PART 1 – GENERAL

1.1 SUMMARY
A. This Section includes a UL Listed and CSA Certified pipe freeze protection of above ground piping system that consists of a self-regulating heating cable, connection kits, controller and accessories.
B. Related Sections
   1. Section 22 07 19 – Plumbing Piping Insulation
   2. Section 22 08 00 – Commissioning of Plumbing
   3. Section 22 09 00 – Instrumentation & Control for Plumbing
   4. Section 22 11 00 – Facility Fuel Piping
   5. Section 22 13 00 – Facility Sanitary Sewerage
   6. Section 22 10 00 – Plumbing Piping
   7. Section 23 07 19 – HVAC Piping Insulation
   8. Section 23 08 00 – Commissioning of Plumbing
   9. Section 23 09 00 – Instrumentation & Control for HVAC
  10. Section 22 05 19 – Low-Voltage Electrical Power Conductors and Cables
  11. Section 26 05 26 – Grounding and Bonding for Electrical Systems

1.2 REFERENCES
A. Underwriter’s Laboratories (UL)
B. Canadian Standards Association (CSA)
C. National Electric Code (NEC)

1.3 SYSTEM DESCRIPTION
A. System for complete above ground water pipe freeze.
B. System consists of a self-regulating heating cable, connection kits, controller and accessories. [Select all that apply]
C. The heating cable shall have a modified polyolefin (J) jacket or fluoropolymer (-F) jacket. [Select one]

1.4 ACTION SUBMITTALS
A. Product Data
   1. Heating cable data sheet
   2. UL, CSA approval certificates for freeze protection of above ground water piping.
   3. Heating Cable Installation and Maintenance Instructions
   4. Connection Kit, Controller, and Thermostat Instructions. [Select all that apply]
   5. Electrical Wiring Diagram of System

1.5 QUALITY ASSURANCE
A. 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 and CSA 22.2 No 130-03 requirements.
B. 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.
C. Regulatory Requirements and Approvals
   1. The heat tracing system shall be UL Listed/CSA Certified
   2. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70 and marked for intended use.

1.6 DELIVERY, STORAGE AND HANDLING
A. General Requirements: Deliver, store and handle products to prevent their deterioration or damage due to moisture, temperature changes, contaminates or other causes.
B. 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. Lot Number
   4. Installation and Maintenance Instructions
C. 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.

1.7 WARRANTY
A. Extended Warranty
   1. Manufacturer shall make available a minimum two (2) year warranty for heating cable and connection kits. Provide one (1) year warranty for all heat trace controllers and thermostats.
   2. Contractor shall submit to owner the results of all installation tests required by the manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURER
A. Contract Documents are based on manufacturer and products named below to establish a standard of quality.
B. Manufacturer
   1. Manufacturer shall be Emerson – EasyHeat
   2. Manufacturer to show minimum of thirty (30) years of experience in manufacturing self-regulating heating cables.
   3. Manufacturer shall provide UL and CSA approval certificates.
### 2.2 MATERIALS

**A. Heating Cables – EasyHeat SR Trace and/or TSR [Select all that apply]**

<table>
<thead>
<tr>
<th>Heating Cables</th>
<th>SR Trace</th>
<th>TSR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalogue No.</td>
<td>Over Jacket</td>
<td>Polyolefin (J)</td>
</tr>
<tr>
<td>120 VAC – 3 W/ft @ 50°F</td>
<td>SR31J</td>
<td>TSR31J</td>
</tr>
<tr>
<td>120 VAC – 5 W/ft @ 50°F</td>
<td>SR51J</td>
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<td>240 VAC – 3 W/ft @ 50°F</td>
<td>SR32J</td>
<td>TSR32J</td>
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<td>TSR82J</td>
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<tr>
<td>240 VAC – 10 W/ft @ 50°F</td>
<td>Unavailable</td>
<td>TSR102J</td>
</tr>
</tbody>
</table>

- **Max. Rated Voltage**: 277 VAC
- **Max. Exposure Temperature**: 85°C (185°F)
- **Bus Wire Size**: 18 Gauge

1. **SR Trace Heating Cable**
   a. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
   b. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 18-gauge copper bus wires.
   c. The conductive core material shall increase or decrease its heat output in response to temperature changes.
   d. Max. rated service voltage shall be 277 VAC.
   e. 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.
   f. A stranded copper braid shall be installed over the inner jacket, providing a continuous ground path.
   g. A modified polyolefin over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.

