CONNECT AND PROTECT

Surface Snow Melting –
MI Mineral Insulated Heating Cable System

This step-by-step design guide provides the tools necessary to design an nVent RAYCHEM Mineral Insulated (MI) heating cable surface snow melting system. For other applications or for design assistance, contact your nVent representative or call (800) 545-6258. Also, visit our web site at nVent.com/RAYCHEM.

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INTRODUCTION

The Mineral Insulated (MI) heating cable system is designed for surface snow melting in concrete and asphalt, and under pavers.

If your application conditions are different, or if you have any questions, contact your nVent representative or call (800) 545-6258.

How to Use this Guide

This design guide presents nVent's recommendations for designing an MI heating cable surface snow melting system. It provides design and performance data, electrical sizing information, and heating cable layout suggestions. Following these recommendations will result in a reliable, energy-efficient system.

Follow the design steps in the section "Surface Snow Melting Design" on page 6 and use the "MI System Surface Snow Melting Design Worksheet" on page 37 to document the project parameters that you will need for your project's Bill of Materials.

Other Required Documents

This guide is not intended to provide comprehensive installation instructions. For complete MI surface snow melting system installation instructions, please refer to the following additional required documents:

- Surface Snow Melting – MI Installation and Operation Manual (H57754)
- Additional installation instructions included with thermostats, controllers, and accessories

If you do not have these documents, you can obtain them from our web site at nVent.com/RAYCHEM.

For products and applications not covered by this design guide, including installations in hazardous locations or where electromagnetic interference (EMI) may be of concern, such as traffic loop detectors, please contact your nVent representative or call (800) 545-6258.

Safety Guidelines

As with any electrical equipment, the safety and reliability of any system depends on the quality of the products selected and the manner in which they are installed and maintained. Incorrect design, handling, installation, or maintenance of any of the system components could damage the system and may result in inadequate performance, overheating, electric shock, or fire. To minimize these risks and to ensure that the system performs reliably, read and carefully follow the information, warnings, and instructions in this guide.

✎ This symbol identifies important instructions or information.

⚠ This symbol identifies particularly important safety warnings that must be followed.

⚠ **WARNING**: To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of nVent, agency certifications, and national electrical codes, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conVentional circuit protection.

Warranty

nVent's standard limited warranty applies to nVent RAYCHEM Snow Melting Systems.

An extension of the limited warranty period to ten (10) years from the date of installation is available, except for the control and distribution systems, if a properly completed online warranty form is submitted within thirty (30) days from the date of installation. You can access the complete warranty on our web site at https://www.nVent.com/en-us/raychem/support/warranty-information.

SYSTEM OVERVIEW

The MI heating cable surface snow melting system provides snow melting for concrete, asphalt, and pavers. The copper-sheathed, mineral insulated heating cables are coated with a Low-Smoke, Zero-Halogen (LSZH) jacket and are supplied as complete factory-assembled cables ready to connect to a junction box. The series-type technology, inherent to all mineral insulated heating cables, provides a reliable and consistent heat source that is ideal for embedded snow melting applications. The system includes heating cable, junction boxes, a control system and sensors, power distribution, and the tools necessary for a complete installation.

Typical System

A typical system includes the following:

- MI heating cable
- Junction boxes and accessories
- Snow controller and sensors
- Power distribution

