SECTION 23 05 33

HEAT TRACING FOR HVAC PIPING

1.0 GENERAL

1. DESCRIPTION
   1. All work specified in this Section is governed by the Common Work Results for HVAC Section 23 05 00.
   2. This Section 23 05 33 and the accompanying drawings cover the provisions of all labor, equipment, appliances and materials, and performing all operations in connection with furnishing and installing the electric heat tracing as specified herein and as shown. This work includes, but is not limited to, the following:
      1. A complete UL listed system of heaters, components, and controls to prevent water-carrying outdoor piping from freezing.
   3. Only one electrical power connection shall be required for each system.
   4. Electric heat tracing shall be UL listed.
2. INTENT
   1. It is the intent of this Section of the specifications to provide complete, operable, fully wired electric heat tracing systems as shown and specified, which operate efficiently and automatically.
3. BASIS OF DESIGN
   1. The basis of design is Raychem XL-Trace. Acceptable alternate manufacturers are Chromalox and Nelson Heat Trace, subject to substitution requirements.

2.0 PRODUCTS

1. ELECTRIC HEAT TRACING
   1. The self-regulating heater shall consist of two (2) 16 AWG nickel-coated, stranded copper bus wires embedded in parallel in a self-regulating polymer core that varies its power output to respond to temperature all along its length, allowing the heater to be crossed over itself without overheating, to be used directly on plastic pipe, and to be cut to length in the field. Heat tracing shall be approved for plastic piping installation where applicable.
   2. Aboveground the heater shall be covered by a radiation cross-linked, modified polyolefin, dielectric jacket with ultraviolet inhibitor. Jacket shall be printed with model number, agency listings, batch number, and length marks.
   3. Belowground, for grease waste, or where fuel oil is present, the heater shall be covered by a fluoropolymer with ultraviolet inhibitor. Jacket shall be printed with model number, agency listings, batch number, and length marks.
   4. Terminate with waterproof, factory-assembled, non-heating leads with connectors at one end, and seal the opposite end with a watertight end seal. Ground braid shall be tinned-copper braid, minimum 70 percent.
   5. Heat tracing components and controllers shall be from a single Manufacturer, and be designed to work as a complete system.
   6. In order to provide energy conservation and to prevent overheating, the heater shall have a self-regulating factor of at least 90 percent. The self-regulation factor is defined as the percentage reduction, without thermostatic control, of the heater output going from 40°F pipe temperature operation to 150°F pipe temperature operation.
   7. The heat tracing shall be 277V 1-phase unless otherwise noted. Coordinate with Division 26.
   8. The heat tracing shall operate on the available line voltage indicated without the use of transformers.
   9. The heater shall be sized according to the following table. The required heater output rating is in watts per foot at 50°F, minimum ambient of -10°F, start-up at -10°F.

Pipe Size Nominal Watts per linear foot

3 inch or less 5 watts

4 inch to 6 inch 5 watts

8 inch to 10 inch 8 watts

12 inch to 14 inch 2 strips of 8 watts

* 1. Deviations from the above chart shall be specifically noted on the submittal with all data about piping and insulation material, thickness, ambient temperature, maintenance temperature, and start-up temperature, and shall have a Manufacturer’s guarantee of performance and freeze protection.
  2. Provide all power connections, end seals, splices, and tee kits. Provide additional length as recommended by the Manufacturer for heat sinks such as valves, flanges, etc.
  3. The system shall be controlled by a bulb-sensing thermostat, 40°F ambient-sensing, with controller mounted outside.

1. CONTROLLER – FREEZE PROTECTION
   1. Provide one controller for each heat-tracing circuit. Controller shall include self-test function to verify heat-tracing integrity a minimum of every 24 hours.
   2. Controller shall have NEMA 4X enclosure, six-character alphanumeric display, low and high temperature alarm set at 34°F and 60°F respectively, adjustable, ground fault alarm and trip, alarm output, and low current alarm. Basis of Design Raychem C910.
   3. Controller shall have stored parameters of minimum and maximum temperature, maximum ground fault current, maximum current, contractor cycle count, and run time.

