

SECTION 40 05 33
PIPE HEAT TRACING

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Factory Mutual.
2. Institute of Electrical and Electronics engineers, Inc (IEEE): 515, Testing, Design, Installation and Maintenance of Electrical Resistance Heat Tracing for Industrial Applications.
3. National Electrical Manufacturers' Association (NEMA): 250, Enclosures for Electrical Equipment (1000 Volts Maximum).
4. UL.

1.02 SUBMITTALS

A. Action Submittals:

1. Manufacturer's descriptive literature.
2. Plastic Pipe Installations: Output adjustment factors for heating tape for the services indicated.
3. Pipe heat loss calculations for each pipe size to be heat traced.

PART 2 PRODUCTS

2.01 SYSTEM DESIGN REQUIREMENTS

A. Design Heating Load:

1. Heating load to be calculated based upon a 50 degree F delta, 20 mph wind if pipes are located outdoors, insulation as specified in Section 40 42 13, Process Piping Insulation, pipe as specified in Section 40 27 00, Process Piping—General, and shall include a 10 percent safety factor. Refer to yard piping drawings for process piping, containment pipe, and tubing sizes. Refer to Piping Schedule as shown on the Drawings for pipe and tubing materials.
2. Heat loss calculations shall be based on IEEE 515, Equation 1, Page 19.

2.02 ELECTRICAL HEATING TAPE/CABLE

A. Manufacturers and Products:

1. Thermon; BSX.
2. Or equal.

B. Physical Characteristics:

1. Cable: Self-limiting, parallel circuit construction consisting of continuous inner core of variable resistance conductive heating material between two parallel copper bus wires. Provide tinned copper braid for PVC, FRP, and stainless steel pipe applications.

C. Functional Characteristics: Installed were indicated on the Drawings to maintain piping temperature above 40 degrees F.

D. Performance Characteristics:

1. UL Listing: Listed as self-limiting pipe tracing material for pipe freeze protection application in ordinary, Class 1, Division 1 and 2 conditions.
2. Operating Ambient Temperature: Minus 76 degrees F (minus 60 degrees C) to plus 131 degrees F (plus 55 degrees C).
3. Maximum Pipe Exposure Temperature: 482 degrees F (250 degrees C).
4. Service Voltage: As indicated by branch circuits provided for heat tracing on the Drawings.

2.03 CONNECTION SYSTEM

A. Connection Kit:

1. Manufacturers and Products:
 - a. Thermon; ZP.
 - b. Or equal.
2. Physical Characteristics:
 - a. Single-entry power connection junction box used to connect power source to parallel heating cables.
 - b. Junction box and pipe-mount are glass-reinforced polymer with O-ring gasket seals, and stainless-steel mounting band.
3. Functional Characteristics: Utilizes terminal blocks to accommodate up to three heat trace cables or power connections to heat trace system.
4. Performance Characteristics:
 - a. Enclosure Rating: IP66.
 - b. Classification: Ordinary and Hazard Class 1, Division 1 and 2.

B. Power and End Termination Kit:

1. Manufacturers and Products:
 - a. Thermon; PETK-1.
 - b. Or equal.
2. Physical Characteristics: Hardware package for connecting power wiring or ending heat trace cable circuit.

3. Functional Characteristics: When installed as per manufactures instructions connect power wiring to heat trace cable or is used to terminate heat trace cable.
4. Performance Characteristics: FM approved connection kit to be used with manufacture Connection Kit enclosure.

C. Splice Termination Kit:

1. Manufacturers and Products:
 - a. Thermon; SCTK-1.
 - b. Or equal.
2. Physical Characteristics: Hardware package for splicing heat trace cable to other cable or end of circuit light kit.
3. Functional Characteristics: When installed as per manufactures instructions splices cable to other cable or system hardware.
4. Performance Characteristics: FM approved connection kit to be used with manufacture Connection Kit enclosure.

D. Splice and End Connection Kit:

1. Manufacturers and Products:
 - a. Thermon; ZS/ZE with PEKT-1 or SCKT-1.
 - b. Or equal.
2. Physical Characteristics: Pipe mounted glass-reinforced polymer splice cap with stainless steel mounting band.
3. Functional Characteristics: Provides rated station enclosure for splicing additional heat trace cable into a circuit, or end termination of heat trace circuit.
4. Performance Characteristics:
 - a. Enclosure Rating: IP66.
 - b. Classification: Ordinary and Hazard Class 1, Division 1 and 2.

E. End of Circuit Light Kit:

1. Manufacturers and Products:
 - a. Thermon; ZE-B, plus SCTK-1.
 - b. Or equal.
2. Physical Characteristics: Pipe mounted glass-reinforced polymer splice cap with stainless steel mounting band and array of bright LED light in rated station.
3. Functional Characteristics: LED light indicate when heat trace is in operation/energized.
4. Performance Characteristics:
 - a. Enclosure Rating: IP66.
 - b. Classification: Ordinary and Hazard Class 1, Division 1 and 2.

