**PART 1 – GENERAL**

* 1. **SUMMARY**
		1. This Section includes a heat trace system for frost heave prevention in walk-in freezers and consists of a self-regulating heating cable, control/monitoring, and accessories.
		2. Related Sections
			1. Section 11 41 26 – Walk-in Freezers
			2. Section 13 18 00 – Ice Rinks
			3. Section 03 06 00 – Schedules for Concrete
			4. Section 03 30 00 – Cast-In Place Concrete
			5. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables
			6. Section 26 05 26 – Grounding and Bonding for Electrical Systems
	2. **REFERENCES**
		1. National Electric Code (NEC)
	3. **SYSTEM DESCRIPTION**
		1. System for frost heave prevention in walk-in freezers.
		2. System consists of a self-regulating heating cable, thermostat, controller, monitor, and accessories.. **[Select all that apply]**
		3. The heating cable shall have a modified polyolefin jacket.
	4. **ACTION SUBMITTALS**
		1. Product Data
			1. Heating cable data sheet
			2. Heating Cable Installation and Maintenance Instructions
			3. Control, monitor and accessory instructions **[Select all that apply]**
			4. Electrical Wiring Diagram of System
	5. **QUALITY ASSURANCE**
		1. Manufacturers’ Qualifications
			1. Manufacturer to show minimum of thirty (30) years of experience in manufacturing self-regulating heating cables.
			2. Manufacturer to provide products consistent with IEEE 515.1 requirements.
		2. Installer Qualifications
			1. System installer shall have complete understanding of product and product literature from manufacturer or authorized representative prior to installation.
			2. Electrical connections shall be performed by a licensed electrician.
		3. Regulatory Requirements and Approvals
			1. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70 and marked for intended use.
	6. **DELIVERY, STORAGE AND HANDLING**
		1. General Requirements: Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminates or other causes.
		2. Delivery and Acceptance Requirements: Deliver products to site in original, unopened containers or packages with intact and legible manufacturers’ labels identifying the following:
			1. Product and Manufacturer
			2. Length/Quantity
			3. Installation and Maintenance Instructions
		3. Storage and Handling Requirements
			1. Store the heating cable in a clean, dry location with a temperature range -40°F to 140°F (-40°C to 60°C).
			2. Protect products from mechanical damage and water ingress.
	7. **WARRANTY**
		1. Extended Warranty
			1. Manufacturer shall make available a minimum two (2) year warranty for heating cable. Provide one (1) year warranty for all heat trace controllers, monitors, and thermostats.
			2. Contractor shall submit to owner the results of all installation tests required by the manufacturer.

**PART 2 – PRODUCTS**

* 1. **MANUFACTURER**
		1. Contract Documents are based on manufacturer and products named below to establish a standard of quality.
		2. Manufacturer
			1. Manufacturer shall be Emerson – Nelson
			2. Manufacturer to show minimum of thirty (30) years of experience in manufacturing self-regulating heating cables.
	2. **MATERIALS**
		1. Heating Cables **[Select all that apply]**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cable** | **Service Voltage, VAC** | **Max. Segment Length, ft** | **Power Output @ 50°F****(adjusted for installation in conduit)** | **Buss Wire Size** |
| CLT-5JT | 120 | 225 | 3.3 W/ft | 18 Gauge |
| CLT-25JT | 240 | 450 |
| CLT-8JT | 120 | 180 | 5.2 W/ft |
| CLT-28JT | 240 | 360 |
| LT-5JT | 120 | 280 | 3.0 W/ft | 16 Gauge |
| LT-25JT | 240 | 560 |
| LT-8JT | 120 | 225 | 4.8 W/ft |
| LT-28JT | 240 | 450 |