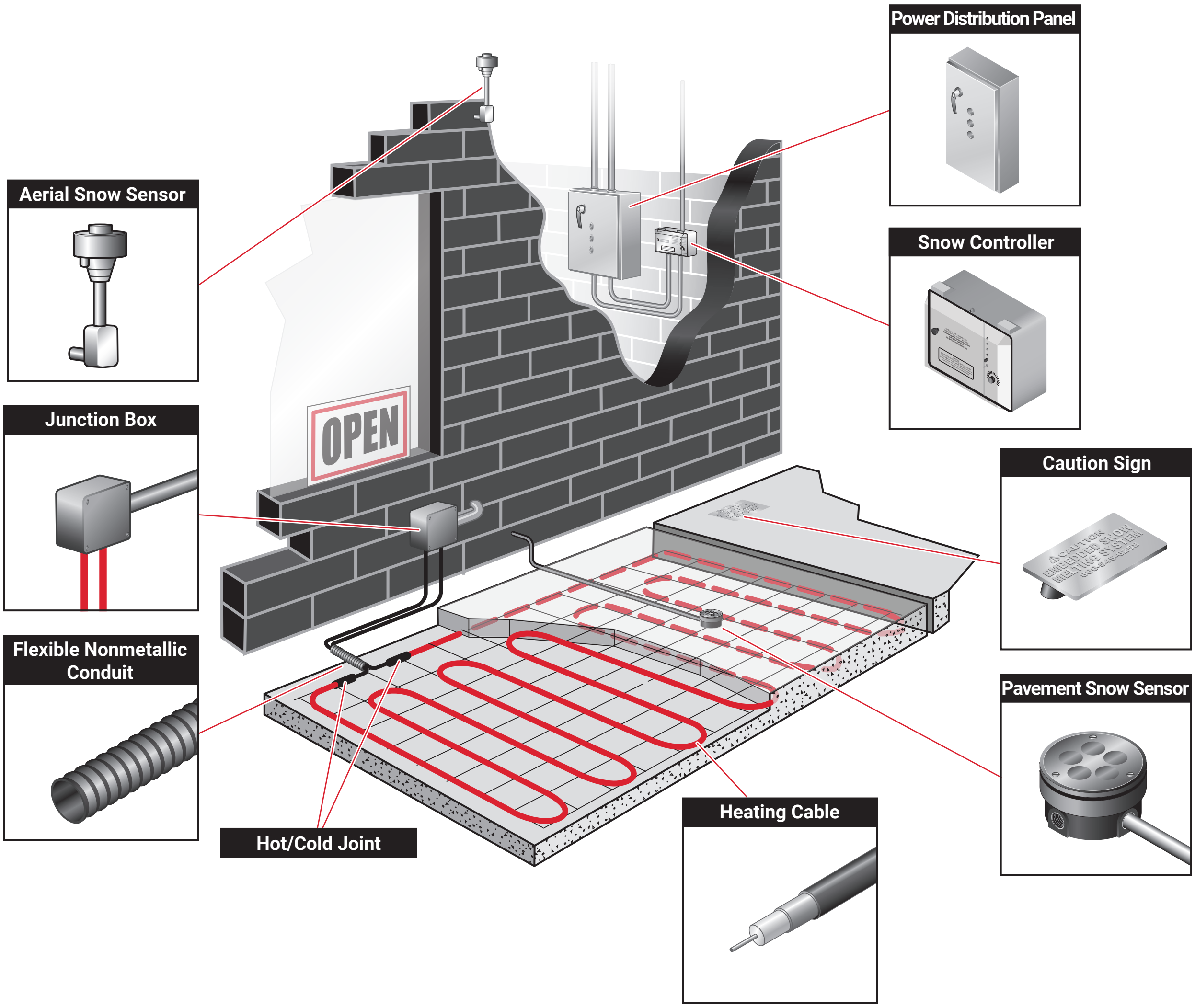

Fig. 1 Typical MI system

MI Heating Cable Construction

Standard surface snow melting MI heating cables are comprised of a single conductor surrounded by magnesium oxide insulation, a solid copper sheath, and an extruded Low-Smoke, Zero-Halogen (LSZH) jacket. The jacket protects the copper sheath from corrosive elements that can exist in surface snow melting applications.

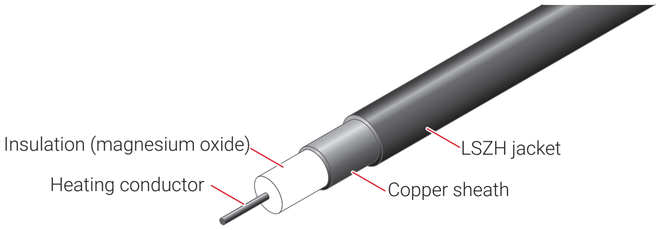

Fig. 2 MI heating cable construction

Custom engineered heating cables are also available for applications outside the scope of this design guide. For design criteria, including the maximum cable loading (watts/foot) for installations in concrete, asphalt and paver applications, refer to the MI Heating Cable for Commercial Applications data sheet (H56990) or contact nVent at (800) 545-6258 for design assistance.

MI Heating Cable Configuration

MI heating cables are supplied as complete factory-fabricated assemblies consisting of an MI heating section that is joined to a section of MI nonheating cold lead and terminated with NPT-threaded connectors. Two configurations are available for standard heating cables:

1. Type SUA, consisting of a looped cable joined to a single 7 ft (2.1 m) cold lead with one 1/2-in NPT-threaded connector.
2. Type SUB, consisting of a single run of cable with a 15 ft (4.6 m) cold lead and a 1/2-in NPT-threaded connector on each end. Where custom cold lead lengths are required for the heating cables shown in Table 2, Table 3, Table 4, and Table 5, contact your nVent sales representative for assistance.

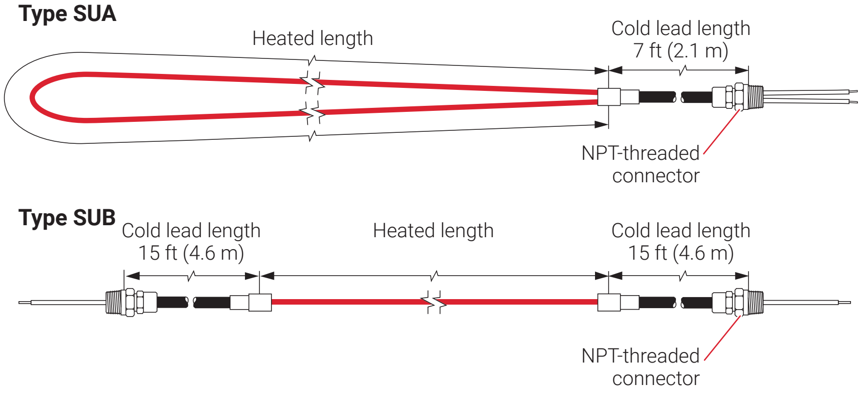

Fig. 3 MI heating cable configurations

Approvals

The MI surface snow melting system is UL Listed and CSA Certified for installation in nonhazardous locations in concrete and asphalt, and under pavers where the cables are embedded in concrete. For paver snow melting installations where the heating cables are embedded in sand or limestone screenings, special permission is required from the Authority Having Jurisdiction, e.g. the local inspection authority.

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SURFACE SNOW MELTING APPLICATIONS

Surface Snow Melting

Surface snow melting systems provide the required heat flux (W/ft^2 or W/m^2) to melt snow and ice on ramps, slabs, driveways, sidewalks, platform scales, and stairs and prevent the accumulation of snow under normal snow conditions.

