

**SECTION XXXXXX**

**ELECTRIC PERMAFROST PREVENTION SYSTEM**

1. GENERAL
	1. SECTION INCLUDES
		1. Permafrost Prevention cables.
		2. Control unit for permafrost prevention cable.
		3. Components and accessories for a complete operating permafrost prevention system.
		4. Permafrost Prevention Installations: Nominal 4 watts/square foot.
	2. REFERENCES

		1. Underwriter’s Laboratories (UL)
	3. SUBMITTALS

		1. Submit under provisions of Section XXXXX
		2. Manufacturer’s product data sheets
		3. Manufacturer’s installation instructions
	4. PROJECT RECORD DOCUMENTS

		1. Record locations of heating cable, temperature and moisture sensors, thermostats and branch circuit connections.
	5. 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. All Permafrost Prevention heating equipment furnished under this section shall be supplied by a single manufacturer.
			2. UL Listed MI heating cables.
			3. Thermostatic monitoring of subgrade temperature.
			4. Self-Regulating cable is not acceptable for this application.
			5. Glycol based systems are not acceptable for this application.
			6. MI Permafrost Prevention cable 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.
	6. COORDINATION
		1. Coordinate installation of heating cable with Electrical Contractor, Concrete, and General Contractor.
		2. Coordinate installation of heating cable with installation of concrete framework and concrete placement.
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. Mineral Insulated (MI) Heating Cable:
			1. UL Listed Mineral Insulated (MI), seamless sheathed, series resistance heating cable.
			2. MI heating cable construction shall consist of MI copper sheath or MI stainless steel sheath, terminated in factory splice to stranded wire connection leads.
			3. 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. Only connection leads in conduit shall exit from heated zone.
			4. Insulator shall be Magnesium Oxide only; a Fiberglass insulator is not permitted.
			5. No combustible materials between heating conductor wire and ground sheath.
			6. Cross section of heated portion of cable not to exceed 0.4 of an inch.
			7. Install heating cable within metallic conduit or directly in the subsoil. Beneath freezer floor thermal insulation.
			8. Cable rating shall be:
				1. 120 VAC
				2. 208 VAC
				3. 240 VAC
				4. 277 VAC
	2. CONTROLS
		1. UL Listed Electronic Temperature Control:
			1. Control input voltages shall be 120VAC, 208VAC, 240VAC, or 277VAC.
			2. Enclosure shall be NEMA 4X FRP.
			3. Control shall have setpoint range from 32o F to 800o F
			4. Control 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. Control shall be electronic line sensing with monitoring and load switching capabilities.
			7. Control shall monitor pipe temperature.
			8. Control shall have adjustable setpoint temperature.
			9. Control shall have 30mA ground fault alarm.
			10. Control shall have RTD failure alarm.
			11. Control shall have low and high temperature alarm.
			12. Control shall monitor current.
			13. Control shall have low current alarm.
			14. Control shall have internal keypad lock-out
			15. Single circuit monitoring control shall be:
				1. Model ETC-120
				2. Model ETC-208/240
				3. Model ETC-277 (UL Pending)
		2. Thermostat shall be: Subgrade temperature sensing. With the use of a thermistor, bulb and capillary, or RTD of suitable length for installation in subgrade between cable runs.
			1. Enclosure shall be A421ABC-2C NEMA 1 Electronic Thermostat
			2. Enclosure shall be A421AEC-2C NEMA 4 Electronic Thermostat
		3. Thermostats to ground fault switching device for all loads.

D. Power Control Panel with G.F.P.E:

* + - 1. Controller shall have:
				1. NEMA rated panel enclosure with one Ground Fault protective device per circuit and one green “operational” LED and one red “trip” LED per circuit.
				2. NEMA rating of NEMA 1, NEMA 4, NEMA 4X.
				3. One red “System On” LED, one green “Control Power On” LED, and one Amber “Trip Indicator” LED on panel door.
				4. Interior G.F. Test button and include Dry alarm contacts.
			2. 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

2.4. ACCESSORIES

1. EXECUTION

	1. EXAMINATION

		1. Installer to verify the framework is ready to receive work.
		2. Installer to verify field measurements are as shown on Drawings.
		3. Installer to verify that required utilities are available, in proper location, and ready for use.
		4. Beginning installation means installer accepts conditions.
	2. PERMAFROST PREVENTION CABLE INSTALLATION

		1. Install in accordance with manufacturer’s instructions.
		2. Complete installation shall conform to all applicable codes and shall also be in accordance with manufacturer’s specification
	3. FIELD QUALITY CONTROL

		1. Test continuity of heating cable.
		2. Test total resistance (TR) using an ohmmeter. The ohmmeter reading should be within 10% of the calculated Total Resistance.
		3. Perform Insulation Resistance (IR) test on each heating cable before, during and after installation. Insulation resistance should be greater than 10 megohms.
		4. Measure voltage and current at each heating unit after completion.
		5. Enter the total resistance and insulation resistance readings on the warranty card.
		6. Annually check system for loose or damaged cable and water in the junction box.
	4. PROTECTION

		1. Protect installed products until completion of project.

END OF SECTION