1. CONTROLLER – FIRE PROTECTION
   1. Provide one controller for each heat-tracing circuit. Controller shall include self-test function to verify heat-tracing integrity for a User defined test, set daily (adjustable).
   2. Controller shall have NEMA 12 enclosure (indoor use only), 5” touchscreen display, low and high temperature alarm set at 36° and 60°F respectively, adjustable, ground fault alarm and trip, alarm output, and low current alarm. Basis of Design Raychem 465.
   3. Controller shall have stored parameters of event description, time stamp, setpoint, deadband, minimum ambient temperature, supply voltage, GFCI current, load current, and run time.
   4. Controller and system shall be appropriate for fire sprinkler freeze protection in accordance with NFPA 13. System shall have alarm contact connected to BMS and shall alarm the Fire Alarm system, power shall be served by an emergency source, and system shall be certified in accordance with UL 515A. System shall be installed in accordance with Manufacturer’s requirements specifically for fire protection systems. System shall be specifically approved by the AHJ prior to installation.
2. SYSTEM APPROVAL
   1. Complete heat trace system (heating cable, connection kits, and controller) shall be listed by an NRTL, and marked for intended freeze protection of metallic and non-metallic piping associated with HVAC, Plumbing, Domestic Hot-Water-Temperature Maintenance, and Fire Suppression systems.

3.0 EXECUTION

1. INSTALLATION
   1. The electric heat tracing and associated controls shall be installed in strict accordance with the Manufacturer's recommendations, including additional wrapping for valves, etc.
   2. Prior to installing heating cable on piping, an insulation resistance test shall be performed by Installing Contractor to ensure the integrity of the heating cable as described in the Manufacturer’s installation and maintenance manual.
   3. In the field, all heating cables shall be meggered with a minimum of 2,500 V dc for self-regulating cable. The following field megger readings shall be taken on each heating cable:
      1. Heating cable shall be meggered when received at Project site before installation.
      2. Heating cable shall be meggered after installation, but before insulation is installed.
      3. Heating cable shall be meggered after insulation is installed.
      4. Heating cable shall be meggered at final commissioning prior to being energized.
      5. Insulation resistance must exceed 1,000 megohms at 2,500 V DC.
      6. All results must meet Manufacturer’s specification.
      7. Note that these are also requirements to obtain the Manufacturer’s 10-year extended warranty.
   4. Installer shall have no less than two (2) years installation experience and shall have complete understanding of the product.
   5. The thermostatic control system shall be completely wired under this Division 23 except the final connection to the controller will be made by Division 26. Wiring shall be in accordance with the NEC and shall meet all requirements for this installation. Coordinate with Division 26.
   6. Apply the heat tracing linearly on the pipe after piping has been successfully pressure tested. Secure the heater to the piping with cable ties or fiberglass tape.
   7. Apply "ELECTRIC TRACED" signs to the outside of the piping insulation.
   8. Heat tracing shall be installed under insulation. See specifications for insulation.
   9. Fire Protection Heat tracing shall be installed under insulation to match hydronic or plumbing piping insulation requirements.
2. WARRANTY
   1. Manufacturer's Limited Warranty: Manufacturer agrees to repair or replace heat tracing products listed below that fail in materials or workmanship within specified warranty period, when such goods are properly installed, operated, and maintained in accordance with product documentation.
      1. Covered Products include the following:
         1. Heating cables, connection kits, and accessories.
         2. Thermostats, controllers, panels, contactors, sensors, and accessories.
      2. Warranty Period: Two (2) years from date of Substantial Completion.
   2. Manufacturer's Extended Warranty: Provide Owner an extended product warranty for heat tracing products described below.
      1. Contractor must complete and forward to Owner the Installation, Inspection, or Commissioning Record(s), and complete Manufacturer's online warranty registration form within 30 days from date of installation or shall provide an equivalent warranty directly under their scope.
      2. Heating Cable Warranty Period: Ten (10) years from date of Substantial Completion.
      3. Heating cables, connection kits, and accessories not automatically offered with a 10-year manufacturer's warranty, as a standard matter of course, will not be allowed. Warranty information must be published on Manufacturer's website.

END OF SECTION