Application Requirements and Assumptions

The design for a standard surface snow melting application is based on the following:

Reinforced Concrete

- 4 to 6 in (10 to 15 cm) thick
- Placed on grade
- Standard density

Heating cable

- Secured to reinforcing steel, mesh or with prepunched strapping
- Located approximately 2 in (5 cm) below finished surface, but not exceeding 3 in (7.5 cm)

Asphalt

- Install on 1 in (2.5 cm) asphalt base layer if a concrete base is used in construction
- Placed on grade

- Secured with prepunched strapping
- Located 2 in (5 cm) below finished surface

Pavers

- 1 ½ to 2 ¼ in (4 to 6 cm) thick pavers
- Minimum 1 in (2.5 cm) limestone screenings or sand compacted base layer
- Placed on an approved compacted base or concrete slab

- Secured to the compacted base or concrete with mesh or prepunched strapping
- Covered with a minimum 1 in (2.5 cm) compacted layer of limestone screenings or sand

Nonstandard applications are not covered in this design guide, but are available by contacting your nVent representative for design assistance. Using proprietary computer modeling based on a finite difference program for nonstandard applications, nVent can design an appropriate snow melting system.

The following are examples of nonstandard applications not addressed in this design guide:

- Concrete thinner than 4 in (10 cm)
- Concrete thicker than 6 in (15 cm)
- Lightweight concrete
- Ramps, walkways, and stairs with air below
- Concrete without reinforcing bar or mesh
- Retrofitting of heating cable to existing pavement

This section details the steps necessary to design your application. The examples provided in each step are intended to incrementally illustrate sample project designs from start to finish. As you go through each step, use the "MI System Surface Snow Melting Design Worksheet" on page 37 to document your project parameters, so that by that end of this section, you will have the information you need for your Bill of Materials.

SnoCalc is an online design tool available to help you create surface snow melting designs and layouts. It is available at nVent.com/RAYCHEM.

Design Step by Step

Your system design requires the following essential steps:

1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Step 1 Determine design conditions

Collect the following information to determine your design conditions:

- Environment
  - Geographical location
- Paving material
  - Concrete
  - Asphalt
  - Pavers
- Size and layout
  - Slab surface area
  - Ramp surface area
  - Stairs
    - Number of stairs
    - Stair width
    - Riser height
    - Stair depth
    - Landing surface area
  - Wheel tracks
    - Track length
  - Concrete joints
  - Surface drains
  - Location of area structures
  - Other information as appropriate
- Supply voltage
- Phase (single-phase or three-phase)
- Control method
  - Automatic snow melting controller
  - Slab sensing thermostat
  - Manual on/off control

Note: Drainage must be a primary concern in any snow melting system design. Improper drainage will result in ice formation on the surface of the heated area once the system is de-energized. Ice formation along the drainage path away from the heated area may create an ice dam and prohibit proper draining. If your design conditions may lead to drainage problems, please contact nVent Technical Support for assistance.

Prepare scale drawing

Draw to scale the area in which the snow melting cables will be installed, and note the rating and location of the voltage supply. Include stairs and paths for melting water runoff. Show concrete joints, surface drains, and location of area structures including post installations for railings, permanent benches, and flagpoles. Measurements for each distinct section of the snow melting application, including stairs, will allow for an accurate system design, including control configuration.
Use these symbols to indicate the heating cable expansion and crack-control joints:

—•—•—	Expansion joint
– – – –	Crack-control joint

Fig. 4 Design symbols

Example: Surface Snow Melting System

Geographical location	Philadelphia, PA
Ramp surface area	45 ft x 12 ft (13.7 m x 3.66 m)
Paving material	Concrete
Supply voltage	480 V, three-phase
Control method	Automatic snow melting controller

Example: Surface Snow Melting System for Stairs

Geographical location	Philadelphia, PA
Number of stairs	5
Stair width	5 ft (1.52 m)
Riser height	8 in (20 cm)
Stair depth	11 in (28 cm)
Landing surface area	5 ft x 3 ft (1.52 m x 0.91 m)
Paving material	Concrete
Supply voltage	208 V, single-phase
Control method	Slab sensing thermostat

Example: Surface Snow Melting System for Wheel Tracks

Geographical location	Philadelphia, PA
Track length	28 ft (8.5 m)
Paving material	Asphalt
Supply voltage	240 V, single-phase
Control method	Automatic snow melting controller

Step 2 Determine the required watt density

For maximum performance from any snow melting system, you must first take into account the local snowfall patterns. 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.

Surface Snow Melting

Table 1 summarizes the required watt density for most major cities in North America based on typical minimum ambient temperatures and the snowfall patterns. Select the city from the list, or closest city, where similar climatic conditions exist.

