ITS Intertek Testing Services

September 12, 1997

Mr. Scott Gwilliam
Heatwave Systems
4403 South 500th West
Murray UT 84123

Dear Scott:

Congratulations! Your product has met the stringent requirements of testing and factory inspection that make it eligible to bear one or more of ITS' product safety Listing Marks.

Now you can tell the world that it has been independently tested and certified for product safety. You may proudly display your Listed Mark in your advertising and sales literature, technical and user documents, on packaging, and in trade shows and promotions.

The more you show the mark, the more it can help, so place it wherever you market or merchandise your product.

This package of materials includes a few simple rules for the use of your Listed Mark and camera-ready artwork of that mark.

If you have questions that are not covered within these materials, you can call your local Intertek Testing Services office for guidance, or call 1-800-WORLDLAB (outside North America, call +1-607-758-6443) and ask to be connected to the Marketing Department for a Listed Mark usage question. Or fax your design and query to +1-978-689-9408.

Thank you for choosing Intertek Testing Services and our worldwide family of product testing, inspection and certification laboratories.

Sincerely,

Sarah Hood

Sarah Hood
ITS Marketing

enc: Listee Package

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Intertek Testing Services NA Inc.
One Tech Drive, Andover, MA 01810
Telephone 508-689-9353 Fax 508-689-9408 http://www.itsqswest.com

ITS Intertek Testing Services

September 30, 1997

Mr. Scott Gwilliam
Heatwave Systems, Inc.
4403 S 500 W
Murray, UT 84123

ph: 801-293-1232
fx: 801-293-3077

Subject: LTO # J97018160 Report No. J97018160-001

Dear Mr. Gwilliam:

This is to confirm that Intertek Testing Services has completed our evaluation of your Radiant Heating and Snow Melting Systems Model Cable Heater E101 and Screen Heater E102.

Enclosed is one copy of your Report and Procedural Guide for your records. Copies of these documents will be sent to the ETL Field Representative for use at the time of the Initial Plant Inspection. Please be advised that any distribution of copies to participant and manufacturer(s) is your responsibility.

As a Participant, you are not authorized by the Certification & Surveillance Services Dept. to apply the ETL Listing Mark/Labels to be applicable models at the manufacturing locations(s) listed on the Procedure Guide until you have complied with all requirements of follow-up services including: (1) successfully completed an Initial Plant Inspection, and (2) returned signed copies of the Listing, Labeling and Follow-Up Service Agreements for yourself, as Participant, and all Manufacturing Locations.

For Information on Scheduling the Initial Plant Inspection or the Listing, Labeling, and Follow-Up Service Agreements, contact:

Certification & Surveillance Services Dept.
ETL Testing Laboratories
3933 U.S. Route 11
Cortland, NY 13045
Ph: 800/345-3851
Fx: 607/756-9891

Your continued interest in ETL's services is appreciated. Please contact us if you have questions.

Sincerely,

Josh Derethi
Engineering Team Leader
Portland Office

Manufacturing Location:
Same As Above

cc: Certification & Surveillance Service Office, Cortland, NY USA

ETL TESTING LABORATORIES, INC.
3003 SW 153RD AVE, SUITE 212 BEAVERTON, OR 97006

LISTING REPORT NO. J97018160-001

INSPECTION, TESTING AND EVALUATION
OF HEATING CABLE AND HEATING SCREEN

RENDERED TO
HEAT WAVE SYSTEMS, INC.
MURREY, UTAH

GENERAL:

This report gives results of the evaluation of Radiant Heating and Snow Melting Systems, Model Cable heater E101, and Screen Heater, Model E102 for conformance with the requirements of the Standard for Safety Electric Radiant Heating Panel and Heating Panel Set (UL-1693, 1ST Edition, Dated December 11, 1996)

The samples were provided by the client and tested at the client facility in Murray, Utah and at our office in Layton, Utah, commencing on August 7, 1997, and concluding September 19, 1997.

Radiant Heating Panel and Heating Panel Set - Category # 531

Participant: Heatwave Systems, Inc.
4403 S. 500 W.
Murray, Utah 84123

Manufacturer: Same as Participant

Contact Name: Scott Gwilliam
Phone: (801) 293-1232
Fax: (801) 293-3077

PRODUCT COVERED:

Radiant Heating and Snow Melting Systems, Model Cable heater E101, and Screen Heater, Model E102.

PRODUCT DESCRIPTION:

The heating and snow melting systems are low voltage (< 60 Vac). It is intended to be embedded in concrete, on concrete, within subfloors, and under any type of floor covering and installed in accordance with applicable articles 424 and 426 of the NEC.

The systems consists of a solid state control board which monitors ambient temperature, heating element current, and transformer temperature. Protection is provided for overcurrent, under current, high transformer temperature, arcing and shorting of the thermistor. The system utilized 2 AWG THHN copper wire from the transformer to the heating element E101, which is 10 AWG THHN copper wire embedded in the concrete, 2 in. from the surface, spread 6 in. apart. For additional information and proper parts list, see installation manual in the illustration instruction of this report.

The systems described above is the same for the screen heating element (E102). The screen heating element is installed on concrete, on wood subfloor, under any type of floor covering to. The screen element is bronze mesh 12 inch wide and can be spraced 2 to 12 inch apart.

ELECTRICAL RATINGS:

The system model E101 is powered by 3 or 6 KVA isolation transformer with a secondary operating range of 20 to 30 volts, and 52 to 60 volts respectively. Current range is between 80 and 90 Amps for the 3 KVA systems and 80-100 amps for the 6 KVA system. See illustration for additional specification for the transformer and systems.

The system model E102 is powered by 3 KVA isolation transformer with a secondary operating range of 20 to 30 volts, current range is between 80 and 90 Amps. See illustration for additional specification for the transformer and systems.

Model #	Primary Rating	Primary Rating	
Model Cable heater E101	208/240 Vac, 28.8/25 Amp 3 phase, 60 Hz.	Maximum Load Maximum Voltage Maximum Current	6000 VA 59.1 Vac 100 Amps
Model Screen heater E102	208/240 Vac, 14.4/12.6 Amp 3 phase, 60 Hz.	Maximum Load Maximum Voltage Maximum Current	2700 VA 30 Vac 90 Amps

CONCLUSION

A representative sample of the Radiant Heating and Snow Melting Systems, Model Cable heater E101, and Screen Heater, Model E102 have been evaluated and subjected to the tests noted below, and found to comply with the applicable requirements of the standard reference on page 1.

TEST	RESULTS
Power Input Test	Pass
Normal Temperature Test	Pass
Abnormal Temperature Test	Pass
Contact Loss Test	Pass
Dielectric Voltage Withstand Test (Dry)	Pass
Dielectric Voltage Withstand Test (In Water)	Pass
Cold Bend Test	Pass
Mechanical Abuse Test	Pass
Stretch Test	Pass
Concrete Slab Test	Pass
Non-heating Conductor Overload	Pass

The products covered by this report will appear in the Directory of ETL listed Product as shown below:

CATEGORY # 531 - Radiant Heating Panel and Heating Panel Set

Radiant Heating and Snow Melting Systems, Model Cable heater E101, and Screen Heater, Model E102 for

Heatwave Systems, Inc.
4403 S. 500 W.
Murray, Utah 84123

In Charge of Testing:

David Abuobaid
Engineering Manager
Utah Office

Reviewed By:

Josh Dereini
Engineering Team Leader
Portland Office

HEATIZON SYSTEMS
4403 South 500 West, Murray, Utah 84123 • Phone: 801-293-1232 • FAX: 801-293-3077

SECTION XXXXX - LOW-VOLTAGE ELECTRIC RADIANT HEATING AND/OR FLOOR WARMING

Part 1 - General

1.1 SUMMARY:

1.1.1 Furnish and install low-voltage electric screen-type heating element as specified herein.

1.1.2 Applications for low-voltage electric heating elements required for this project include the following:

1.1.2.1 Radiant space heating of structures
1.1.2.2 Floor warming
1.1.2.3 Floor drying

1.1.3 Related Sections - Other Division 16 sections for wire/cable, electrical raceways, boxes, fittings and wiring devices which are required in conjunction with low-voltage electric heating cables; not work of this section.

1.2 SUBMITTALS:

1.2.1 Product Data: Submit manufacturer's technical product data and installation instructions for low-voltage electric screen heating element systems.

1.2.2 Wiring Diagrams to Include:

1.2.2.1 Locations for activation devices
1.2.2.2 Location of low-voltage heating element step-down transformer and control box
1.2.2.3 Cold-lead cable runs from transformer to heating element connection points
1.2.2.4 Heating element layout and spacing
1.2.2.5 Cold-lead jumpers from one heated area to another
1.2.2.6 Connections between cold-lead and heating element
1.2.2.7 Low-voltage wiring between control box and activation device
1.2.2.8 Location of floor temperature sensors
1.2.2.9 Low-voltage wiring between sensor(s) and activation device(s)
1.2.2.10 Differentiate between:
a. Control wiring
b. Heating element
c. Cold-lead
d. Branch-circuit wiring
1.2.2.11 Differentiate between zones of heating element

1.3 QUALITY ASSURANCE:

1.3.1 Manufacturer's Qualifications: Firms regularly engaged in manufacturing of electric heating cables, of type, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than five years.

1.3.2 Installer's Qualifications: firms with at least two years of successful installation experience with projects utilizing electric screen heating element work similar to that required for this project.

1.3.3 Codes and Standards:

1.3.3.1 Electrical Code Compliance: comply with applicable local electrical code requirements of the authority having jurisdiction.

1.3.3.2 Provide products that are listed and/or recognized and labeled by a Nationally Recognized Testing Laboratory (NRTL) such as ETL, CSA and UL.

1.4 DELIVERY, STORAGE AND HANDLING:

1.4.1 Products and materials should be delivered, stored and handled as per manufacturer's recommendations.

1.4.2 Damaged materials should be removed from the job site and replaced with new.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.1.1 Subject to compliance with requirements, provide low-voltage electric cable heating, system components for radiant heating and/or floor warming applications.

2.1.1.1 Heatizon Systems, L.L.C.

2.2 LOW-VOLTAGE ELECTRIC SCREEN HEATING ELEMENT SYSTEM

2.2.1 LOW-VOLTAGE SCREEN HEATING ELEMENT:

2.2.1.1 Screen heating element shall be rated for operating at a variable output of 0-12 watts per linear foot.

2.2.1.2 Maximum operating voltage is 0.1262 volts per linear foot of heating element.

2.2.1.3 Operating voltage not to exceed 30.3 volts. Heating element operating temperature not to exceed 90° C.

2.2.1.4 Screen element thickness not to exceed 0.020".

2.2.1.5 Heating element shall be rated for installation on wood or concrete-based subfloor.

2.2.1.6 Element shall allow for penetrations by screws, nails and staples so long as they don't contact any other metallic objects.

2.2.1.7 Shall be of a corrosion-resistant material.

2.2.1.8 Maximum length of element on one circuit is 250 feet.

2.2.2 LOW-VOLTAGE ELECTRIC HEATING ELEMENT TRANSFORMER AND CONTROL BOX:

2.2.2.1 Power Transformer: Provide a power transformer that is properly sized such that the cable heating element operates between 90-100 amps. Transformer is to be multi-tapped on the primary side to allow for operation with supply of 120/208/240 volts. Power transformer to be multi-tapped on the secondary side to allow for proper operation when operating a range of heating element lengths.

2.2.2.2 Control Unit: Provide a control unit that "soft starts" the transformer, monitors the overall system for proper operation, interfaces with the activation device, monitors the overall system for safe operation, shuts the system off in the event of any fault. Provides a means of identifying faults and fault status. Is fitted with a power service disconnect rated for its operating range.

2.2.3 ACTIVATION DEVICE(S): Provide a suitable activation device with a dry contact rated for 1 amp and 250 volts AC. Devices which may be used, but are not limited to:

2.2.3.1 Heatizon - M315 - Thermostat - Ivory
2.2.3.2 Heatizon - M315H -Thermostat - White
2.2.3.3 Heatizon - M317 - Thermostat - Digital Slimline (requires M313)
2.2.3.4 Heatizon - M318 - Thermostat - Programmable Slimline (requires M313)
2.2.3.5 Heatizon - M320 - Sensor - Remote Bulb Temperature
2.2.3.6 Heatizon - M321 - Thermostat - Programmable
2.2.3.7 Heatizon - M322 - Controller - Floor Temperature
2.2.3.8 Heatizon - M323 - Timer - 24 hour Programmable
2.2.3.9 Heatizon - M325D - Timer - 12 hour Mechanical with Hold
2.2.3.10 Heatizon - M330 -Floorstat - FWT-1

2.2.4 SYSTEM ACCESSORIES:

2.2.4.1 E216 - Wall Plate
2.2.4.2 E219 - Jumper Plate

PART 3 - EXECUTION:

3.1 SITE EXAMINATION AND PREPARATION:

3.1.1 Examine areas where heating element is to be installed and notify contractor in writing of conditions detrimental to proper completion of work.

3.2 INSTALLATION OF HEATING SYSTEM

3.2.1 Rough-in of Cold Lead and all Control Wiring: Install cold-lead cables for each zone - routed from transformer location to termination point of heating element, as per manufacturer's installation instructions and in accordance with appropriate local codes. Install control wiring between sensors, activation devices and control units as per manufacturer's installation instructions and appropriate local codes or standards. Label both ends of all co

3.2.2 Install Low-voltage Screen Heating Element: Plan layout of screen element as per manufacturer's installation instructions. Install cable element, beginning and ending at cold-lead locations, spacing and attaching element as per installation instructions. Make connections between screen element and cold lead as per manufacturer's installation instructions.

If a floor sensor is to be used, it should be installed at the same time as the screen heating element as per manufacturer's installation instructions.

The floor covering is to be installed as soon as possible after screen element installation.

3.2.3 Install Control Unit and Transformer: Install control unit(s) and transformer(s) and make all electrical connections [illegible]

3.2.4 Install and wire activation devices as per manufacturer's installation instructions.

3.3 GROUNDING:

3.3.1 Provide equipment grounding connections for electric heating cables as indicated. Tighten connections to comply with tightening torque specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL:

3.4.1 Check each screen element system for electrical continuity of element and check for electrical isolation of element to ground and any metallic materials near cable heating element.

3.4.2 Energize system, make any adjustments required by the manufacturer and demonstrate system operation. Demonstrate proper operation of activation devices.

End of Section - Low-voltage Electric Radiant Heating and/or Floor Warming

HEATIZON SYSTEMS

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SECTION XXXXX - LOW-VOLTAGE ELECTRIC ROOF DE-ICING AND/OR SNOW-MELTING USING 9" OR 12" WIDE SCREEN HEATING ELEMENT

PART 1 - GENERAL

1.1 SUMMARY:

1.1.1 Furnish and install low-voltage electric screen-type heating element as specified herein.

1.1.2 Applications for low-voltage electric heating elements required for this project include the following:

- 1.1.2.1 Roof de-icing
- 1.1.2.2 Eave de-icing
- 1.1.2.3 Valley de-icing

1.1.3 Related Sections - Other Division 16 sections for wire/cable, electrical raceways, boxes, fittings and wiring devices which are required in conjunction with low-voltage electric heating cables; not work of this section.

1.2 SUBMITTALS:

1.2.1 Product Data: Submit manufacturer's technical product data and installation instructions for low-voltage electric screen heating element systems.

1.2.2 Wiring Diagrams to Include:

- 1.2.2.1 Locations for activation devices
- 1.2.2.2 Location of low-voltage heating element step-down transformer and control box
- 1.2.2.3 Cold-lead cable runs from transformer to heating element connection points
- 1.2.2.4 Heating element layout and spacing
- 1.2.2.5 Cold-lead jumpers from one heated area to another
- 1.2.2.6 Connections between cold-lead and heating element
- 1.2.2.7 Low-voltage wiring between control box and activation device
- 1.2.2.8 Location of floor temperature sensors
- 1.2.2.9 Low-voltage wiring between sensor(s) and activation device(s)
- 1.2.2.10 Differentiate between:
  - a. Control wiring
  - b. Heating element
  - c. Cold-lead
  - d. Branch-circuit wiring
- 1.2.2.11 Differentiate between zones of heating element

1.3 QUALITY ASSURANCE:

1.3.1 Manufacturer's Qualifications: Firms regularly engaged in manufacturing of electric heating cables, of type, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than five years.

1.3.2 Installer's Qualifications: Firms with at least two years of successful installation experience with projects utilizing electric screen heating element work similar to that required for this project.

1.3.3 Codes and Standards:

1.3.3.1 Electrical Code Compliance: comply with applicable local electrical code requirements of the authority having jurisdiction.

1.3.3.2 Provide products that are listed and/or recognized and labeled by a Nationally Recognized Testing Laboratory (NRTL) such as ETL, CSA and UL.

1.4 DELIVERY, STORAGE AND HANDLING:

1.4.1 Products and materials should be delivered, stored and handled as per manufacturer's recommendations.

1.4.2 Damaged materials should be removed from the job site and replaced with new.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.1.1 Subject to compliance with requirements, provide low-voltage electric cable heating system components for radiant heating and/or floor warming applications.

2.1.1.1 Heatizon Systems, L.L.C.

2.2 LOW-VOLTAGE ELECTRIC SCREEN HEATING ELEMENT SYSTEM

2.2.1 LOW-VOLTAGE SCREEN HEATING ELEMENT:

2.2.1.1 Screen heating element shall be rated for operating at a variable output of 0-12 watts per linear foot.

2.2.1.2 Maximum operating voltage is 0.1262 volts per linear foot of heating element.

2.2.1.3 Operating voltage not to exceed 30.3 volts. Heating element operating temperature not to exceed 90° C.

2.2.1.4 Screen element thickness not to exceed 0.020".

2.2.1.5 Heating element shall be rated for installation on wood or concrete-based subsurface.

2.2.1.6 Element shall allow for penetrations by screws, nails and staples so long as they don't contact any other metallic objects.

2.2.1.7 Shall be of a corrosion-resistant material.

2.2.1.8 Maximum length of element on one circuit is 250 feet.

2.2.2 LOW-VOLTAGE ELECTRIC HEATING ELEMENT TRANSFORMER AND CONTROL BOX:

2.2.2.1 Power Transformer: Provide a power transformer that is properly sized such that the cable heating element operates between 90-100 amps. Transformer is to be multi-tapped on the primary side to allow for operation with supply of 120/208/240 volts. Power transformer to be multi-tapped on the secondary side to allow for proper operation when operating a range of heating element lengths.

2.2.2.2 Control Unit: Provide a control unit that "soft starts" the transformer, monitors the overall system for proper operation, interfaces with the activation device, monitors the overall system for safe operation, shuts the system off in the event of any fault. Provides a means of identifying faults and fault status. Is fitted with a power service disconnect rated for its operating range.

2.2.3 ACTIVATION DEVICE(S): Provide a suitable activation device with a dry contact rated for 1 amp and 250 volts AC. Devices which may be used, but are not limited to:

2.2.3.1 Heatizon - M320 - Sensor - Remote Bulb Temperature
2.2.3.2 Heatizon - M322 - Controller - Temperature
2.2.3.3 Heatizon - M323 - Timer - 24 hour Programmable
2.2.3.4 Heatizon - M325D - Timer - 12 hour Mechanical with Hold
2.2.3.5 Heatizon - M326 - Sensor - Aerial Mounted Temperature/Moisture (requires M329)
2.2.3.6 Heatizon - M329 - Selector Box

2.2.4 SYSTEM ACCESSORIES:

2.2.4.1 E216 - Wall Plate
2.2.4.2 E219 - Jumper Plate

PART 3 - EXECUTION:

3.1 SITE EXAMINATION AND PREPARATION:

3.1.1 Examine areas where heating element is to be installed and notify contractor in writing of conditions detrimental to proper completion of work.

3.2 INSTALLATION OF HEATING SYSTEM

3.2.1 Rough-in of Cold Lead and all Control Wiring: Install cold-lead cables for each zone - routed from transformer location to termination point of heating element, as per manufacturer's installation instructions and in accordance with appropriate local codes. Install control wiring between sensors, activation devices and control units as per manufacturer's installation instructions and appropriate local codes or standards. Label both ends of all cold-leads and control wires.

3.2.2 Install Low-voltage Screen Heating Element: Plan layout of screen element as per manufacturer's installation instructions. Install moisture barrier on the subsurface everywhere that screen heating element is to be installed. Install screen element, beginning and ending at cold-lead locations, spacing and attaching element as per installation instructions. Install a moisture barrier over all of the screen heating element, such that the element is now sandwiched in a water-tight barrier. Make connections between screen element and cold lead as per manufacturer's installation instructions.

Screen element shall not come into contact with any metallic objects that may short out the system.

3.2.3 Install Control Unit and Transformer: Install control unit(s) and transformer(s) and make all electrical connections as per manufacturer's installation instructions.

3.2.4 Install and wire activation devices as per manufacturer's installation instructions.

3.3 GROUNDING:

3.3.1 Provide equipment grounding connections for electric heating cables as indicated. Tighten connections to comply with tightening torque specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL:

3.4.1 Check each screen element system for electrical continuity of element and check for electrical isolation of element to ground and any metallic materials near cable heating element. Areas of concern are valley metal, metal drip edge, flashings or fasteners that might contact the screen element and any of these surfaces.

3.4.2 Energize system, make any adjustments required by the manufacturer and demonstrate system operation. Demonstrate proper operation of activation devices.

END OF SECTION - LOW-VOLTAGE ELECTRIC ROOF DE-ICING AND/OR SNOW-MELTING USING 9" OR 12" WIDE SCREEN HEATING ELEMENT

HEATIZON SYSTEMS

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SECTION 16846 - LOW-VOLTAGE ELECTRIC SNOW-MELTING IN NEW POUR CONCRETE

PART 1 - GENERAL

1.1 SUMMARY:

1.1.1 Furnish and install low-voltage electric cable snow-melting system in concrete as specified herein.

1.1.2 Applications for low-voltage electric heating cables required for this project include the following:

1.1.2.1 Melting of falling or fallen snow
1.1.2.2 Melting of ice formed on concrete from drifting and melting snow, roof drains, snow from vehicles, etc.

1.1.3 Related Sections - Other Division 16 sections for wire/cable, electrical raceways, boxes, fittings and wiring devices which are required in conjunction with low-voltage electric heating cables; not work of this section.

1.2 SUBMITTALS:

1.2.1 Product Data: Submit manufacturer's technical product data and installation instructions for low-voltage electric heating cable.

1.2.2 Wiring Diagrams to Include:

1.2.2.1 Locations for activation devices
1.2.2.2 Location of low-voltage heating cable step-down transformer and control box
1.2.2.3 Cold-lead cable runs from transformer to heating element connection points
1.2.2.4 Heating element layout and spacing
1.2.2.5 Cold-lead jumpers through concrete expansion joints
1.2.2.6 Connections between cold-lead and heating element
1.2.2.7 Low-voltage wiring between control box and activation device
1.2.2.8 Location of aerial or slab-mounted temperature/moisture sensor(s)
1.2.2.9 Low-voltage wiring between sensor(s) and activation device(s)
1.2.2.10 Differentiate between:
a. Control wiring
b. Heating element
c. Cold-lead
d. Branch-circuit wiring
1.2.2.11 Differentiate between zones of heating eleme[illegible]

1.3 QUALITY ASSURANCE:

1.3.1 Manufacturer's Qualifications: Firms regularly engaged in manufacturing of electric heating cables, of type, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than five years.

1.3.2 Installer's Qualifications: Firms with at least two years of successful installation experience with projects utilizing electric heating cable work similar to that required for this project.

1.3.3 Codes and Standards:

1.3.3.1 Electrical Code Compliance: comply with applicable local electrical code requirements of the authority having jurisdiction.

1.3.3.2 Provide products that are listed and/or recognized and labeled by a Nationally Recognized Testing Laboratory (NRTL) such as ETL, CSA and UL.

1.4 DELIVERY, STORAGE AND HANDLING:

1.4.1 Products and materials should be delivered, stored and handled as per manufacturer's recommendations.

1.4.2 Damaged materials should be removed from the job site and replaced with new.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

2.1.1 Subject to compliance with requirements, provide low-voltage electric cable heating system components for in-concrete snow/ice-melting applications.

2.1.1.1 Heatizon Systems, L.L.C.

2.2 LOW-VOLTAGE ELECTRIC HEATING CABLE SYSTEM

2.2.1 IN-CONCRETE LOW-VOLTAGE SNOW/ICE-MELTING CABLE: Cable shall be rated for operating at a variable output of 0-12 watts per linear foot. Maximum operating voltage is 0.118 volts per linear foot of heating element. Maximum element is not to exceed 65.5 volts. Heating element operating temperature not to exceed 80° C.

2.2.2 LOW-VOLTAGE ELECTRIC HEATING CABLE TRANSFORMER AND CONTROL BOX:

2.2.2.1 Power Transformer: Provide a power transformer that is properly sized such that the cable heating element operates between 90-100 amps. Transformer is to be multi-tapped on the primary side to allow for operation of supply of 208 or 240 volts. Power transformer to be multi-tapped on the secondary side to allow for proper operation when operating a range of heating element lengths.

2.2.2.2 Control Unit: Provide a control unit that "soft starts" the transformer, monitors the overall system for proper operation, interfaces with the activation device, monitors the overall system for safe operation, shuts the system off in the event of any fault. Provides a means of faults and fault status. Is fitted with a power service disconnect rated for its operating range.

2.2.3 ACTIVATION DEVICE(S): Provide a suitable activation device with a dry contact rated for 1 amp and 250 volts AC. Devices which may be used, but are not limited to:

2.2.3.1 Heatizon - M333 - Controller - Slab Temperature (requires M329)
2.2.2.2 Heatizon - M320 - Sensor - Remote Bulb Temperature
2.2.2.3 Heatizon - M331 - Pavement Mounted Snow Switch (requires M329)
2.2.2.4 Heatizon - M326 - Aerial Mounted Snow Switch (requires M329)
2.2.2.5 Heatizon - M329 - Selector Box - 1 to 4 zone control of areas
2.2.2.6 Heatizon - M323 - Timer - 24 hour Programmable
2.2.2.7 Heatizon - M325D - Timer - 12 hour Mechanical with Hold

2.2.4 SYSTEM ACCESSORIES:

2.2.4.1 Insulation: Provide ¾" or 1" thick extruded polystyrene insulation below concrete slab prior to concrete pour rated at the appropriate mechanical properties.

2.2.4.2 Remesh - Welded Wire Fabric: Provide welded wire fabric of the appropriate pattern and gauge to accommodate the spacing of the heating element. This is used for holding heating element in place while concrete is poured.

PART 3 - EXECUTION:

3.1 SITE EXAMINATION AND PREPARATION:

3.1.1 Examine areas where heating element is to be installed and notify contractor in writing of conditions detrimental to proper completion of work.

3.2 INSTALLATION OF HEATING SYSTEM

3.2.1 Rough-in of Cold-lead and all Control Wiring: Install cold-lead cables for each zone - routed from transformer location to termination point of heating element in the concrete slab, as per manufacturer' s installation instructions and in accordance with appropriate local codes. Install control wiring between sensors, activation devices and control units as per manufacturer' s installation instructions and appropriate local codes or standards. Label both ends of all cold-leads and control wires.

3.2.2 Install Low-voltage Cable Heating Element: Install insulation on grade and remesh on insulation. Tie remesh together with wire ties. Plan layout of cable element as per manufacturer' s installation instructions. Install cable element, beginning and ending at cold-lead locations, spacing and attaching element as per installation instructions. Make connections between cable element and cold-lead as per manufacturer's installation instructions.

If an in-concrete sensor is to be used, it should be installed at the same time as the cable heating element as per manufacturer' s installation instructions.

The remesh with cable element attached should be placed on chairs such that it will be 1 ½" – 2" below the finished surface of the concrete slab.

3.2.3 Install Control Unit and Transformer: Install control unit(s) and transformer(s) and make all electrical connections as per manufacturer' s installation instructions.

3.2.4 Install and wire activation devices as per manufacturer's installation instructions.

3.3 GROUNDING:

3.3.1 Provide equipment grounding connections for electric heating cables as indicated. Tighten connections to comply with tightening torque specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL:

3.4.1 Immediately prior to and immediately following concrete pour, check each cable element system for electrical continuity and check for electrical isolation (resistance) to ground and any metallic materials near cable heating element.

3.4.2 Energize system, make any adjustments required by the manufacturer and demonstrate system operation. Demonstrate proper operation of activation devices.

END OF SECTION 16856 - LOW-VOLTAGE ELECTRIC SNOW-MELTING IN NEW POUR CONCRETE

HEATIZON SYSTEMS
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SECTION XXXXX - LOW-VOLTAGE ELECTRIC SNOW-MELTING IN EXISTING CONCRETE OR ASPHALT

PART 1 - GENERAL

1.1 SUMMARY:

1.1.1 Furnish and install low-voltage electric cable snow-melting system in existing concrete or asphalt as specified herein.

1.1.2 Applications for low-voltage electric heating cables required for this project include the following:

1.1.2.1 Melting of falling or fallen snow
1.1.2.2 Melting of ice formed on concrete from drifting and melting snow, roof drains, snow from vehicles, etc.

1.1.3 Related Sections - Other Division 16 sections for wire/cable, electrical raceways, boxes, fittings and wiring devices which are required in conjunction with low-voltage electric heating cables; not work of this section.

1.2 SUBMITTALS:

1.2.1 Product Data: Submit manufacturer's technical product data and installation instructions for low-voltage electric heating cable.

1.2.2 Wiring Diagrams to Include:

1.2.2.1 Locations for activation devices
1.2.2.2 Location of low-voltage heating cable step-down transformer and control box
1.2.2.3 Cold-lead cable runs from transformer to heating element connection points
1.2.2.4 Heating element layout and spacing
1.2.2.5 Cold-lead jumpers between non-adjacent areas
1.2.2.6 Connections between cold-lead and heating element
1.2.2.7 Low-voltage wiring between control box and activation device
1.2.2.8 Location of aerial or slab-mounted temperature/moisture sensor(s)
1.2.2.9 Low-voltage wiring between sensor(s) and activation device(s)
1.2.2.10 Differentiate between:
a. Control wiring
b. Heating element
c. Cold-lead
d. Branch-circuit wiring
1.2.2.11 Differentiate between zones of heating element

1.3 QUALITY ASSURANCE:

1.3.1 Manufacturer's Qualifications: Firms regularly engaged in manufacturing of electric heating cables, of type, sizes and ratings required, whose products have been in satisfactory use in similar service for not less than five years.

1.3.2 Installer's Qualifications: firms with at least two years of successful installation experience with projects utilizing electric heating cable work similar to that required for this project.

1.3.3 Codes and Standards:

1.3.3.1 Electrical Code Compliance: comply with applicable local electrical code requirements of the authority having jurisdiction.

1.3.3.2 Provide products that are listed and/or recognized and labeled by a Nationally Recognized Testing Laboratory (NRTL) such as ETL, CSA and UL.

1.4 DELIVERY, STORAGE AND HANDLING:

1.4.1 Products and materials should be delivered, stored and handled as per manufacturer's recommendations.

1.4.2 Damaged materials should be removed from the job site and replaced with new.

Part 2 - Products

2.1 MANUFACTURERS

2.1.1 Subject to compliance with requirements, provide low-voltage electric cable heating system components for existing concrete or asphalt snow/ice-melting applications.

2.1.1.1 Heatizon Systems, L.L.C.

2.2 LOW-VOLTAGE ELECTRIC HEATING CABLE SYSTEM

2.2.1 IN-CONCRETE LOW-VOLTAGE SNOW/ICE-MELTING CABLE: Cable shall be rated for operating at a variable output of 0-12 watts per linear foot. Maximum operating voltage is 0.118 volts per linear foot of heating element. Maximum element is not to exceed 65.5 volts. Heating element operating temperature not to exceed 80° C.

2.2.2 LOW-VOLTAGE ELECTRIC HEATING CABLE TRANSFORMER AND CONTROL BOX:

2.2.2.1 Power Transformer: Provide a power transformer that is properly sized such that the cable heating element operates between 90-100 amps. Transformer is to be multi-tapped on the primary side to allow for operation of supply of 208 or 240 volts. Power transformer to be multi-tapped on the secondary side to allow for proper operation when operating a range of heating element lengths.

2.2.2.2 Control Unit: Provide a control unit that "soft starts" the transformer, monitors the overall system for proper operation, interfaces with the activation device, monitors the overall system for safe operation, shuts the system off in the event of any fault. Provides a means of faults and fault status. Is fitted with a power service disconnect rated for its operating range.

2.2.3 ACTIVATION DEVICE(S): Provide a suitable activation device with a dry contact rated for 1 amp and 250 volts AC. Devices which may be used, but are not limited to:

2.2.3.1 Heatizon - M333 - Controller - Slab Temperature (requires M329)
2.2.2.2 Heatizon - M320 - Sensor - Remote Bulb Temperature
2.2.2.3 Heatizon - M331 - Pavement Mounted Snow Switch (requires M329)
2.2.2.4 Heatizon - M326 - Aerial Mounted Snow Switch (requires M329)
2.2.2.5 Heatizon - M329 - Selector Box - 1 to 4 zone control of areas
2.2.2.6 Heatizon - M323 - Timer - 24 hour Programmable
2.2.2.7 Heatizon - M325D - Timer - 12 hour Mechanical with Hold

Part 3 - Execution:

3.1 SITE EXAMINATION AND PREPARATION:

3.1.1 Examine areas where heating element is to be installed and notify contractor in writing of conditions detrimental to proper completion of work.

3.2 INSTALLATION OF HEATING SYSTEM

3.2.1 Rough-in of Cold Lead and all Control Wiring: Install cold-lead cables for each zone - routed from transformer location to termination point of heating element in the concrete slab, as per manufacturer's installation instructions and in accordance with appropriate local codes. Install control wiring between sensors, activation devices and control units as per manufacturer's installation instructions and appropriate local codes or standards. Label both ends of all cold-leads and control wires.

3.2.2 Mark concrete or asphalt for saw cutting - mark surface using chalk line. Spacing between adjacent runs should be as per manufacturer's recommendations based upon required heat density. A cut-out, 4" x 4" x 3" deep should be made for each cold lead/heating element joint. Pattern must allow for continuous run of heating element without crossing itself and ending at junction points. Clear coat the chalk lines with acrylic lacquer after chalking is complete.

3.2.3 Saw cut concrete or asphalt for cable heating element and cold leads. Cuts for cable heating element are to be ¼" wide by 1" deep. Where ever saw cuts join to make a turn, the saw cuts must overlap by 2r-1 where "r" is the radius of the saw blade. Cuts for cold lead are to be ½" wide x 1½" deep.

3.2.4 Install Low-voltage Cable Heating Element: Install cable element in saw cuts beginning and ending at cold-lead locations. Make connections between cable element and cold-lead as per manufacturer's installation instructions.

If an in-concrete sensor is to be used, it should be installed at the same time as the cable heating element as per manufacturer's installation instructions.

3.2.5 Caulk or seal coat saw cuts after element is installed.

3.2.6 Install Control Unit and Transformer: Install control unit(s) and transformer(s) and make all electrical connections as per manufacturer's installation instructions.

3.2.7 Install and wire activation devices as per manufacturer's installation instructions.

3.3 GROUNDING:

3.3.1 Provide equipment grounding connections for electric heating cables as indicated. Tighten connections to comply with tightening torque specified in UL Standard 486A.

3.4 FIELD QUALITY CONTROL:

3.4.1 Check for exposed heating element. Cable heating element should be completely embedded.

3.4.2 Energize system, make any adjustments required by the manufacturer and demonstrate system operation. Demonstrate proper operation of activation devices.

END OF SECTION - LOW-VOLTAGE ELECTRIC SNOW-MELTING IN EXISTING CONCRETE OR ASPHALT