



SECTION 15770

ELECTRIC FLOOR HEATING AND SNOW MELTING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Floor Heating Systems for the following applications:
 - 1. Under Concrete
 - 2. Within Concrete
 - 3. Over Concrete
 - 4. Over Subfloor
 - 5. Under Subfloor between Joists
 - 6. Under Floor Coverings.
- B. Snow Melting Systems
- C. Roof and Gutter Deicing Systems
- D. Low Voltage Power Supplies
- E. Low Voltage Controls

1.2 RELATED SECTIONS

- A. Section 03300 - Cast-In-Place Concrete
- B. Section 03500 - Cementitious Decks and Underlayments
- C. Section 06050 - Basic Wood and Plastic Materials
- D. Section 06100 - Rough Carpentry
- E. Section 07200 - Thermal Protection; Insulation Under Heating Elements
- F. Section 07300 - Shingles, Roof Tiles and Roof Coverings
- G. Section 09300 - Tile
- H. Section 09600 - Flooring

15770-1

FEEL
THE FUTURE

- I. Section 13600 - Solar and Wind Energy Equipment
- J. Section 15700 - Heating, Ventilation and Air-Conditioning Equipment
- K. Section 15770 - Floor Heating and Snow Melting Equipment
- L. Section 15920 - Electric and Electronic Controls
- M. Section 16460 - Low-voltage Transformers
- N. Section 16050 - Basic Electrical Methods and Materials

1.3 REFERENCES

- A. Electrical Standards:
 1. UL 1693 - Electric Radiant Heating Panels and Heating Panel Sets.
 2. UL 5085 – Safety of Power Supply Units and Similar Products.
 3. ANSI/UL 823 – Electric heaters for Use in Hazardous (Classified) Locations
 4. EN 60335 – Safety of Flexible Sheet Heating Elements for Room Heating.
 5. EN 61558 – Safety of Power Supply Units and Similar Products.
 6. CSA C22.2 No.66 – Safety of Power Supply Units and Similar Products.
 7. EN 62233 – Magnetic Field Emission.
 8. NF EN ISO 9239-1 & NF EN ISO 11925-2 – Flammability Test.
- B. Building Standards:
 1. ASTM C 627 - Standard Test Method for Evaluating Ceramic Floor Tile Installation Systems Using the Robinson-Type Floor Tester.
- C. Quality Standards:
 1. International Standards Organization: ISO 9001 - Quality management systems.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation methods.
- C. Shop Drawings: Provide shop drawings indicating details of construction, electrical schematics and installation.
- D. Training and Maintenance Instructions: Instruct Owner regarding operation of installed system. Provide Owner with manufacturer's installation instructions for installed components within the system. Provide Owner with copies of any detailed as-built layout drawings, worksheets and measurements taken of the installed system.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications:
 1. ISO 9001 certified facility.
 2. Over 30 years' experience manufacturing products similar to those specified herein.
 3. Provides technical support and design assistance.
- B. Contractor Qualifications:

1. Qualified personnel who are familiar with the heating system and installation procedures.
 2. Licensed electrician to perform electrical rough in and measurements.
- C. Single Source Requirements:
1. Provide products and accessories from a single manufacturer to the greatest extent possible.
 2. Products manufactured in the United States.
 3. Declaration of conformity.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store products in manufacturer's unopened packaging maintaining environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer until ready for installation to protect from damage.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.
- B. Thermal insulation is recommended under the heating elements for energy efficiency.
- C. Verify that all materials will be installed on dry, clean, non-conductive and structurally sound surface.

1.8 SEQUENCING AND SCHEDULING

- A. Convene a pre-installation conference to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.
- B. Verify that all materials used are approved for the specific application and have no adverse compatibility with the heating elements.
- C. Calculate and make a layout to determine the materials required.

1.9 WARRANTY

- A. Manufacturer's standard limited warranty for materials and workmanship:
1. 20 years STEP Warmfloor Elements
 2. 10 years STEP Snowmelt & STEP Deicing Elements
 3. 10 years on transformer coils in STEP Power Supplies.
 4. 3 years on the interface electronics in STEP Power Supplies.
 5. 3 years on the Controls.

1.11 SYSTEM START-UP

- A. Verify all electrical components are installed per local and National Electrical Code (NEC) prior to start-up.
- B. Comply with manufacturer's requirements for drying and curing time for adjacent materials.

1.12 OWNER'S INSTRUCTIONS

- A. Instruct Owner regarding operation of installed system. Provide Owner with manufacturer's installation instructions for installed components within the system. Provide Owner with copies of any detailed as-built layout drawings, worksheets and measurements taken of the installed system.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Electro Plastics Inc., located at: 11147 Dorsett Road; St. Louis, MO 63043; Toll Free: 1-877-783-7832; Tel: 314-426-3555; Fax: 314-426-3556; E-mail: sales@stepheat.com; Web: www.stepheat.com
- B. Substitutions: Not permitted.
- C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 FLOOR HEATING PRODUCTS

- A. Low Voltage Floor Heating Products - General:
 - 1. System: STEP Warmfloor as manufactured by Electro Plastics Inc.
 - 2. Heating Element:
 - a. Voltage: 24V AC or DC from AC power supply or DC controller and alternative energy, e.g., solar panel or wind turbine.
 - b. Description: Heating element comes in a roll, cut to desired length on site and field-wired.
 - c. Materials: Flat, flexible, homogeneous, positive temperature coefficient (PTC) semi-conductive polymer.
 - d. Properties: Self-regulating, when the ambient temperature increases, the electrical resistance increases and the consumption of electricity decreases.
 - e. Heat Generation: Continuous, up to 140°F (60°C) without being mechanically effected; melts above 248°F (120°C).
 - f. Thickness: 3/64 inch (1.2 mm).
 - g. Length: standard roll 174 feet (53 m) or customized.
 - 3. Compliance:
 - a. ETL listed, conforms to UL 1693 3rd Edition.
 - b. ETL listed, conforms to ANSI/UL 823
 - c. ETL listed, conforms to UL 5085-1 & 2.
 - d. ETL listed, conforms to CSA C22.2 No.66.1 & 2-06.
 - e. ETL/CE, conforms to EN 61558-2-2:2007.
 - f. ETL/CE, conforms to EN 60335-2-96-2009.
 - g. TUV, conforms to EN 62233:2008
 - 4. Certificates:
 - a. The Tile Council of America, test report number: TCA-248-03 - rated Extra Heavy according to ASTM C627.
 - b. Greener Product Certification Seal of Compliance.
 - c. Buy American Act - Certificate of Compliance
 - d. North American Free Trade Agreement - NAFTA Certified
 - e. American Bureau of Shipping - ABS Certificate No. 04-HS445756-1-PDA
- B. Low Voltage Floor Heating Products: **STEP Residential** as manufactured by Electro Plastics.
 - 1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wires, STEP crimp tool
 - 2. Heating Element Model: EP-30-25W-24V
 - 3. Width: 12 inches (305 mm)
 - 4. Power Output: 7.8 W/ft. (25.5 W/m) @ 68°F (20°C)
 - 5. Length: Cut to size – maximum single-element length 57 ft. (17.5 m)
 - 6. Terminal Board: T-BLOCK; if applicable
 - 7. Power Supply: Standard low voltage isolation transformer, including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - b. Secondary voltage: 24V

8. Power Supply: EPI-LX-R-500W; for up to 57 ft. (17.6 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 115 ft. (35.2 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 173 ft. (52.8 m) of heating element
 11. DC Controller: EPI-DC-M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- C. Low Voltage Floor Heating Products: **STEP Commercial** as manufactured by Electro Plastics.
1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wires, STEP crimp tool
 2. Heating Element Model: EP-30-29W-24V
 3. Width: 12 inches (305 mm)
 4. Power Output: 9 W/ft. (29.5 W/m) @ 68°F (20°C)
 5. Length: Cut to size – maximum single-element length 50 ft. (15.2 m)
 6. Terminal Block: T-BLOCK; if applicable
 7. Power Supply: Standard low voltage isolation transformer, including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500W; for up to 50 ft. (15.2 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 100 ft. (30.5 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 150 ft. (45.7 m) of heating element
 11. DC Controller: EPI-DC-M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- D. Low Voltage Floor Heating Products: **STEP 9-Inch** as manufactured by Electro Plastics.
1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wires, STEP crimp tool
 2. Heating Element Model: EP-23-22W-24V
 3. Width: 9 inches (230 mm)
 4. Power Output: 6.8 W/ft. (22 W/m) @ 68°F (20°C)
 5. Length: Cut to size – maximum single-element length 66 ft. (20 m)
 6. Terminal Board: T-BLOCK; if applicable
 7. Power Supply: Standard low voltage isolation transformer, including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500W; for up to 66 ft. (20 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 132 ft. (40 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 198 ft. (60 m) of heating element
 11. DC Controller: EPI-DC- M3, -M4
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- E. Low Voltage Floor Heating Products: **STEP RV** as manufactured by Electro Plastics.
1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wires, STEP crimp tool
 2. Heating Element Model: EP-30-36W-24V
 3. Width: 12 inches (305 mm)
 4. Power Output: 11 W/ft. (36 W/m) @ 68°F (20°C)
 5. Length: Cut to size – maximum single-element length 40 ft. (12.2 m)
 6. Terminal Board: T-BLOCK; if applicable
 7. Power Supply: Standard low voltage isolation transformer, including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V, or 230V, 50/60 Hz
 - b. Secondary voltage: 24V

8. Power Supply: EPI-LX-R-500W; for up to 40 ft. (12.2 m) of heating element
9. Power Supply: EPI-LX-R-1000W; for up to 81 ft. (24.7 m) of heating element
10. Power Supply: EPI-LX-R-1500W; for up to 122 ft. (37.2 m) of heating element
11. DC Controller: EPI-DC-M3
12. Thermostat: EPI-LX-TC
13. External Sensor: EPI-LX-TS

2.3 SNOW MELTING AND DEICING PRODUCTS

- A. Low Voltage Snow Melting and Deicing Products - General
 1. System: STEP Snowmelt and STEP Deicing as manufactured by Electro Plastics.
 2. Heating Element:
 - a. Voltage: 24V AC or DC from AC power supply or DC controller and alternative energy, e.g., solar panel or wind turbine.
 - b. Description: Heating element comes in a roll, cut to desired length on site and field-wires.
 - c. Materials: Flat, flexible, homogeneous, positive temperature coefficient (PTC) semi-conductive polymer.
 - d. Properties: Self-regulating, when the ambient temperature increases, the electrical resistance increases and the consumption of electricity decreases.
 - e. Heat Generation: Continuous, up to 104°F (60°C) without mechanically effected; melts above 248°F (120°C).
 - f. Thickness: 3/64 inch (1.2 mm).
 - g. Length: standard roll 174 feet (53 m) or customized.
 3. Compliance:
 - a. ETL listed, conforms to UL 1693 3rd Edition.
 - b. ETL listed, conforms to UL 5085-1 & 2.
 - c. ETL listed, conforms to CSA C22.2 No.66.1 & 2-06.
 - d. ETL/CE, conforms to EN 61558-2-2:2007.
 4. Certificates:
 - a. The Tile Council of America, test report number: TCA-248-03 - rated Extra Heavy according to ASTM C627.
 - b. Greener Product Certification Seal of Compliance.
 - c. Buy American Act - Certificate of Compliance
 - d. North American Free Trade Agreement - NAFTA Certified
 - e. American Bureau of Shipping - ABS Certificate No. 04-HS445756-1-PDA
- B. Low Voltage Snow Melting Products: **STEP Snowmelt-12"** as manufactured by Electro Plastics.
 1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wires, STEP crimp tool
 2. Heating Element Model: MEP-30-70W-24V
 3. Width: 12 inches (305 mm)
 4. Power Output: 24 W/ft. (78.8 W/m) @ 32°F (0°C)
 5. Length: Cut to size – maximum single-element length 18 ft. (5.5 m)
 6. Terminal Board: T-BLOCK; if applicable
 7. Power Supply: Standard low voltage isolation transformer including regulator and auxiliary low voltage circuit for operating thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V. 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500W; for up to 18 ft. (5.5 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 37 ft. (11.3 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 56 ft. (17.0 m) of heating element
 11. DC Controller: EPI-DC--M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- C. Low Voltage Snow Melting Products: **STEP Snowmelt-9"** as manufactured by Electro Plastics.

1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wire, STEP crimp tool
 2. Heating Element Model: MEP-23-80W-24V
 3. Width: 9 inches (230 mm)
 4. Power Output: 27 W/ft. (88.5 W/m) @ 32°F (0°C)
 5. Length: Cut to size – maximum single-element length 16 ft. (5 m)
 6. Terminal Board: T-BLOCK; if applicable
 7. Power Supply: Standard low voltage isolation transformer including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500W; for up to 16 ft. (4.9 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 33 ft. (10.1 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 50 ft. (15.2 m) of heating element
 11. DC Controller: EPI-DC-M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- D. Low Voltage Deicing Products: **STEP Roof Deicing-12"** as manufactured by Electro Plastics.
1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24V, stranded tinned copper wires, STEP crimp tool
 2. Heating Element Model: MEP-30-36W-24V
 3. Width: 12 inches (305 mm)
 4. Power Output: 13 W/ft. (42.6 W/m) @ 32°F (0°C)
 5. Length: Cut to size – maximum single-element length 34 ft. (10.4 m)
 6. Terminal Board: T-BLOCK; if applicable.
 7. Power Supply: Standard low voltage isolation transformer including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208 or 230V, 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500 W; for up to 34 ft. (10.4 m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 69 ft. (21 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 103 ft. (31.4 m) of heating element
 11. DC Controller: EPI-DC-M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS
- E. Low Voltage Deicing Products: **STEP Roof Deicing-9"** as manufactured by Electro Plastics.
1. Standard System Components: STEP Heating Element, STEP connector pack, STEP Power Supply 24 Volts, stranded tinned copper wire, STEP crimp tool
 2. Heating Element Model: MEP-23-36W-24V
 3. Width: 9 inches (230 mm)
 4. Power Output: 13 W/ft. (42.6 W/m) @ 32°F (0°C)
 5. Length: Cut to size – maximum single-element length 34 ft. (10.4 m)
 6. Terminal Board: T-BLOCK, if applicable
 7. Power Supply: Standard low voltage isolation transformer including regulator and auxiliary low voltage circuit for operation of thermostat or other control
 - a. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - b. Secondary voltage: 24V
 8. Power Supply: EPI-LX-R-500W; for up to 34 ft. (10.4m) of heating element
 9. Power Supply: EPI-LX-R-1000W; for up to 69 ft. (21.0 m) of heating element
 10. Power Supply: EPI-LX-R-1500W; for up to 103 ft. (31.4 m) of heating element
 11. DC Controller: EPI-DC-M3
 12. Thermostat: EPI-LX-TC
 13. External Sensor: EPI-LX-TS

2.4 POWER SUPPLY PRODUCTS

- A. Low Voltage Power Supply Series – General
1. System: STEP Power Supply as manufactured by Electro Plastics, Inc.
 2. SELV (Safety Extra-Low Voltage):
 - a. Description: Low voltage isolation power supply
 - b. Primary voltage: 120V, 208V or 230V, 50/60 Hz
 - c. Secondary voltage: 24 VAC
 - d. Efficiency: 96%
 - e. Insulation class: B (266 degrees F, 130 degrees C)
 - f. Enclosure: For indoor use only
 - g. Circuit protection: Built-in interface board with resettable circuit breakers on the primary and secondary sides
 - h. Power: Divided in circuits of maximum 500 Watts
 3. Regulator:
 - a. Built-in low voltage regulator board
 - b. Serves as an intelligent switch to enable/disable the line voltage in such a way that switching/pulsing does not harm the power supply's toroidal coil(s)
 - c. Has a unique parallel connection that reduces high starting current
 4. Design:
 - a. Made from extruded aluminum profiles providing high performance cooling structure as well as an enclosure eliminating air sound
 - b. Sound is reduced by the high quality winding of the coils
 - c. All vibrating parts are isolated, thereby eliminating transmittal of noise in the building structure
 5. Installation:
 - a. Mount in a vertical position (with load wires routing from bottom) so that heat is dissipated effectively
 - b. Must not be in contact with flammable materials or covered with an insulating material
- B. Low voltage Power Supply Series: EPI-LX-R and EPI-LX as manufactured by Electro Plastics.
1. EPI-LX-R-500W: 1 x 500W, with interface and regulator boards
 2. EPI-LX-R-1000W: 2 x 500W with interface and regulator boards
 3. EPI-LX-R-1500W: 3 x 500W with interface and regulator boards
 4. EPI-LX-500W: 1 x 500W, with interface board

2.5 CONTROL PRODUCTS

- A. Control Products: STEP Touch Thermostat as manufactured by Electro Plastics.
1. EPI-LX-TC: Low voltage thermostat
 2. EPI-LX-TS: External temperature sensor
 3. Control Modes:
 - a. Pos.1 C or F: Displays degrees in Celsius or Fahrenheit
 - b. Pos.2 or DIM: Display is lit or dimmed
 - c. Pos.3 or EXT: Displays the ambient or floor temperature when using an external temperature sensor
 - d. Pos.4 or SM: Interior or snowmelt with remote external temperature sensor
 4. Operation:
 - a. Can be used in conjunction with the AC Regulator or DC Controller
 - b. For space heating, use the ambient air temperature
 - c. For floor warming or in combination with another system, use with the external temperature sensor in the floor.
 - d. For snowmelt and deicing, use with the external temperature sensor to sense the exterior temperature
 - e. When settings are done the thermostat is operated by two touch buttons only; up or down or press both buttons simultaneously to switch the heating on/off

- E. Control Products: STEP AC Regulator as manufactured by Electro Plastics.
 - 1. Regulator board REG-EPI-211 built-in the STEP Power Supply EPI-LX-R
 - a. Primary voltage: 110V-120V or 208-240V
 - b. Secondary voltage: 24V
 - 2. Wiring:
 - a. Use a 3-conductor signal wire (red, green and black) from the regulator board to the thermostat
 - b. Unlimited STEP AC power supplies can be connected to one thermostat with a turn-on delay of 1.5 seconds between each power supply

- F. Control Products: STEP DC Controller as manufactured by Electro Plastics.
 - 1. Controller board REG-EPI-311 comes in an extruded aluminum enclosure
 - a. Voltage: 20 – 24 VDC
 - 2. Wiring:
 - a. Use a 3-conductor signal wire (red, green and black) from the controller board to the thermostat
 - b. Unlimited STEP DC controllers can be connected to one thermostat with a turn-on delay of 1.5 seconds between each power supply

3. PART 3 EXECUTION

3.1 PREPARATION

- A. Do not proceed with installation until substrates have been properly prepared and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- B. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
- C. Coordinate preparation and installation requirements and schedule with the general contractor and/or subcontractor before beginning work.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's written instructions and recommendations.
- B. Protect heating elements against site damage if there is a delay between product installation and covering installation.
- C. Repair or replace damaged products before Substantial Completion.
- D. Perform electrical measurements (voltage and amperage) for each section of system and record the as-built data after product installation but before covering the heating elements.
- E. Test system briefly after floor covering installation for function and integrity but do not place into full operation until concrete, mortar, grout and other coverings as applicable are fully cured per manufacturer specifications.
- F. Keep records of system products, test results, and photographs for as-built installation.

3.3 DOCUMENTATION AND TRAINING

- A. Contractor/installer shall present the Owner with equipment operational documentation, system layout and worksheets showing installation as-built.
- B. Complete and return the Warranty Registration card and check list.

END OF SECTION