Table 1 Required Watt Density for Surface Snow Melting

City	Watts/ft²			Watts/m²		
	Concrete	Asphalt or pavers	Concrete stairs	Concrete	Asphalt or pavers	Concrete stairs
USA						
Baltimore, MD	35	40	40	377	431	431
Boston, MA	35	40	45	377	431	484
Buffalo, NY	40	45	45	431	484	484
Chicago, IL	35	40	40	377	431	431
Cincinnati, OH	35	40	40	377	431	431
Cleveland, OH	35	40	40	377	431	431
Denver, CO	35	40	40	377	431	431
Detroit, MI	35	40	40	377	431	431
Great Falls, MT	50	50	55	538	538	592
Greensboro, NC	35	35	40	377	377	431
Indianapolis, IN	35	40	40	377	431	431
Minneapolis, MN	50	50	55	538	538	592
New York, NY	35	40	45	377	431	484
Omaha, NE	45	50	50	484	538	538
Philadelphia, PA	35	40	45	377	431	484
Salt Lake City, UT	35	35	40	377	377	431
Seattle, WA	35	35	40	377	377	431
St. Louis, MO	35	40	45	377	431	484
Canada						
Calgary, AB	45	45	50	484	484	538
Edmonton, AB	50	50	55	538	538	592
Fredericton, NB	40	45	45	431	484	484
Halifax, NS	35	40	40	377	431	431
Moncton, NB	40	40	45	431	431	484
Montreal, QC	45	45	50	484	484	538
Ottawa, ON	45	45	50	484	484	538
Prince George, BC	50	55	55	538	592	592
Quebec, QC	45	45	50	484	484	538
Regina, SK	50	55	55	538	592	592
Saskatoon, SK	50	50	55	538	538	592
St. John, NB	40	45	45	431	484	484
St. John's, NF	35	35	40	377	377	431
Sudbury, ON	40	45	50	431	484	538
Thunder Bay, ON	50	55	55	538	592	592
Toronto, ON	35	40	40	377	431	431
Vancouver, BC	35	40	40	377	431	431
Winnipeg, MB	50	55	55	538	592	592

Example: Surface Snow Melting System

Geographical location	Philadelphia, PA (from Step 1)
Paving material	Concrete (from Step 1)
Required watt density	**35 W/ft^2 (377 W/m^2)** (from Table 1)

Example: Surface Snow Melting System for Stairs

Geographical location	Philadelphia, PA (from Step 1)
Paving material	Concrete (from Step 1)
Required watt density	**45 W/ft^2 (484 W/m^2)** (from Table 1)

Example: Surface Snow Melting System for Wheel Tracks

Geographical location	Philadelphia, PA (from Step 1)
Paving material	Asphalt (from Step 1)
Required watt density	**40 W/ft^2 (431 W/m^2)** (from Table 1)

Surface Snow Melting

1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Step 3 Determine the total area to be protected

Surfaces

To select the proper heating cable you need to know the size of the surface area you will be protecting from snow accumulation. For large areas, divide the area into smaller subsections no greater than 400 ft^2 (37.2 m^2). For three-phase voltage supplies, create multiples of three equal areas not exceeding 400 ft^2 (37.2 m^2) as shown in Fig. 5. Do not exceed 20 ft (6.1 m) in any direction. If assistance is required to select heating cables for irregularly-shaped areas, please contact your nVent representative.

Total surface area (ft^2/m^2) = Length (ft/m) x Width (ft/m)

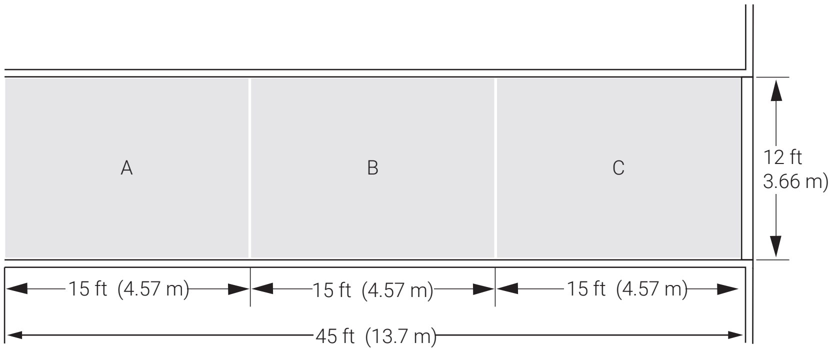


Fig. 5 Example for surface snow melting

Joints in Concrete

Many large concrete slabs are constructed with control and expansion joints. There are three types of joints that can be placed in concrete slabs. An explanation of each follows:

1. Crack-control joints (sawcuts) are intended to control where the slab will crack. Their exact location is determined by the concrete installers before the concrete is poured. Because of the reinforcement in the base slab, there is rarely a shearing action caused by differential vertical movement between the concrete on either side of the crack. As a precautionary measure, however, either of the two methods of crossing control joints shown in Fig. 7 should be used. Minimize the number of times the joint is crossed as shown in Fig. 7. When installing cables using the two-pour method, control joints must be placed in both the base slab and the surface slab.

2. Construction joints are joints that occur when the concrete pour is going to stop but will resume at a later date. Therefore their location may not be known beforehand. However, the rebar is left protruding out of the first pour so that it enters the next pour and therefore shearing action rarely occurs due to differential vertical movement between the concrete on either side of the joint. As a precautionary measure, either of the two methods of crossing control joints shown in Fig. 7 should be used.

3. Expansion joints are placed where a concrete slab abuts a structure, such as a building, a slab, or a foundation, etc. Since the reinforcement does not cross expansion joints, differential movement will occur between the slab and the adjoining structure. **Avoid crossing expansion joints with the heating cable.** If this is not possible, expansion joints can be crossed using a sand filled metal box as shown in Fig. 6.