* + - 1. CLT Heating Cable **[Select if applicable]**
				1. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
				2. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 18-gauge copper bus wires.
				3. The conductive core material shall increase or decrease its heat output in response to temperature changes.
				4. Max. rated service voltage shall be 277 VAC.
				5. Shall feature a thermoplastic elastomer inner jacket extruded over the conductive core material that provides dielectric strength, moisture resistance, and protection from impact and abrasion damage.
				6. A stranded copper braid shall be installed over the inner jacket, providing a continuous ground path.
				7. A modified polyolefin over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.
			2. LT Heating Cable **[Select if applicable]**
				1. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
				2. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 16-gauge copper bus wires.
				3. The conductive core material shall increase or decrease its heat output in response to temperature changes.
				4. Max. rated service voltage shall be 277 VAC.
				5. Two inner thermoplastic jackets shall be extruded over and bonded to the core material for extra dielectric strength, moisture resistance, and protection from impact and abrasion damage.
				6. A modified polyolefin over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.
1. Thermostats – Nelson TH4X325 **[Select if applicable]**
	* 1. Shall be used for controlling heat tracing systems and offers the following features:

Enclosure: Die Cast Aluminum

Classifications: NEMA Type 4X IP66

Temperature Range: -4°C to +163°C (+25°F to +325°F)

Exposure: -40°C to +71°C (-40 to +160°F )

Capillary:

Length: 3 m (10 ft)

Material: Stainless Steel

Maximum Bulb Temperature: +215°C (+420°F)

Electrical Data:

CSA Rating: 22 amp resistance 480 Vac

UL Rating: 22 amp resistance 480 Vac

Calibration Accuracy: +1.6°C (+3°F)

Switch Type: Single Pole Double Throw

1. Controller – Nelson CM-GP **[Select if applicable]**
	* 1. Shall be a micro-processor based digital controller specifically designed for wall mounted electric heat tracing applications.
		2. Shall provide temperature control of an individual heater segment with sensor monitoring, remote alarm contacts, and ground fault leakage detection.
		3. Shall offer the following features:
			1. Ground Fault Trip function

A fixed 30mA trip level is provided for circuit integrity eliminating the need for separate EPD branch circuit breakers.

* + - 1. Temperature Input:

Range: 0°C to +218°C (32°F to +425°F)

Accuracy: +/- 1°C

Repeatability: +/- 1°C

RTD: 100-ohm platinum, 3-wire, (lead compensated up to 20 ohms)

* + - 1. Voltage Range: 100 Vac to 277 Vac
			2. Heater Switching

Configuration: Two-pole, EMR

Ratings: 100-277 Vac, 30A continuous (resistive load only)

Line Frequency: 50 or 60 Hz

* + - 1. Control Power

Power Requirement: Control power from heater voltage, 110-277 VAc, 12 VA max

* + - 1. User Interface

Display: 4-character LCD Alphanumeric display

Panel Indicators:

Actual Temp LED

Setpoint Temp LED

Alarm LED

Keypad:

4 buttons, glass-reinforced epoxy laminate faceplate

Next, Up, Down, Menu

* + - 1. Environment

Ambient Temperature: -40°C to +55°C Starting at -20°C (-4°F)

Conformal Coating: Boards conformal coated for hostile environments

* + - 1. Enclosure

Type: NEMA Type 4X Fiberglass reinforced, carbon impregnated, UV resistant polymer

Size: 6.5”H x 6.5” W x 4.0” D

Features: Captive cover screws

* + - 1. Alarm Output

Alarm: EMR Form C

Alarm Rating: EMR Version 24-277 Vac @ 2.0A Max, 12-30Vdc

Alarm Output: LED Indication

* + - 1. Alarm Function

High Temperature Alarm

Low Temperature Alarm

Sensor Failure

Ground Fault Trip

* + - 1. User-Definable Options

Deadband: Adjustable 1°C to 6°C (2°F to 10°F)

Alarm Contacts: NO or NC operation

1. Monitor – Nelson CM-1 **[Select if applicable]**
	1. Monitoring system shall continually monitor the status of both series and parallel styles of electric heat tracing cables and panels.
	2. Shall offer the following features:
		* 1. Ambient Temperature: -40° to +55°C (-40° to +130°F)
			2. Relative Humidity: 0-95% maximum, non-condensing, PC boards are conformal coated and special connectors are used.
			3. Enclosures **[Select one]**:

NEMA 4, powder coated steel

NEMA 4X, Stainless Steel

* + - 1. Display: Single line numeric LED circuit indication. LED bar indicators for Alarm status
			2. Power Input: 120Vac, 1.0A
			3. Voltage Range: 85 to 300Vac
			4. Current Range: 0.05 to 30.0A
			5. Continuity: Requires additional CMD device for each monitored circuit
			6. Alarm Output Rating: AC/DC Contact, 12-120V @ 0.1A maximum
			7. Control Input: Requires Dry Contact from control device(s) or -V Control Input Option
			8. Communications: RS-485, Modbus® Protocol
		1. Accessory Kits – Nelson SLT-ES, LT-MP, and/or LT-ME **[Select all that apply]**
			1. Entry Seal Kit - Nelson SLT-ES
				1. Shall be suitable for providing a watertight entry seal into a customer supplied junction box.
				2. Shall contain: Box Adapter; Sealing Gasket and Lockout
			2. Power End Termination Kit - Nelson LT-MP
				1. Shall be suitable for terminating heating cables inside a junction box.
				2. Shall contain: Five (5) molded silicone terminations and silicone adhesive.
			3. End Seal Kit - Nelson LT-ME
				1. Shall be suitable for sealing ends of heating cables inside a junction box.
				2. Shall contain: Five (5) molded silicone end seals and silicone adhesive.

**PART 3 – EXECUTION**

* 1. **EXAMINATION**
		1. Preinstalling Testing
			1. Prior to installing heating cable an insulation resistance test shall be performed by the installing contractor to ensure integrity of heating cable as describe in the installation & maintenance manual.
	2. **INSTALLATION**
		1. Acceptable Installers
			1. Subject to compliance with requirements of Contract Documents, installer shall be familiar with installing heating cables and equipment.
		2. The frost heave prevention system shall conform to all local building codes including but not limited to NFPA70, IEEE 515.1 Commercial Heat Tracing Applications.
		3. The installer shall layout heating cable per approved shop drawings.
		4. Grounding of the heat trace system shall be in accordance with section 26 05 26 “Grounding & Bonding for Electrical Systems”
		5. Connections of all electrical wiring shall be in accordance with section 26 05 19 “Low-Voltage Electrical Systems”
		6. Comply with the following manufacturer’s recommendations:
			1. Embedded Floor Heating System Installation Instructions (GA-2390).
			2. TA4X140/TH4X325 Thermostat Installation and Maintenance Manual (Bulletin No. 27277-Z). **[Select if applicable]**
			3. CM-GP Installation and Operating Instructions (14251-001). **[Select if applicable]**
			4. CM-1 Installation and Maintenance Manual (GA-2129). **[Select if applicable]**
			5. SLT-ES Entry Seal Kit Instructions (GA-2250). **[Select if applicable]**
			6. LT-MP Power End Termination Kit Instructions (GA-1451). **[Select if applicable]**
			7. LT-ME End Seal Kit Instructions (GA-1452). **[Select if applicable]**
	3. **FIELD QUALITY CONTROL**
		1. Initial start‐up and field testing (commissioning) of the system shall be performed by a technician per the owner’s requirements.
		2. Field Tests and Inspections in accordance with the Embedded Floor Heating System Installation Instructions recorded and included in submittals to owner:
			1. The following test shall be performed before the heat cable has been installed:
				1. Continuity test on reel
				2. Insulation resistance on reel – 2500 VDC
			2. The following test shall be performed after the heat cable has been installed:
				1. Continuity test
				2. Insulation resistance – 2500 VDC, 5 megaohm minimum
	4. **MAINTENANCE**
		1. Maintenance Service
			1. Comply with manufacturer’s recommendations in the applicable Installation and Maintenance Instructions.

**END OF SECTION**