- F. Operating Monitor Light: Furnish End of Circuit Light Kit with each circuit power connection kit to indicate when heat tracing is energized.

2.04 SECURING TAPE

- A. Plastic Piping Systems: Aluminum foil coated adhesive tape.
 - 1. Manufacturers and Products:
 - a. Thermon; AL-20H.
 - b. Or equal.
 - 2. Physical Characteristics: Adhesive backed foil tape.
 - 3. Functional Characteristics: Designed for attaching heating cables and thermostat sensors to pipes and tanks.
 - 4. Performance Characteristics: Holds heat trace cable and thermostat sensors in place on pipe and equipment under insulation.
- B. Metallic Piping Systems: Glass or polyester cloth pressure sensitive tape.
 - 1. Manufacturers and Products:
 - a. Thermon; FT-1H.
 - b. Or equal.
 - 2. Physical Characteristics: Glass or polyester cloth pressure sensitive tape.
 - 3. Functional Characteristics: Designed for attaching heating cables and thermostat sensors to pipes and tanks.
 - 4. Performance Characteristics: Holds heat trace cable and thermostat sensors in place on pipe and equipment under insulation.

2.05 PIPE MOUNTED THERMOSTAT

- A. Type: Adjustable control thermostat with rated junction box enclosure.
 - 1. Manufacturers and Products:
 - a. Thermon; 4X/7-350235JB, with TM7 mounting kit.
 - b. Or equal.
 - 2. Physical Characteristics:
 - a. Epoxy coated aluminum IP66 enclosure that can be used as a system power junction box, with Class 1, Division 1 and 2 mounting kit.
 - b. 125/240/277V ac double pole switch (25 amp) with adjustable control thermostat from 35 degrees F (2 degrees C) to 235 degrees F (113 degrees C).
 - c. Nickle plated copper thermostat capillary armored 6 feet (1.8 meters) flexible stainless-steel cable.
 - 3. Functional Characteristics: Designed to control the heat trace cable and to be used as a power connection junction box for the heat trace system.
 - 4. Performance Characteristics: Control thermostat switch with watertight, dust tight FM Approved for Class 1, Division 1 and 2 areas.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Provide and install piping heat trace where specifically identified on the Drawings.
- B. General:
 - 1. Install in accordance with the manufacturer's instructions and recommended practices.
 - 2. Secure heat trace cable to pipe using either adhesive foil tape or glass-polyester tape as recommended by heat trace cable manufacture.
 - 3. Provide insulation as specified in Section 40 42 13, Process Piping Insulation, over all pipe heat tracing.
 - 4. Ground metallic structures or materials used for support of heating cable or on which it is installed in accordance with applicable codes.
 - 5. Wiring between power connection points of heat tracing cable branch lines shall be provided by heat tracing system supplier.
 - 6. Provide end of circuit pilot lights on heat tracing circuits.
 - 7. Coordinate heat trace circuit assignments with general electrical. Being most of the facility is backed up by generator power, there are no heat trace or emergency specific panels or separate power feeds.
- C. Electrical Heating Tape/Cable:
 - 1. Determine required length of electrical heating tape by considering length of circuit, number and type of fittings and fixtures, design heating load, and heating tape output.
 - 2. Where design heating load exceeds heating tape capacity, install by spiraling.
 - 3. Derate heating tape capacity when installed on plastic piping.
 - 4. Where heat tracing buried FOS/FOR pipe follow double contained piping manufacture heat trace install recommendations.
 - 5. Install on services as indicated on Piping Schedule only in locations identified on the Drawings.

6. Install additional heating tape at bolted flanges, valves, pipe supports, and other fittings and fixtures as recommended by supplier, but not less than the following:

Item	Heating Tape Length (min. feet)
Bolted flanges (per pair)	Two times pipe diameter
Valves	Four times valve length
Pipe hanger or support penetrating insulation	Three times pipe diameter

- D. Heat Tracing Circuits: Limit individual lengths of heat tracing circuits such that maximum single circuit capacity is 20 amps when starting the circuit at 40 degrees F. Provide multiple 20-amp circuits as required at individual heat tracing locations.
- E. Thermostats:
1. Install in accordance with manufacturer's instructions and as approved by Contracting Officer.
 2. For each group of heat traced circuit, install one ambient thermostat.

3.02 FIELD QUALITY CONTROL

- A. Test each circuit with 500-volt insulation tester between circuit and ground with neutrals isolated from ground.
1. Insulation Resistance: Minimum 1,000 megohms per 1,000 feet.

END OF SECTION