2. **TSR Heating Cable**
   a. Shall be a self-regulating heater cable with a parallel circuit electric heater strip.
   b. Shall feature an irradiation cross-linked conductive polymer core material that is extruded over the multi-stranded, tin-plated, 16-gauge copper bus wires.
   c. The conductive core material shall increase or decrease its heat output in response to temperature changes.
   d. Max. rated service voltage shall be 277 VAC.
   e. 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.
   f. A modified polyolefin or fluoropolymer [select one] over jacket shall cover the braid for added dielectric strength, moisture resistance, and protection from impact and abrasion damage.

B. **Connection Kits – EasyHeat TSRP, TSRS, TSRT, or TSRL [Select all that apply]**

1. **TSRP Power Connection Kit**
   a. Shall be suitable for connecting up to two heating cables to customer supplied power wiring.
2. TSRS Splice Connection Kit
   a. Shall be suitable for connecting two heating cables in an in-line splice configuration.

3. TSRT Tee Connection Kit
   a. Shall be suitable for connecting three heating cables in a tee splice configuration.

4. TSRL Lighted Connection Kit
   a. Shall feature an end-of circuit indicating light assembly utilizing a low-temperature LED lamp.
   b. Shall operate in 120-277 VAC service voltage.

C. Thermostats – EasyHeat T4XA, T4XC and/or C4XC [Select all that apply]

1. T4XA Thermostat
   a. Shall be used for ambient temperature control and offers the following features:
      i. Enclosure: Die Cast Aluminum
      ii. Classifications: NEMA Type 4X IP66
      iii. Temperature Range: -9°C to +60°C (+15°F to +140°F)
      iv. Exposure: -40°C to +71°C (-40 to +160°F)
      v. Capillary:
         • Material: Stainless Steel
         • Maximum Bulb Temperature: +71°C (+160°F)
      vi. Electrical Data:
         • CSA Rating: 22 amp resistance 480 Vac
         • UL Rating: 22 amp resistance 480 Vac
      vii. Calibration Accuracy: +1.1°C (+2°F)
      viii. Switch Type: Single Pole Double Throw

2. T4XC Thermostat
   a. Shall be used for controlling heat tracing systems and offers the following features:
      i. Enclosure: Die Cast Aluminum
      ii. Classifications: NEMA Type 4X IP66
      iii. Temperature Range: -4°C to +163°C (+25°F to +325°F)
      iv. Exposure: -40°C to +71°C (-40 to +160°F)
      v. Capillary:
         • Length: 3 m (10 ft)
         • Material: Stainless Steel
         • Maximum Bulb Temperature: +215°C (+420°F)
      vi. Electrical Data:
         • CSA Rating: 22 amp resistance 480 Vac
         • UL Rating: 22 amp resistance 480 Vac
      vii. Calibration Accuracy: +1.6°C (+3°F)
      viii. Switch Type: Single Pole Double Throw

3. C4XC Thermostat
   a. Shall be used for controlling heat tracing systems and offers the following features:
      i. Suitable for indoor/outdoor locations having hostile, non-hazardous environments.
      ii. Can be used in ambient sensing mode or line sensing mode.
      iii. Enclosure: NEMA 4x polycarbonate plastic
      iv. Fixed temperature: +40°F (+4.4°C)
v. Maximum exposure temperature: +140° F (+60° C)
vi. Capillary length: 2.5 ft (0.762 m)
vii. Current: 22 Amps
viii. Voltage: 120, 240 or 480 Vac
ix. Calibration accuracy: ±4° F (±2.2° C)

