5. Enclosure shall have three button keypad and digital LED display on the front panel door.
			6. Thermostat shall be electronic line sensing with monitoring and load switching capabilities.
			7. Thermostat shall monitor pipe temperature.
			8. Thermostat shall have adjustable setpoint temperature.
			9. Thermostat shall have 30mA ground fault alarm.
			10. Thermostat shall have RTD failure alarm.
			11. Thermostat shall have low and high temperature alarm.
			12. Thermostat shall monitor current.
			13. Thermostat shall have low current alarm.
			14. Thermostat shall have internal keypad lock-out
			15. Single circuit monitoring thermostat shall be:
				1. Model ETC-120
				2. Model ETC-208/240
				3. Model ETC-277 (UL Pending)
		2. CSA Certified Multiple Circuit MasterTrace Monitoring Thermostat:
			1. Thermostat shall be electronic line sensing
			2. Thermostat input voltages shall be 120, 208/240, or 277 VAC.
			3. Enclosure shall be NEMA 4 steel, powder coat painted
			4. Enclosure shall have LCD digital display on the panel door
			5. Thermostat shall have setpoint range from 0o to 511o F or C
			6. Thermostat shall have standard RTD rated at 200o C
			7. Thermostat shall have low and high temperature alarm
			8. Thermostat shall have current failure alarm
			9. Thermostat shall have ground fault alarm
			10. Thermostat shall have RTD failure alarm
			11. Thermostat shall have remote monitoring
		3. Thermostat:
			1. Thermostat shall be:
				1. Line sensing OTS-L with stainless steel bulb and capillary.
			2. Enclosure shall be:
				1. NEMA 1 rated
				2. NEMA 4 rated.
				3. NEMA 4X rated.
				4. NEMA 7 rated.
				5. NEMA 9 rated.
			3. Thermostat shall be set to activate at the maintenance temperature.
		4. Power Control Panel with G.F.P.E.:
			1. Controller shall have a NEMA 1, NEMA 4, NEMA 4X rated panel enclosure with one Ground Fault protective device per circuit and one green “working” LED and one red “trip” LED per circuit.
			2. One red “System On” LED, one green “Control Power On” LED, and one Amber “Trip Indicator” LED on panel door.
			3. Interior G.F. Test button and include Dry alarm contacts.
			4. Power Control Panel Model shall be:
				1. GFPE-2-N
				2. GFPE-4-N
				3. GFPE-6-N
				4. GFPE-8-N
				5. GFPE-12-N
		5. Custom Control Panel Specification
		6. Accessories: Fiberglass tape, caution labels, aluminum tape, and stainless- steel banding, monitor light.

Part 3 EXECUTION

3.1 EXAMINATION

* + 1. Installer to verify field measurements are as shown on Drawings.
		2. Installer to verify that required power is available, in proper location, and ready for use.
		3. Do not begin installation until pipes have been properly prepared.

3.2 PREPARATION

* + 1. Clean surfaces prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer.

3.3 INSTALLATION

* + 1. Complete installation shall conform to all applicable codes.
		2. Install heating cables in accordance with detailed layout drawings and manufacturer's instructions.
		3. Band heating cable to pipe with tape wraps approximately every 12 inches.
		4. Locate heating cable on pipe per manufacturer's instructions.
		5. Where heating cable is scheduled to heat plastic pipe, attach aluminum tape length of pipe and band heating cable on aluminum tape to evenly distribute heat.
		6. Mineral Insulated (MI) Cable Installation
		Install per Manufacturer’s Instructions.
			1. Pull stranded M.I. connection leads through conduit from the M.I. Assembly supplied conduit body to junction boxes.
			2. Do not pinch or make sharp bends in cable.
			3. Tape heating cable hot-cold junction to pipe.
		7. Self-Regulating (SR) Cable Installation
		Install per Manufacturer’s Instructions.
			1. Terminate non-power end of cable per termination kit instructions.
			2. Do not pinch or make sharp bends in cable.
			3. At power termination mount power connection standoff and junction box per power termination kit instructions. The electrical connection shall be made per the termination kit instruction and all local codes.
			4. All splice connections shall be made per the kit instruction and all local codes.
			5. Install monitor lights per the kit instruction and all local codes.
		8. Constant Watt (CW) Cable Installation
		Install per Manufacturer’s Instructions.
			1. Identify the heating zone (every 24” to 48”) before cutting cable leaving at least 12 inches for terminating the cable.
			2. Terminate non-power end of cable per termination kit instructions.
			3. Do not pinch or make sharp bends in cable.
			4. At power termination mount power connection standoff and junction box per power termination kit instructions. The electrical connection shall be made per the termination kit instruction and all local codes.
			5. Install monitor lights per the kit instruction and all local codes.

3.4 FIELD QUALITY CONTROL

* + 1. Test continuity of heating cable.
		2. Perform Insulation Resistance (IR) or “Megger” test on each heating cables before, during, and after pipe insulation has been installed. Insulation resistance should be greater than 10 megohms.
		3. Measure voltage and current at each unit after pipe installation is complete.
		4. Enter the total resistance and insulation resistance readings on the warranty card.
		5. Annually check system for loose or damaged cable.

3.5 PROTECTION

* + 1. Protect installed products until completion of project.
		2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION