Raychem HTS

ElectroMelt System

DESIGN GUIDE

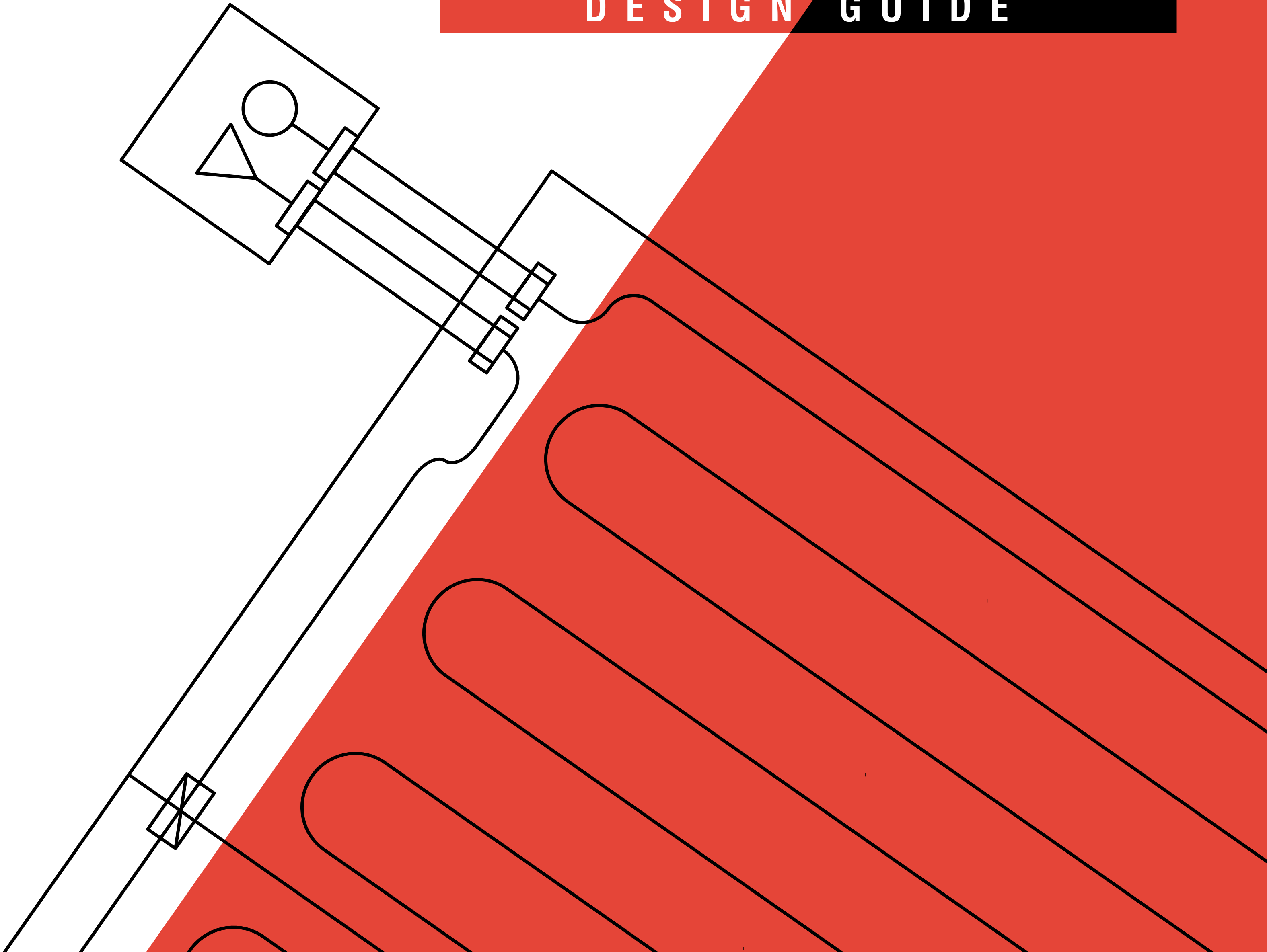


Table of Contents

Introduction

Overview

This guide presents Raychem's recommendations for designing an ElectroMelt snow-melting and anti-icing system for use in concrete pavement. Do not use the ElectroMelt system buried in asphalt.

⚠ **WARNING: ElectroMelt heating cable and associated system components are electrical devices that must be designed and installed properly. Follow all design, installation, assembly, and test instructions to ensure proper operation and to prevent shock or fire. Warnings are highlighted with ⚠ in the manual.**

Following these recommendations will result in a reliable, energy-efficient system. For information regarding other heat-tracing applications, contact your Raychem representative.

How to Use This Guide

The ElectroMelt System Design Guide provides instructions to all engineering disciplines and trades involved in the design and installation of an ElectroMelt System. It provides design and performance data, electrical sizing information, and heating-cable layout suggestions.

If you still have questions concerning the design of an ElectroMelt system after reading this design guide, contact your Raychem representative. For instructions on installing an ElectroMelt system be sure to read and follow the ElectroMelt Installation and Operation Manual (H53392).

How to Use the Installation and Operation Manual

In addition to this design guide, electrical and mechanical design engineers should also use the ElectroMelt Installation and Operation Manual as a general reference document during the design of an ElectroMelt system. They should use it during installation as well to coordinate the work of the trades involved. During and after startup, they should use the manual to record important design and test data.

Before design work begins, designers should review appropriate sections of the manual with the Raychem representative. Design engineers will obtain design details from the manual as well as trade coordination and testing requirements, all of which should be addressed in the project specification to ensure a successful snow-melting or anti-icing system.

The general contractor or construction manager should arrange a meeting with the other trades to discuss installation of the ElectroMelt system prior to the system installation. At this meeting, each trade should be given the appropriate section of the manual, and any questions regarding coordination and timing should be addressed.

System Description

The ElectroMelt system performs snow-melting and anti-icing in concrete pavement. The backbone of the system is the EM2-XR self-regulating heating cable. As the illustration on the next page indicates, the cable's output is reduced automatically as the pavement warms, so there is no possibility of failure due to overheating.

Elements of an ElectroMelt system include the EM2-XR heating cable, termination and splice components, and accessories, such as a junction box, automatic controls, ground-fault protection device, contactor, and the tools necessary for a complete installation. For a copy of the ElectroMelt Product Data Sheets, use Raychem's Fax On Demand Service by calling (800) 329-4494 and plugging in document ID number 20110.

Codes

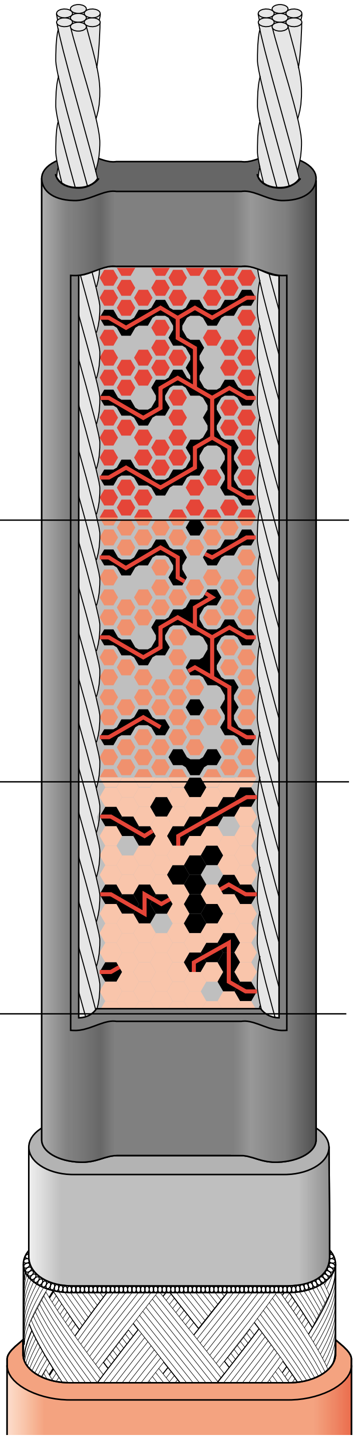
Installation of the ElectroMelt System is governed by Article 426 of the National Electrical Code, which requires the use of a ground-fault protection device (GFEPD). Your installation must also comply with all applicable local codes and standards.

Introduction

Warranty

The instructions in this guide and in the product packages must be followed. The Raychem warranty will not apply in the event of damage caused by accident, misuse, neglect, alteration, or improper installation, repair, or testing. For the complete warranty statement refer to Appendix A.

Raychem Self-Regulating Heating-Cable Technology



***At low temperature**, there are many conducting paths, resulting in high output and rapid pavement heat-up. Heat is generated only when it is needed and precisely where it is needed.*

***At moderate temperature**, there are fewer conducting paths because the heating cable efficiently adjusts to weather conditions by decreasing output—eliminating any possibility of concrete overheating.*

***At high temperature**, there are few conducting paths and output is correspondingly lower—conserving energy during operation.*

ElectroMelt Products

Self-Regulating Heating Cable

The ElectroMelt EM2-XR heating cable is embedded in concrete pavement to melt snow and ice that might otherwise accumulate on the surface. The heating cable responds to the local concrete temperature, increasing heat output when concrete temperature drops and decreasing heat output when concrete temperature rises. The self-regulating heating cable cannot overheat and destroy itself, even if overlapped in the concrete, and therefore does not require the use of overlimit thermostats.

Description	Catalog #
Self-regulating heating cable	EM2-XR

Components

Raychem provides all the components necessary for system installation. They are available from Raychem in the kits listed below.

Note: ElectroMelt components must be used in order to satisfy code, approval agencies, and warranty requirements. Installation instructions included with the kits must be followed. For more detailed information on these components, call Raychem's Fax On Demand Service at (800) 329-4494 and plug in document ID number 20110.

Description	Catalog #
Power connection kit (includes one end seal)	EMK-XP
Splice kit	EMK-XS
Expansion joint kit	EMK-XEJ

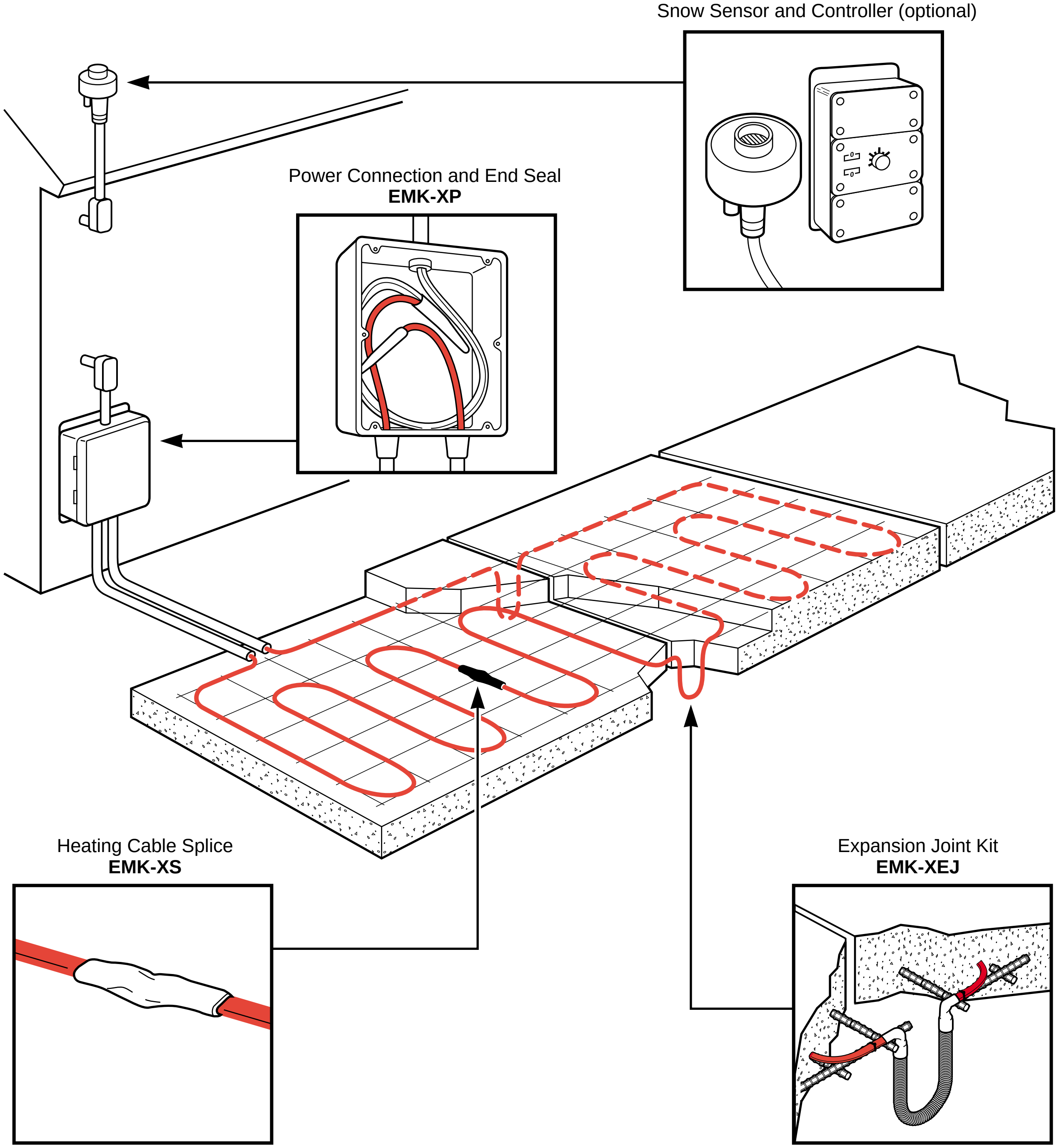
Accessories

Raychem also provides the following accessories for the ElectroMelt system:

Description	Catalog #
Junction box	EMK-XJB
Automatic snow controller	APS-3B or APS-4
Sensors for snow controller	CIT-1, GIT-1, or SIT-5E
Contactor	E104
Ambient sensing thermostat	AMC-1A
Cable ties	EMK-XCT
Cable markers	EMK-MARK
Crimping tool	EMK-XT
Propane torch	FH-2616A-1
Megohmmeter	EMK-MEG
Jacket repair kit	EMK-XJR

For more detailed information on these accessories, call Raychem's Fax On Demand Service at (800) 329-4494 and plug in document ID number 20110.

ElectroMelt System Design



Component	Catalog #	Usage	Heating cable allowance
Power connection kit (includes end seal)	EMK-XP	One per circuit	3 feet
Splice kit	EMK-XS	As required	1 foot
Expansion joint kit	EMK-XEJ	One per expansion joint crossing	1½ feet
Cable ties	EMK-CT	One per foot of cable used	–
Snow controller (optional)	APS-3B or APS-4	One per system	–
Sensor for snow controller	CIT-1, GIT-1, or SIT-5E	Up to 6 per system	–

ElectroMelt System Design

Basic ElectroMelt System Design

The power produced by ElectroMelt EM2-XR heating cable installed on 12-inch centers is adequate for the majority of concrete-pavement snow-melting and anti-icing systems. For this reason, the design steps in the next section and information in other ElectroMelt literature are based on this spacing.

In addition, information in this guide and in other ElectroMelt literature is based on the standard application of the EM2-XR heating cable in concrete pavement poured on grade only.

ElectroMelt system literature includes the following:

• ElectroMelt System Brochure	H53391
• ElectroMelt System Design Guide	H53393
• ElectroMelt System Installation and Operation Manual	H53392

Design for Standard Applications

The basic ElectroMelt system design for standard applications on grade is adequate for most snowfall and icing conditions, allowing no snow accumulation 97 percent of the time. The design keeps the pavement surface at or above freezing when the air above the pavement is at 5°F and the wind is steady at 10 miles per hour or less.

Because the design information in this guide applies only to standard concrete pavement poured on grade, it should not be used for other applications.

Design Requirements and Assumptions

The design for standard applications is based on the following assumptions with regard to the concrete and the heating cable:

Concrete:
- 4 to 6 inches thick
- Placed on grade
- Standard density

Heating cable:
- 12-inch cable spacing
- Secured to reinforcing steel or mesh
- Located 1½ to 2 inches below finished surface

⚠ **WARNING: Concrete cracks that extend to the depth of the cable may damage the cable and create the risk of fire. Install the cable in pavement or slabs that have been designed for long-term structural integrity.**

Design for Nonstandard Applications

Increased Power and Performance Requirements

Some applications and some locations require more snow-melting power or more complete anti-icing protection than the standard 12-inch spacing provides. For these cases, refer to the Supplemental Design Information section of this guide for more detailed performance information and design data for nonstandard applications.

For nonstandard applications, contact your Raychem representative for assistance with your design. Using proprietary computer modeling based on a finite difference program for nonstandard applications, Raychem can design the appropriate system for a nonstandard application.

The following are some nonstandard applications:
- concrete thinner than 4 inches
- concrete thicker than 6 inches
- lightweight concrete
- concrete with pavers thicker than 1½ inches
- ramps and walkways with air below
- nonconcrete pavements
- concrete without reinforcing
- retrofitting of heating cable to existing pavement

Step 1.
Determine Heating-Cable Spacing

For most standard applications, ElectroMelt EM2-XR heating cable may be installed on 12-inch centers. The design steps that follow are based on 12-inch spacing.

Snowfall and icing conditions vary widely with location. For this reason, heating cable installed on 12-inch centers may not provide adequate performance for every location.

To determine correct heating-cable spacing for a particular location, consult the Supplemental Design Information section of this guide.

Step 2.
Lay Out Heating Cable

For uniform heating, arrange the heating cable in a serpentine pattern that covers the area. Space the cable on 12-inch centers or use alternate spacing determined by consulting the Supplemental Design Information section of this guide.

Maintain the heating cable spacing in the design within 1 inch.

Use these symbols to indicate the heating cable and components:

Ⓟ	Power Connection
▽E	End Seal
–[S]–	Splice

Do not route the heating cable closer than 4 inches to the edge of the pavement, drains, anchors, or other material in the concrete.

The water resulting from the melted snow or ice should run into a drain or off to a safe area.

Arrange the heating cable so that both ends of the cable terminate in an above-ground, UL Listed or CSA Certified weatherproof junction box. The following are guidelines for this procedure:

- Mount the heating-cable junction box above grade to prevent water entry. Use an EMK-XJB or equivalent UL Listed or CSA Certified weatherproof junction box.
- Protect the heating cable from the pavement to the junction box by installing heating cable inside individual 1-inch rigid metal conduits. Minimize the length of the protective conduit. Do not penetrate building walls or floors with the protective conduit or insulate the conduit.
- Extend the conduit approximately 6 inches into the concrete for support.
- Provide bushings on both ends of each conduit.
- Do not install more than one run of heating cable per conduit.
- Minimize the length of the conduit.
- Do not insulate the conduit.
- Do not penetrate building floors or walls with the conduit.

If possible avoid crossing expansion, crack-control, or other pavement joints. Where crossing a joint is unavoidable, use the EMK-XEJ expansion joint kit to protect the heating cable.

Use these symbols to indicate the location of the joints:

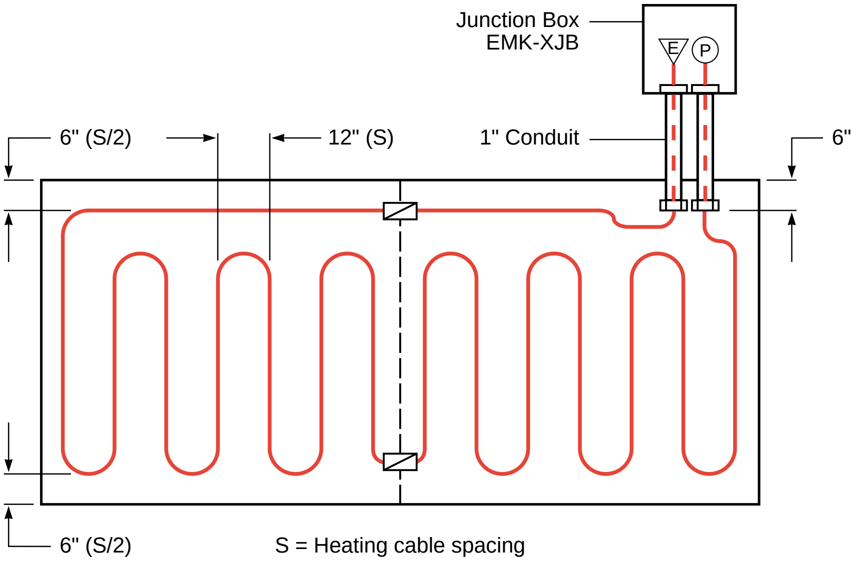
–•–•–	Expansion Joint
– – – –	Crack-control joint
–▱–	Expansion joint kit

Design Steps

Calculate the total length of heating cable required as:

$$\text{Total heating cable length} = \frac{\text{Heated area (ft}^2\text{) x 12}}{\text{Heating cable spacing (in.)}} + \text{end allowances}^{a} + \text{component allowances}^{b}$$

[a] End allowance is the length of heating cable installed between the heated area and the power connection junction box, measured in feet.
[b] Component allowances measured in feet (see page 7).



Step 3.
Determine Electrical Parameters

This section will help you determine the electrical parameters for an ElectroMelt system. To determine the demands an ElectroMelt system will place on your electrical equipment, refer to “Electrical Performance Requirements” in the Supplemental Design Information section of this guide.

Electrical Protection

The installation and design of the ElectroMelt System is governed by Article 426 of the National Electrical Code. Your installation must also comply with all applicable local codes and standards. To comply with the National Electrical Code, use a 30-mA ground-fault protection device (GFEPD).

⚠ **WARNING: To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, use a ground-fault protection device with a 30-mA trip level. Electrical fault currents may be too small to trip conventional circuit breakers.**

Voltage

Standard design information is provided for operation at 208 Vac. The allowable range of voltage for EM2-XR is 200 to 277 Vac. Using a voltage higher than 208 volts results in slightly higher surface temperatures and allows longer maximum circuit lengths as indicated in Tables 1 and 2.

Design Steps

Circuit Breaker Rating

Use thermal-magnetic circuit breakers rated no greater than 50 amperes for overcurrent protection. Use the lowest-rated circuit breaker compatible with the circuit lengths to be used. Use Tables 1 or 2 below to determine maximum circuit length.

Table 1. Maximum Heating Cable Circuit Length for Startup at 0°F (in feet)

Circuit breaker	Heating cable operating voltage			
	208 V	220 V	240 V	277 V
50 amp	245	250	265	300
40 amp	200	200	210	240
30 amp	145	150	160	180
20 amp	100	100	110	120
15 amp	75	75	80	90

Table 2. Maximum Heating Cable Circuit Length for Startup at 20°F (in feet)

Circuit breaker	Heating cable operating voltage			
	208 V	220 V	240 V	277 V
50 amp	265	270	285	325
40 amp	210	215	230	260
30 amp	160	165	170	195
20 amp	105	110	115	130
15 amp	80	80	85	100

Ground-Fault Protection Devices (GFEPDs)

Raychem and the National Electric Code Sections 426 and 427 require ground-fault protection equipment on each heating cable branch circuit. To reduce the risk of fire caused by damage or improper installation, circuit breakers such as Square D QO-EPD and QOB-EPD or equivalent, with a 30-mA trip level, should be used. Alternative designs providing comparable levels of ground-fault protection may also be acceptable. For technical assistance, call Raychem or you Raychem representative.

Controls

Three control methods are commonly used with snow-melting and anti-icing systems. All three methods require a contactor as shown in the diagram on the next page. The contactor must be sized to carry the load. Each method offers a tradeoff of initial cost against energy efficiency. Choose the one that best meets the project performance requirements.

Automatic snow controller

An automatic snow controller offers the highest system reliability and the lowest operating cost. Raychem's automatic snow controller detects both precipitation and low temperature and automatically energizes the ElectroMelt snow-melting system. When precipitation stops or the temperature rises above freezing, the controller de-energizes the snow-melting system. However, the pole-mounted sensor cannot detect runoff from adjacent areas, snow which is tracked into the heated area, or freezing dew.

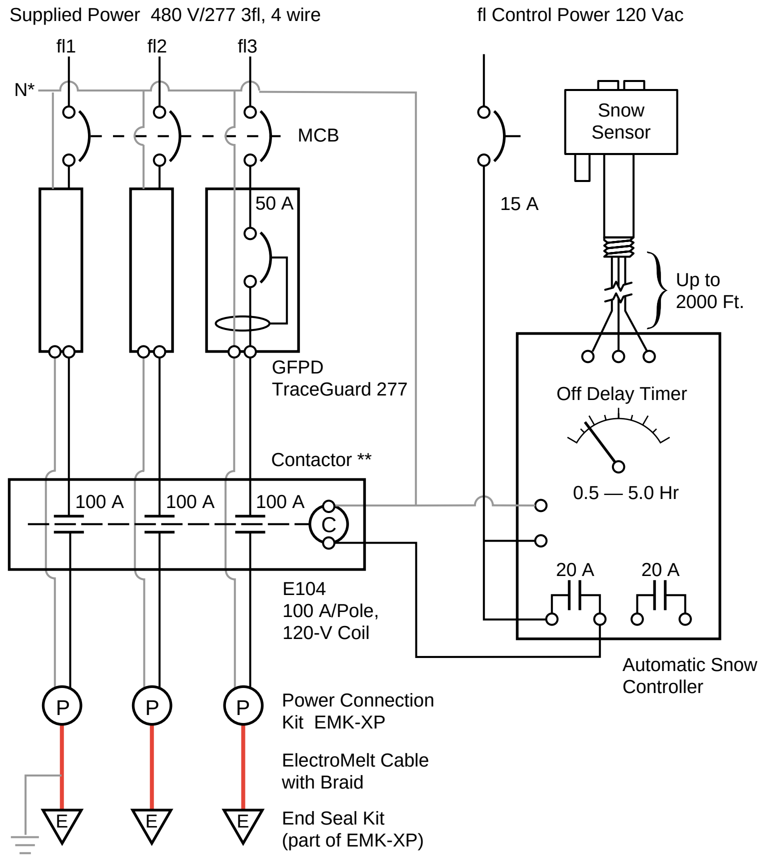
Ambient thermostat

An ambient thermostat can be used to energize the system whenever the ambient temperature is below freezing. Raychem's AMC-1A ambient thermostat should be used whenever the design objective is to prevent surface icing under all conditions (anti-icing). Since the number of hours of freezing temperatures is two to ten times the number of snowfall hours, the energy usage of a system under control of an ambient thermostat is two to ten times that of a system controlled by an automatic snow controller.

Manual control

Under manual control the system is operated by a manual switch controlling the system power contactor. In some small installations, the system may be controlled directly by operating the circuit breakers.

Typical Control Diagram



* Neutral wire must pass through TraceGuard 277 (See Installation Instructions).
** In 208-volt and 240-volt systems, means should be provided to disconnect both phases.

Installation and Testing

After the design is completed, the system should be installed and tested. Follow all design, installation, assembly, and test instructions to ensure proper operation and to prevent shock or fire. Use only Raychem ElectroMelt connection components and follow the installation instructions included with them.

Install the ElectroMelt system in accordance with Raychem's ElectroMelt System Installation and Operation Manual (H53392) and the installation instructions supplied with the heating cable and components.

Test the insulation resistance of the ElectroMelt heating cable with a 2500-Vdc megohmmeter. Test after installation, during the concrete pour, and annually thereafter. Refer to the ElectroMelt Installation and Operation Manual (H53392) for the proper testing procedure.

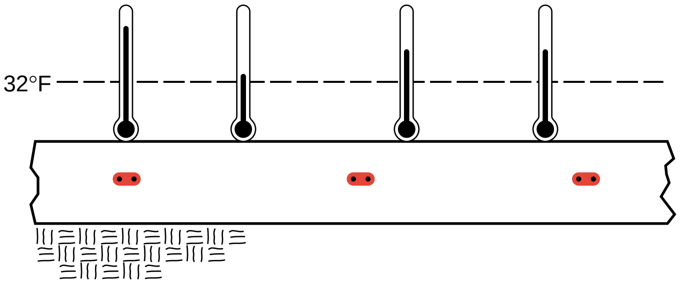
Supplemental Design Information

Factors Affecting Snow-Melting System Design

Snow-melting systems are installed for convenience and safety. They are often thought of only in terms of snowfall, but an important–and often the principal– function may be anti-icing.

Anti-icing is the ability of the system to prevent the formation of ice on the pavement surface; it is the ability to maintain all points on the surface above 32°F for given temperature and wind conditions. The anti-icing behavior of a system must be considered when the primary objective of the system is to reduce slipping hazards or when tracking or runoff of water from adjacent unheated pavement areas is a potential problem.

All surface points above 32°F.



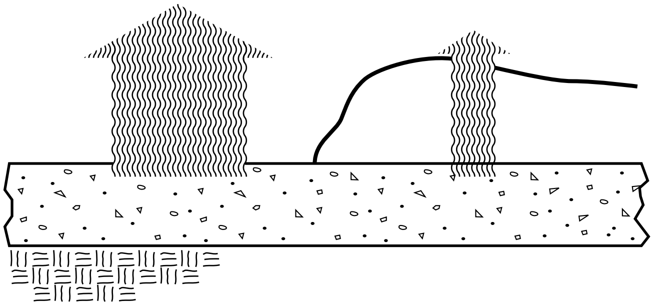
Snowfall

Snowfall patterns vary widely with location. A system design that works well in one city may be inadequate in another. The energy required to melt snow varies with air temperature, wind speed, relative humidity, snow density, and the depth of the snow on the pavement.

The effective power of a snow-melting system (that is, the power delivered to the top surface of the pavement) is used to warm the fallen snow to melting temperature, to supply the heat to melt the snow, to make up for evaporation losses from the surface, and to make up for both convection- and radiation-heat losses from the pavement surface.

The power required in a given situation is strongly influenced by whether the surface is kept clear as snow falls. If snow is melted immediately as it falls, the system must make up for convection-, radiation-, and evaporation-heat losses as well as melt the fallen snow. However, if a light film of snow is allowed to cover the surface, the insulating blanket of snow reduces or eliminates the losses due to convection, radiation, and evaporation, and more of the effective system power is available for melting snow.

Heat loss varies with snow cover.



Supplemental Design Information

Icing

Virtually any level of power will melt snow if there is a sufficiently deep snow cover to insulate the surface from convection-heat loss. However, icing problems may arise once the insulating blanket has been melted and the pavement is subject to increased heat loss due to wind action on the exposed surface.

Icing problems also arise when water from adjacent unheated areas runs onto the heated area or when snow and slush are tracked onto the heated area by pedestrians or vehicles. In many situations the expected anti-icing behavior of a system imposes more severe constraints than the ability to melt snow does.

Snow-melting and anti-icing systems require only enough power to meet the system performance requirements. Providing excess power increases system cost and leads to higher energy costs.

Performance Requirements

In designing an ElectroMelt system it is therefore critical to specify system performance requirements accurately. This means determining both anti-icing and snow-melting requirements, as shown below.

Sample Performance Specification

Anti-icing requirements	
Minimum ambient temperature	5°F
Average wind speed	10 MPH

Snow-melting requirements:	
Surface clear	50% of snowfall hours
Snow accumulation	3% or less of snowfall hours

As shown in the specification example above, a typical performance specification specifies the minimum ambient temperature and the average wind speed at which all surface points must be above freezing. These are the anti-icing requirements. It specifies the snow-melting requirements as well, in terms of the percentage of all snowfall hours for which the operating system must keep the surface essentially clear, and the allowable percentage of all snowfall hours for which some snow accumulation is tolerable.

The sections that follow should help you determine and specify an application's anti-icing and snow-melting requirements.

Anti-Icing Performance Requirements

Determining Ambient Temperature

Once you have determined the heating-cable spacing of an ElectroMelt System you can determine the ambient temperature by referring to Table 3 on page 16. Simply locate the row corresponding to the design's heating-cable spacing. Move across that row to the column corresponding to the average wind speed during freezing periods and read the minimum ambient temperature at which all points on the pavement surface will be at or above 32°F.

Note: This procedure is derived from finite model studies of 4-inch slabs and is applicable to standard concrete pavement from 4 inches to 6 inches thick placed directly on grade. If your application involves other materials or constructions, contact your Raychem representative.

Supplemental Design Information

Table 3. Ambient Temperatures (°F) for Ice-Free Surfaces

Heating-cable spacing (in inches)	Average wind speed during freezing periods			
	5 mph	10 mph	15 mph	20 mph
6	-40	-25	-10	0
8	-40	-10	0	10
10	-25	0	10	15
12	-15	5	15	20

Snow-Melting Performance Requirements

Obtaining Snowfall Data

Snowfall data is not available for all cities. However, you may still specify snow-melting performance if you can obtain snowfall data for a city with comparable snowfall conditions for which published data are available.

Alternatively, you can use Table 4 below and Figures 1–6 on page 18 to determine the snow-melting performance to specify. Each figure contains a snow-melting performance curve from which you can determine cumulative snowfall hours for your application.

Using Table 4

Which of the snow-melting curves you should use depends on the snowfall conditions for the city in which your application is located. Table 4 below lists typical U.S. and Canadian cities and shows the figure number for the curve applicable to snowfall conditions for each city. Using Table 4, locate the city with a snowfall pattern similar to the location for which you are designing the ElectroMelt system. Turn to the snow-melting curve in the figure listed for that city.

Table 4. Figure Selection for Snow-Melting Performance Curves

USA

City	Fig.	City	Fig.	City	Fig.
Albuquerque, N. Mex.	1	Detroit, Mich.	1	Oklahoma City, Okla.	5
Boston, Mass.	6	Duluth, Minn.	4	Philadelphia, Pa.	2
Buffalo-Niagara Falls, N. Y.	1	Falmouth, Mass.	6	Pittsburgh, Pa.	1
Burlington, Vt.	1	Great Falls, Montana	4	Rapid City, S. D.	4
Caribou-Limestone, Maine	3	Hartford, Conn.	6	Salina, Kansas	3
Cheyenne, Wyo.	5	Lincoln, Nebr.	4	Sault Ste. Marie, Mich.	3
Chicago, Ill.	1	Memphis, Tenn.	6	Spokane, Wash.	1
Colorado Springs, Colo.	3	Minneapolis-St. Paul, Minn.	3	St. Louis, Mo.	6
Columbus, Ohio	1	New York, N. Y.	2	Washington, D. C.	2

Canada

City	Fig.	City	Fig.	City	Fig.
Calgary, Alberta	4	Ottawa, Ont.	3	Sudbury, Ont.	4
Halifax, N. S.	6	Quebec City, P. Q.	3	Toronto, Ont.	1
Kamloops, B. C.	1	Regina, Sask.	4	Vancouver, B. C.	1
Montreal, P. Q.	3	Saint John, N. B.	1	Winnipeg, Man.	4

Supplemental Design Information

Using Figures 1–6 on page 18
Once you have determined the correct curve to use for your application, turn to the correct figure for that curve and take the following steps:

1. Draw a horizontal line across the figure at the heating-cable spacing you plan to use in the design.
2. Draw vertical lines from the points where the segmented snow melting performance curves intersect your horizontal heating-cable-spacing line.
3. From the intersection of the left vertical line with the percentage axis read the percentage of all snowfall conditions for which the pavement will be completely clear.

The distance between the left and right vertical lines is the additional percentage of all snowfall conditions for which the pavement may have a light snow cover. The distance, if any, from the right line to the end of the percentage axis is the percentage of snowfall conditions for which snow may actually accumulate while the system is in operation. If increased snow-melting performance is required, reduce the heating cable spacing.

Example
To determine the snow-melting performance you should specify for ElectroMelt heating cable installed on 10-inch centers in Chicago, Illinois, find the figure number for Chicago in Table 4. The table refers you to Figure 1.

Using Figure 1, you see that the intersection of the 10-inch-spacing line with the “Surface Completely Clear” curve occurs at approximately 88%, and the intersection with the “Some Accumulation Possible” curve occurs at 0%.

These percentages indicate that the system with 10-inch spacing will keep the surface completely clear for 88% of all snowfall conditions occurring in Chicago, and will allow no accumulation.

For the remaining 12% of conditions, the surface may have a light covering of snow, but the system will be able to melt snow at the same rate at which it falls (no accumulation).

Snow-Melting Performance Curves

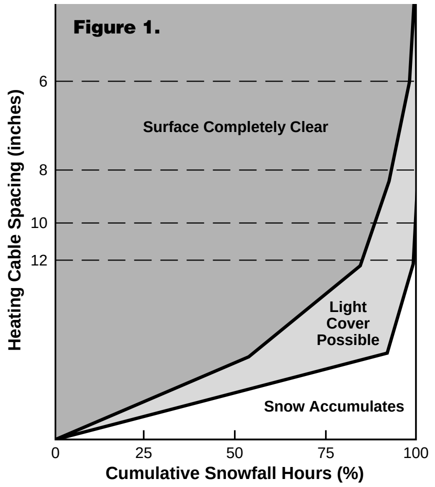


Figure 1.

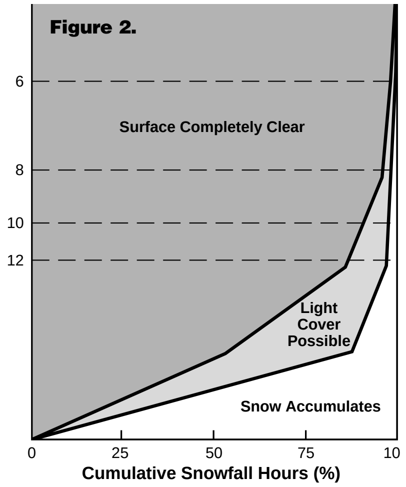


Figure 2.

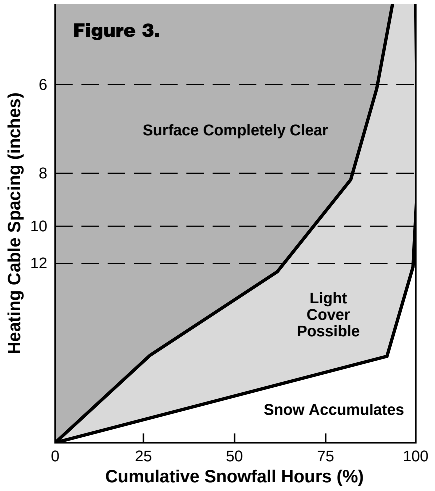


Figure 3.

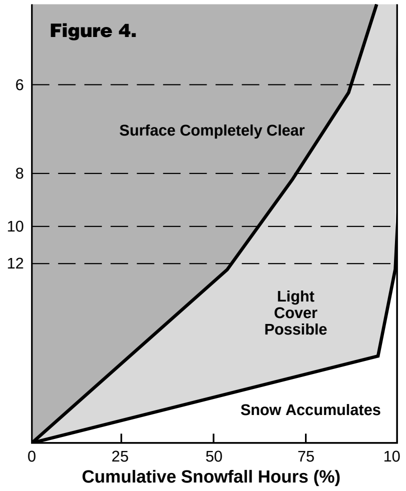


Figure 4.

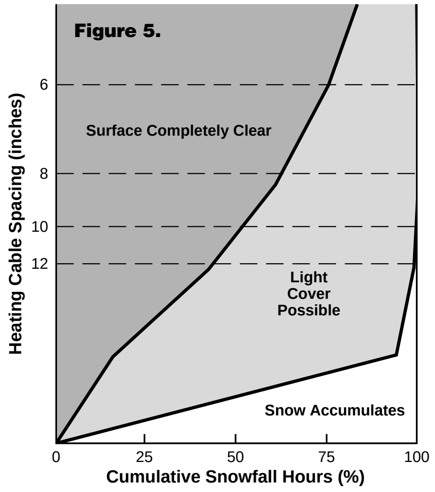


Figure 5.

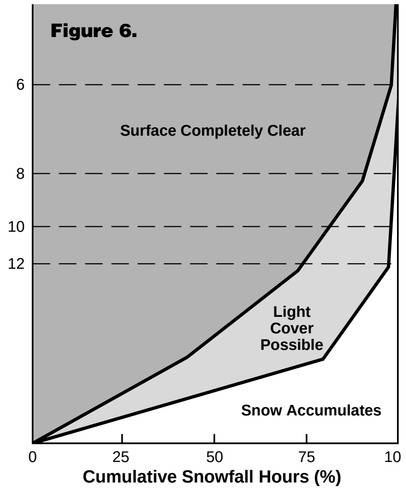


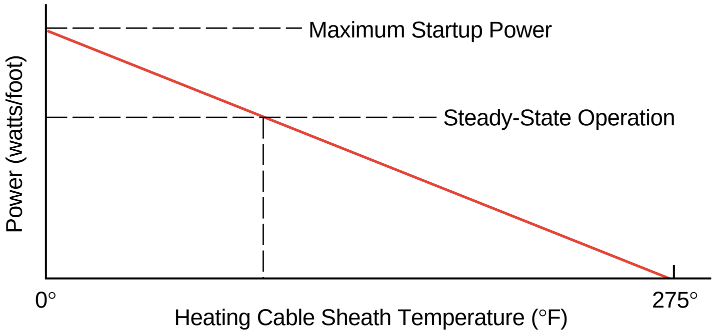
Figure 6.

Supplemental Design Information

Electrical Performance Requirements

Electrical Design

The ElectroMelt EM2-XR self-regulating heating cable varies its power output at every point along its length in response to the surface temperature or sheath temperature of the heating cable. When the concrete in contact with the surface of the heater is cool, the cable is cool and the resistance of the specially blended polymer core is low, resulting in high power output. As the pavement warms, the heating cable core warms and the core resistance rises, resulting in lower power output. A graph of the relationship between sheath temperature and power output of the EM2-XR heating cable appears below.



During normal operation, the heating-cable output varies between the points marked “Maximum Startup Power” and “Steady-State Operation.” The heating-cable operating temperature varies with the concrete temperature and weather conditions, but is usually about 60°F warmer than the concrete surface. On a hot summer day, the concrete in contact with the heating cable could reach 150°F.

Startup Temperature

The maximum length of heating cable allowed on a given size circuit breaker is determined primarily by the current drawn by the heating cable during low-temperature (high-power) startup conditions. The maximum circuit length data given in Table 1 on page 11 is based on starting the heating cable when the concrete pavement is at 0°F. A maximum length circuit started at 0°F will result in branch circuit loading of less than 80 percent of the circuit breaker rating within 10 minutes.

Transformer Sizing

Transformers should be sized to handle the startup load of the heating cable indefinitely. To determine the current load of each circuit, refer to the circuit breaker rating tables on page 11. The actual current per foot of heating cable and the transformer size are calculated as follows:

$$\text{Current per foot} = 0.8 \times \frac{\text{Circuit breaker rating}}{\text{Maximum allowed length of heating cable at design voltage}}$$

$$\text{Transformer size} = \text{Current per foot} \times \text{Total heating cable length} \times \text{Heating cable operating voltage}$$

Voltage Drop

Calculate the branch circuit voltage drop based on the current as computed above. Note that the maximum size branch circuit conductor that can be terminated in the EMK-XP power connection kit is 4 AWG.

Supplemental Design Information

Example

An application at a parking garage requires four heating cable circuits 275 feet long. The heating cable is to be powered at 277 Vac.

Circuit Breaker Sizing

From Table 1 on page 11, up to 300 feet of heating cable may be connected to a single 50-amp branch circuit breaker.

Transformer Sizing

The branch circuit current after startup at 0°F is calculated as follows:

Current = 80% x 50 amp/300 ft
= 0.13 amp/ft

Transformer size = 0.13 amp/ft x 275 ft/circuit x 4 circuits x 277 Vac
= 39,600 watts
= 39.6 kilowatts

To have a copy of the ElectroMelt Product Data Sheets automatically faxed to you, use Raychem’s Fax On Demand Service.

Dial (800) 329-4494 and plug in Document ID Number 20110.

Project Submittal Data

Submittal Data Form

Project Data

Project or area name ______

Submitted by ______

Reference ______

Date ______

Design Data

Site location ______

Minimum ambient temperature ______

Average wind speed ______

Heating cable spacing ______

Description of performance requirements ______

______

Pavement Data

Pavement material ______

Pavement thickness ______

Heating cable depth ______

Type of reinforcement ______

Description of area to be heated ______

______

Is pavement placed on grade? ______

(if not, please describe) ______

______

Product Data

Heating cable model ______

Heating cable manufacturer ______

Product approvals ______

Power connection kit model ______

Splice kit model ______

Expansion joint kit model ______

Electrical Data

Heating cable operating voltage ______

Branch circuit overcurrent protection device and rating ______

Heating cable junction box description ______

Control system description ______

Total electrical load (kW) ______

Condensed Specification Guide

This is the product portion of a specification for the ElectroMelt System. For a complete specification that includes installation and testing recommendations, contact your Raychem representative.

PART 1 – GENERAL

Furnish and install a UL Listed and CSA Certified snow-melting system complete with heating cable, termination components, junction boxes, contactors, and controls.

PART 2 – PRODUCTS

2.1 The heating cable and termination components shall be UL Listed as De-icing and Snow-melting Equipment and CSA Certified as Designation 1B, 2B.

2.2 The heating cable shall consist of two 14-gauge nickel-coated-copper bus wires embedded in parallel in a self-regulating polymer core. Power output shall vary in response to temperature all along its length, allowing the heating cable to be crossed over itself without overheating, to be cut to length in the field, and to have no heater-to-cold-lead connections buried in the pavement. The heating cable shall be covered by a crosslinked dielectric jacket and protected by a tinned-copper braid and a 70-mil-thick modified polyolefin outer jacket.

2.3 The heating cable shall be of parallel circuit construction to allow the cable to be spliced if it is inadvertently cut during or after construction, and to be powered from both ends if it becomes advantageous to divide a circuit in two.

2.4 The heating cable shall operate on (select: 208, 220, 240, or 277) volts without the use of transformers.

2.5 The heating cable shall be ElectroMelt EM2-XR as manufactured by Raychem Corporation.

2.6 The system shall be controlled by (select: a switch, an ambient sensing thermostat, or an automatic snow controller) through an appropriate contactor.

2.7 The heating cable power connection and end seal terminations shall be made in an ElectroMelt EMK-XJB junction box.

2.8 Each circuit shall be protected by a 30-mA ground-fault protection device.

PART 3 – INSTALLATION

3.1 The heating cable shall be installed according to the manufacturer's recommendations, the instructions supplied with the heating cable and components, and the instructions in the ElectroMelt Installation and Operation Manual (H53392).

3.2 The heating cable shall be installed only in concrete pavement designed for long-term structural integrity. The pavement shall be reinforced with rebar or wire mesh and the reinforcing supported such that the location of the reinforcing and the attached heating cable is not disturbed during the concrete placement. The rebar shall be placed at the heating-cable depth whenever possible.

3.3 The heating cable shall be protected from where it leaves the pavement to the junction box by installing the cable in 1-inch rigid metal conduit. Use one conduit for each heating cable.

3.4 The power connection and end seal junction box shall be mounted above grade. The junction box shall be installed so that water can not enter it.

3.5 Heating-cable repairs and splices shall be made using a splice kit provided by the manufacturer and specifically approved for the purpose. They shall pass the Megger test after installation.

PART 4 – TESTING

The heating cable shall be tested for insulation resistance with a 2500-Vdc Megger after installation, during the concrete pour, and annually thereafter according to the manufacturer's recommendations and following the instructions provided in the ElectroMelt Installation and Operation Manual (H53392).

Appendix A

Warranty; Suitability

(a) Raychem warrants products delivered hereunder against faulty workmanship and use of defective materials for a period of eighteen (18) months from the date of installation or twenty-four (24) months from the date of shipment, whichever is sooner. When the contract calls for systems design, drawings, technical advice, services, or instructions (collectively “Services”) by Raychem, in connection with the products, Raychem further warrants for the above stated warranty period solely that such Services will be undertaken in accordance with Raychem’s reasonable technical judgment based on Raychem’s understanding of the pertinent technical data as of the date of performance of such Services. The foregoing warranty with respect to products shall not be enlarged or affected by, and (except as expressly provided herein) no obligation or liability shall arise or grow out of, Raychem’s rendering Services in connection with the products. Such warranty is the only warranty made by Raychem and it can be amended only by a written instrument signed by a duly authorized officer of Raychem. If the products furnished by Raychem hereunder are determined to contain a deficiency, Buyer’s exclusive remedy shall be to have Raychem repair such products or supply replacement products or credit Buyer’s account for such products and accept their return, whichever Raychem may elect in its sole discretion. Notwithstanding the foregoing sentence, in no circumstances shall Raychem have any liability or obligation with respect to expenses, liabilities, or losses associated with the installation or removal of any products or the installation of replacement products or for any inspection, testing, or redesign occasioned by any deficiency or by the repair or replacement of products. Raychem’s obligations are subject to the further condition that Raychem shall have no liability whatsoever for any deficiency unless (i) Raychem is notified in writing promptly (and in no event later than 30 days) after discovery by Buyer of the alleged deficiency, which notice shall include a detailed explanation of the alleged deficiency, (ii) the products containing the alleged deficiency are promptly returned to Raychem, F.O.B. Raychem’s plant, and (iii) Raychem’s examination of such products discloses to Raychem’s satisfaction that such alleged deficiency actually exists and occurred in the course of proper and normal use and was not caused by accident, misuse, neglect, alteration or improper installation, repair, or testing. If any products so prove to contain a deficiency and Raychem elects to repair or replace them, Raychem shall have a reasonable time to make such repair or replacement.

THE FOREGOING WARRANTY IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, OR NONINFRINGEMENT, AND OF ANY OTHER OBLIGATION ON THE PART OF RAYCHEM.

(b) It shall be the responsibility of the Buyer to determine, on the basis of the most current written technical data, the suitability of the products and of any systems design or drawings for the intended use and their compliance with applicable laws, regulations, codes, and standards and the Buyer assumes all risks pertaining thereto.

ISO 9001

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LISTED

877Z
De-Icing and Snow-Melting Equipment

DESIG. 1B, 2B

Important: All information, including illustrations, is believed to be reliable. Users, however, should independently evaluate the suitability of each product for their application. Raychem makes no warranties as to the accuracy or completeness of the information, and disclaims any liability regarding its use. Raychem's only obligations are those in the Raychem Standard Terms and Conditions of Sale for this product, and in no case will Raychem or its distributors be liable for any incidental, indirect, or consequential damages arising from the sale, resale, use, or misuse of the product. Specifications are subject to change without notice. In addition, Raychem reserves the right to make changes—without notification to Buyer—to processing or materials that do not affect compliance with any applicable specification.

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