D. Controller – EasyHeat EGPC [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:
   i. Ground Fault Trip function
      • A fixed 30mA trip level is provided for circuit integrity eliminating the need for separate EPD branch circuit breakers.
   ii. 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)
   iii. Voltage Range: 100 Vac to 277 Vac
   iv. Heater Switching
      • Configuration: Two-pole, EMR
      • Ratings: 100-277 Vac, 30A continuous (resistive load only)
      • Line Frequency: 50 or 60 Hz
   v. Control Power
      • Power Requirement: Control power from heater voltage, 110-277 VAc, 12 VA
   vi. 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
   vii. Environment
      • Ambient Temperature: -40°C to +55°C Starting at -20°C (-4°F)
      • Conformal Coating: Boards conformal coated for hostile environments
   viii. 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
   ix. Alarm Output
      • Alarm: EMR Form C
PART 3 – EXECUTION

3.1 EXAMINATION
A. Verification of Conditions
   1. Prior to installation of heating cable system, verify that all piping which will be
   heat trace has passed all hydrostatic/pressure test and is signed off by
   plumbing inspector.
B. Preinstalling Testing
   1. Prior to installing heating cable on the piping an insulation resistance test shall
   be performed by the installing contractor to ensure integrity of heating cable as
   describe in the installation & maintenance manual.

3.3 INSTALLATION
A. Acceptable Installers
   1. Subject to compliance with requirements of Contract Documents, installer shall
   be familiar with installing pipe trace cables and equipment.
B. The process pipe freeze protection installation shall conform to all local building codes
   including but limited to NFPA70, IEEE 515 industrial Heat Tracing Applications.
C. The installer shall layout heating cable per approved shop drawings.
D. Grounding of the Process Pipe Freeze Protection System shall be in accordance with
   section 26 05 26 “Grounding & Bonding for Electrical Systems”
E. Connections of all electrical wiring shall be in accordance with section 26 05 19 “Low-
   Voltage Electrical Systems”
F. Comply with the following manufacturer’s recommendations:
   1. SR Trace Cable Instruction Sheet (14120-001) and/or TSR Cable Instruction
      Sheet (40252-001). [Select all that apply]
   2. TSRP Power Connection Kit Instructions (14036-001).
   3. TSRS Splice Connection Kit Instructions (14037-001). [Select if applicable]
   4. TSRT Tee Connection Kit Instructions (14038-001). [Select if applicable]
   5. TSRL Series End of Circuit Light Kit Instructions (14032-001). [Select if
      applicable]
   6. T4XA Thermostat Installation/Specification (14026-001). [Select if applicable]
   7. T4XC Thermostat Installation/Specification (14029-001). [Select if applicable]
   8. C4XC Thermostat Installation/Specification (14027-001). [Select if
      applicable]
   9. EGPC Installation and Operating Instructions (14251-002). [Select if
      applicable]
3.4 FIELD QUALITY CONTROL
A. Initial start-up and field testing (commissioning) of the system shall be performed by factory technician or factory representative per the owner’s requirements.
B. Field Tests and Inspections in accordance with the cable instructions, recorded and included in submittals to owner:
   1. The following test shall be performed before the heat cable has been installed:
      a. Continuity test on reel
      b. Insulation resistance on reel – 2500 VDC
   2. The following test shall be performed after the heat cable has been installed but before the insulation and after insulating the piping:
      a. Continuity test
      b. Insulation resistance – 2500 VDC, 5 megaohm minimum
   3. The technician shall verify that the T4XA, T4XC, C4XC and/or EGPC [Select all that apply] parameters are set to the application requirements.

3.5 MAINTENANCE
A. Maintenance Service
   1. Comply with manufacturer’s recommendations in the applicable Installation and Maintenance Instructions.

END OF SECTION