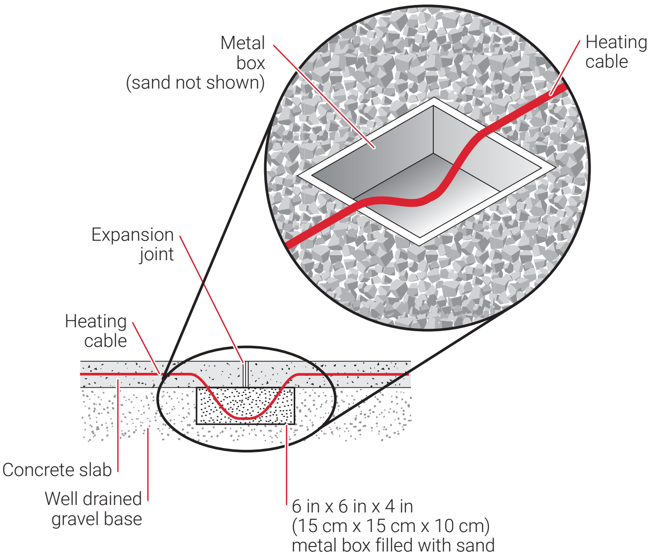


Fig. 6 Crossing expansion joints

Cold leads may cross expansion joints provided that they are fed through nonmetallic conduit to protect against shear (see Fig. 7).

Important Points to Remember

- Concrete slabs should have crack-control joints at intervals typically not exceeding 20 ft (6.1 m).
- When crossing crack-control joints, protect the cable as shown in Fig. 7 or design for a sufficient number of heating cables to avoid crossing control joints altogether.
- Avoid crossing expansion joints. If possible, design for a sufficient number of heating cables so that the cables do not cross expansion joints.

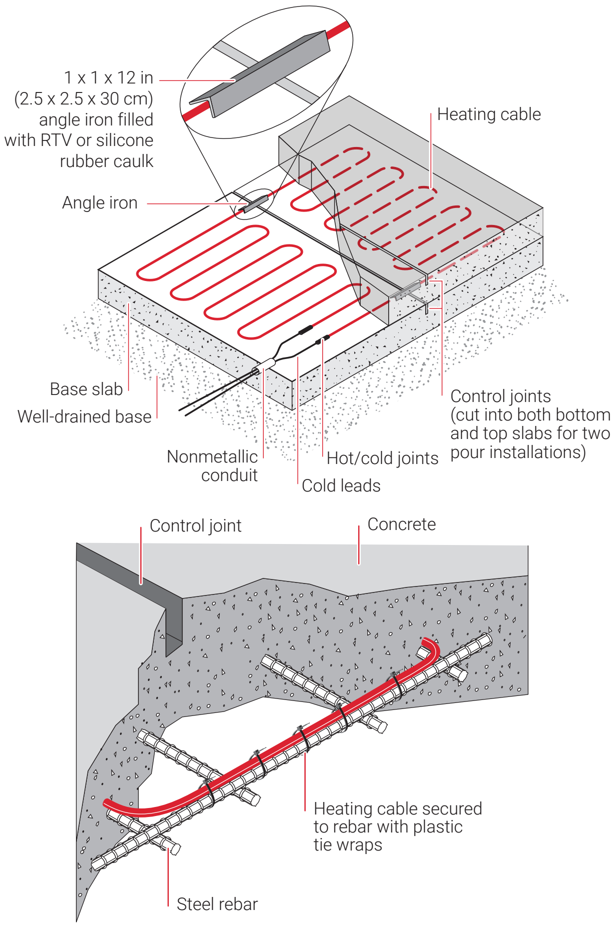


Fig. 7 Method of crossing crack-control joints with MI heating cable in concrete slabs

Example: Surface Snow Melting System

Total ramp surface area	45 ft x 12 ft = 540 ft^2 (from Step 1) (13.7 m x 3.66 m = 50.1 m^2)
For three-phase, divide the ramp into three equal subsections	15 ft x 12 ft = 180 ft^2 (see Fig. 5) (4.57 m x 3.66 m = 16.7 m^2)

Continue with "Select the heating cable" on page 15 and use Table 2 or Table 3 to select an appropriate heating cable.

Stairs

Snow melting applications in concrete stairs present a problem distinct from snow melting on single layer surfaces. Heat loss in stairs occurs from the two exposed surfaces: the top of each stair and its side. Melting snow and ice from stairs requires one run of heating cable be installed 2 to 3 in (5 to 7.5 cm) maximum from the front, or nose, of each stair at a depth of 2 in (5 cm) below the surface of the stair.

Note: Stairs typically require a heating cable that is a specific length. In many cases, it may not be possible to find a SUA/SUB heating cable of the exact length, and a custom engineered heating cable will be required. In these cases, or for elevated stairs or stairs that are not concrete, please contact your nVent representative for assistance in designing a custom engineered heating cable.

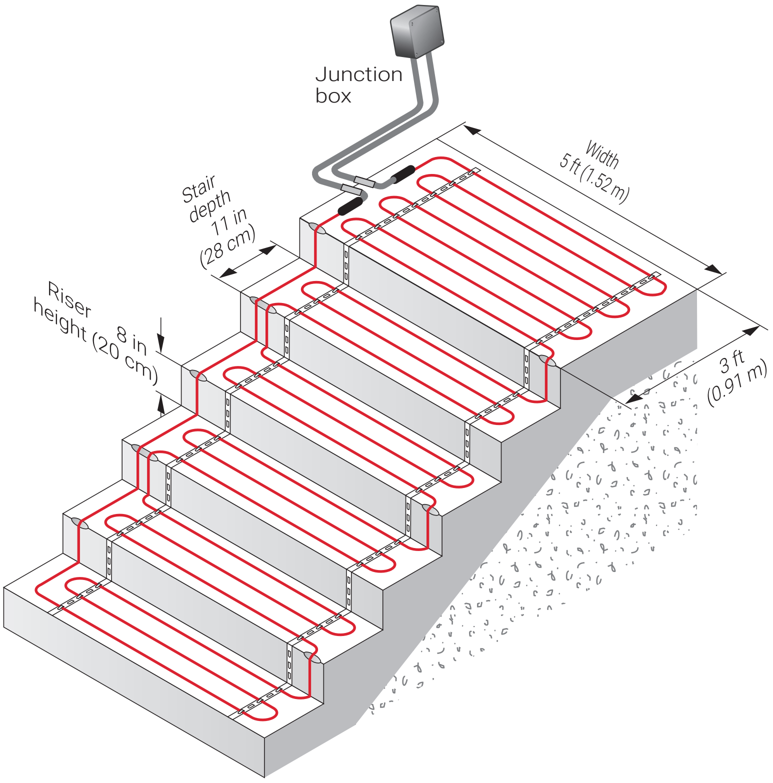


Fig. 8 Example for concrete stair

Typically, three runs of cable are used for stairs with a depth of 10.5 to 12 in (27–30 cm); two runs of cable may be used for stairs with a depth of less than 10.5 in (27 cm). Riser height is typically 8 in (20 cm). For stairs greater than 12 in (30 cm) in depth, contact your nVent representative.

Use the formulas below to determine the length of cable required for stairs (a) and for an attached landing (b), if any, where no expansion joint exists between the stair and landing.

(a) Length of cable for stair (ft/m) = No. of stairs x [(No. of runs per stair x stair width (ft/m)) + (2 x riser height (ft/m))]

(b) $$\text{Length of cable for attached landing (ft)} = \frac{\text{Landing area (ft}^2\text{)} \times 12}{4.5}$$

$$\text{Length of cable for attached landing (m)} = \frac{\text{Landing area (m}^2\text{)} \times 1000}{115}$$

For applications where the landing area is very large or where an expansion joint exists between the stairs and landing, consider the stairs and landing as two separate areas. In these cases, determine the length of cable required for the stairs as shown above and select the cable for the landing as shown for surface snow melting.

Example: Surface Snow Melting System for Stairs

Number of stairs	5 stairs (from Step 1)
Stair width	5 ft (1.52 m) (from Step 1)
Riser height	8 in (20 cm) convert to 0.7 ft (0.2 m) (from Step 1)
Stair depth	11 in (28 cm) (from Step 1)
Number of cable runs per stair	3 runs (for 11 in (28 cm) stair depth)
Length of cable for stair	5 stairs x [(3 x 5 ft) + (2 x 0.7 ft)] = 82 ft 5 stairs x [(3 x 1.52 m) + (2 x 0.2 m)] = 25 m
Landing surface area	5 ft x 3 ft = 15 ft^2 (from Step 1) 1.52 m x 0.91 m = 1.4 m^2
Length of cable for attached landing	(15 ft^2 x 12) / 4.5 = 40 ft (1.4 m^2 x 1000) / 115 = 12.2 m
Total heating cable length required	**82 ft + 40 ft = 122 ft** **25 m + 12.2 m = 37.2 m**

Continue with "Select the heating cable" on page 15, and use Table 4 on page 20 to select an appropriate heating cable.

Wheel Tracks

To reduce power consumption for concrete and asphalt driveways, it may be sufficient to snow melt only the wheel tracks. However, do not snow melt only the wheel tracks in paver applications because of potential problems with pavers sinking.

It is not necessary to calculate the area of the wheel track to select the heating cable. Four runs of heating cable per wheel track spaced evenly over the track width, typically 18 in (46 cm), will provide sufficient heat for snow melting.

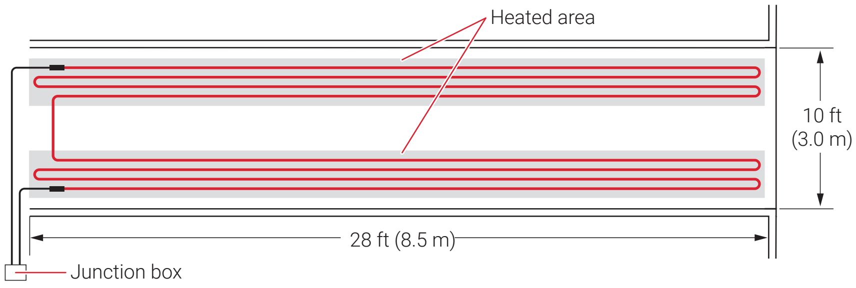


Fig. 9 Example for wheel tracks

Example: Surface Snow Melting System for Wheel Tracks

Wheel track length	28 ft (8.5 m) (from Step 1)
Typical wheel track width	18 in (46 cm)

Continue with "Select the heating cable" on page 15 and use Table 5 on page 21 to select an appropriate heating cable.

Step 4 Select the heating cable

Surface Snow Melting
1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Three-phase supply voltages, including 208 V, 480 / 277 V, and 600 / 347 V, are commonly used for snow melting applications for large areas. For small areas, a single-phase supply voltage must be used. A snow melting system designed for a three-phase supply uses three identical heating cables in each circuit, resulting in the following advantages: fewer circuits, reduced distribution system costs, and a balanced heating system load.

Surfaces

Select a heating cable from Table 2 on page 16 or Table 3 on page 17. When selecting cables from Table 2, ensure that the selected cable is suitable for use when embedded in the paving material being used. The heating cables in Table 3 are suitable for surface snow melting applications where the cables will be directly embedded only in concrete. To select a cable, first calculate the required heating cable output (watts) by multiplying the watt density by the area or subsection area.

Under the appropriate voltage in Table 2 or Table 3, select a heating cable from the "Heating cable output" column with a heating cable output equal to or up to 30% greater than the calculated wattage. In cases where the surface area has been divided into equal subsections, select the appropriate number of heating cables.

Required watts = Watt density x Area
Number of cables = Number of subsection areas

Example: Surface Snow Melting System

Supply voltage	480 V, three-phase (from Step 1)
Required watt density for ramp	35 W/ft^2 (377 W/m^2) (from Step 2)
Subsection area (for 3 equal areas)	180 ft^2 (16.7 m^2) (from Step 3)
Required watts (for each subsection)	35 W/ft^2 x 180 ft^2 = 6300 W 377 W/m^2 x 16.7 m^2 = 6300 W
Heating cable catalog number	**SUB20 (from Table 2)**
Cable wattage	6450 W
Cable voltage	480 V (for cables connected in Delta configuration)
Heating cable length	340 ft (103.6 m)
Number of cables	3 (one cable required for each subsection)

Table 2 Selection Table for Concrete, Asphalt, and Paver Areas

Heating cable catalog number				Heating cable output	Heating cable length		Heating cable current
	Concrete	Asphalt	Pavers[1]	(W)	(ft)	(m)	(A)
120 V							
SUA5	Yes	Yes	Yes	550	40	12.2	4.6
SUA9	Yes	Yes	Yes	1100	66	20.1	9.2
208 V							
SUA4	Yes	Yes	No	1600	68	20.7	7.7
SUA7	Yes	Yes	No	2300	95	29	11.1
SUB1	Yes	Yes	No	3100	132	40.2	14.9
SUB3	Yes	Yes	Yes	3900	280	85.3	18.8
SUB5	Yes	Yes	No	5500	260	79.2	26.4
SUB7	Yes	Yes	No	7000	310	94.5	33.7
SUB9	Yes	Yes	Yes	9000	630	192	43.3
SUB10	Yes	Yes	Yes	13000	717	218.5	62.5
240 V							
SUA3	Yes	Yes	Yes	2000	140	42.7	8.3
SUA8	Yes	Yes	Yes	3200	177	53.9	13.3
SUB2	Yes	Yes	Yes	4000	240	73.1	16.7
SUB3	Yes	Yes	Yes	5200	280	85.3	21.7
SUB4	Yes	Yes	Yes	6000	320	97.5	25
SUB5	Yes	No	No	7350	260	79.2	30.6
SUB6	Yes	Yes	Yes	7500	375	114.3	31.3
SUB8	Yes	Yes	Yes	9000	550	167.6	37.5
SUB7	Yes	No	No	9250	310	94.5	38.5
SUB9	Yes	Yes	Yes	12000	630	192	50
SUB10	Yes	Yes	No	17000	717	218.5	70.8
277 V							
SUA3	Yes	Yes	Yes	2740	140	42.7	9.9
SUA8	Yes	Yes	No	4100	177	53.9	14.8
SUB15	Yes	Yes	Yes	4250	225	68.6	15.3
SUB2	Yes	Yes	No	5300	240	73.1	19.1
SUB16	Yes	Yes	Yes	6180	310	94.5	22.3
SUB3	Yes	Yes	No	6850	280	85.3	24.7
SUB4	Yes	Yes	No	8000	320	97.5	28.9
SUB17	Yes	Yes	Yes	8700	440	134.1	31.4
SUB6	Yes	No	No	10200	375	114.3	36.8
SUB18	Yes	Yes	No	12000	560	170.7	43.3
SUB8	Yes	Yes	No	12200	550	167.6	44.0
SUB9	Yes	No	No	16400	630	192	59.2
480 V							
SUB19	Yes	Yes	Yes	4700	245	74.7	9.8
SUB20	Yes	Yes	Yes	6450	340	103.6	13.4
SUB21	Yes	Yes	Yes	8700	440	134.1	18.1
SUB22	Yes	Yes	No	11000	525	160	22.9

[1] Cables embedded in sand or limestone screenings.

Note: Type SUA cables supplied with 7 ft (2.1 m) cold lead. Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Table 2 Selection Table for Concrete, Asphalt, and Paver Areas

Heading cable catalog number	Concrete	Asphalt	Pavers[1]	Heating cable output (W)	Heating cable length (ft)	(m)	Heating cable current (A)
600 V							
SUB11	Yes	Yes	Yes	4100	225	68.6	6.8
SUB12	Yes	Yes	Yes	5800	310	94.5	9.7
SUB13	Yes	Yes	Yes	8000	428	130.5	13.3
SUB14	Yes	Yes	Yes	11000	548	167	18.3

[1] Cables embedded in sand or limestone screenings.

Note: Type SUA cables supplied with 7 ft (2.1 m) cold lead. Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

The heating cables in Table 3 have been specifically designed for use only in concrete. Do not use these cables in asphalt or for paver areas because they exceed the maximum watts per foot loading for these applications (embedded in asphalt - 25 watts/foot maximum; embedded in sand/limestone screenings for paver areas – 20 watts/foot maximum). To select a cable, calculate the required heating cable output (watts) as shown in the example earlier in this section.

Table 3 Selection Table for Concrete Areas

Heating cable catalog number	Heating cable output (W)	Heating cable length (ft)	(m)	Heating cable current (A)
208 V				
SUB1402	1400	50	15.2	6.7
SUB1702	1700	64	19.5	8.2
SUB2002	2000	72	22.0	9.6
SUB2402	2400	90	27.4	11.5
SUB2802	2800	103	31.4	13.5
SUB3402	3400	121	36.9	16.3
SUB3902	3900	139	42.4	18.8
SUB4502	4500	160	48.8	21.6
SUB5502	5500	197	60.1	26.4
SUB6402	6400	226	68.9	30.8
SUB7802	7800	277	84.5	37.5
SUB10302	10300	368	112.2	49.5
SUB12802	12800	455	138.7	61.5
SUB16102	16100	576	175.6	77.4

Note: Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Table 3 Selection Table for Concrete Areas

Heading cable catalog number	Heating cable output	Heating cable length		Heating cable current
	(W)	(ft)	(m)	(A)
240 V				
SUB1604	1600	59	18.0	6.7
SUB2004	2000	74	22.6	8.3
SUB2304	2300	84	25.6	9.6
SUB2804	2800	103	31.4	11.7
SUB3204	3200	120	36.6	13.3
SUB3904	3900	140	42.7	16.3
SUB4504	4500	160	48.8	18.8
SUB5204	5200	185	56.4	21.7
SUB6404	6400	225	68.6	26.7
SUB7304	7300	263	80.2	30.4
SUB9004	9000	320	97.6	37.5
SUB11904	11900	426	129.9	49.6
SUB14704	14700	528	161.0	61.3
SUB18604	18600	664	202.4	77.5
277 V				
SUB1807	1800	70	21.3	6.5
SUB2307	2300	85	25.9	8.3
SUB2707	2700	95	29.0	9.7
SUB3207	3200	119	36.3	11.6
SUB3807	3800	135	41.2	13.7
SUB4507	4500	162	49.4	16.2
SUB5207	5200	184	56.1	18.8
SUB6007	6000	213	64.9	21.7
SUB7307	7300	262	79.9	26.4
SUB8507	8500	300	91.5	30.7
SUB10307	10300	372	113.4	37.2
SUB13707	13700	491	149.7	49.5
SUB17207	17200	600	182.9	62.1
347 V				
SUB2305	2300	85	25.9	6.6
SUB2905	2900	107	32.6	8.4
SUB3405	3400	119	36.3	9.8
SUB4105	4100	148	45.1	11.8
SUB4705	4700	171	52.1	13.5
SUB5605	5600	205	62.5	16.1
SUB6505	6500	231	70.4	18.7
SUB7505	7500	267	81.4	21.6
SUB9205	9200	327	99.7	26.5
SUB10605	10600	380	115.9	30.5
SUB13005	13000	463	141.2	37.5
SUB17205	17200	614	187.2	49.6

Note: Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Table 3 Selection Table for Concrete Areas

Heating cable catalog number	Heating cable output	Heating cable length		Heating cable current
	(W)	(ft)	(m)	(A)
480 V				
SUB3208	3200	118	36.0	6.7
SUB4008	4000	147	44.8	8.3
SUB4708	4700	163	49.7	9.8
SUB5708	5700	202	61.6	11.9
SUB6608	6600	233	71.0	13.8
SUB7908	7900	278	84.8	16.5
SUB9008	9000	320	97.6	18.8
SUB10408	10400	368	112.2	21.7
SUB12808	12800	450	137.2	26.7
SUB14808	14800	520	158.5	30.8
SUB18008	18000	640	195.1	37.5
600 V				
SUB4006	4000	147	44.8	6.7
SUB5106	5100	181	55.2	8.5
SUB5806	5800	207	63.1	9.7
SUB7106	7100	254	77.4	11.8
SUB8206	8200	293	89.3	13.7
SUB9806	9800	350	106.7	16.3
SUB11206	11200	402	122.6	18.7
SUB13006	13000	462	140.9	21.7
SUB15906	15900	566	172.6	26.5

Note: Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Stairs

For stairs, select a heating cable from Table 4. Under the appropriate voltage, select a cable from the "Heating cable length" column with a length equal to or up to 20 ft (6.1 m) longer than the calculated length from Step 3. Next, confirm that the watt density is equal to, or greater than, the watt density determined from Step 2. If a cable of the required length is not available, please contact your nVent representative for assistance in designing a custom heating cable.

Anticipate and design for the addition of railings or other follow on construction that will require cutting or drilling into the concrete as damage to installed heating cable may occur. Allow for at least 4 in (10 cm) clearance between the heating cable and any planned cuts or holes.

Example: Surface Snow Melting System for Stairs

Supply voltage	208 V, single-phase (from Step 1)
Required watt density	45 W/ft^2 (484 W/m^2) (from Step 2)
Total heating cable length required	122 ft (37.2 m) (from Step 3)
Heating cable catalog number	**SUB1**
Cable wattage	3100 W
Cable voltage	208 V
Heating cable length	132 ft (40.2 m)
Number of cables	1
Installed watt density	55 W/ft^2 (592 W/m^2) (from Table 4)

Table 4 Selection Table for Concrete Stairs

Heating cable catalog number	Heating cable length		Watt density				Heating cable output	Heating cable current
			3 runs cable [1]		2 runs cable [2]			
	(ft)	(m)	(W/ft^2)	(W/m^2)	(W/ft^2)	(W/m^2)	(W)	(A)
120 V								
SUA5	40	12.2	40	431	–	–	550	4.6
SUA9	66	20.1	50	538	40	431	1100	9.2
208 V								
SUA4	68	20.7	55	592	55	592	1600	7.7
SUA7	95	29.0	55	592	55	592	2300	11.1
SUB1	132	40.2	55	592	55	592	3100	14.9
SUB3	280	85.3	40	431	–	–	3900	18.8
SUB5	260	79.2	55	592	50	538	5500	26.4
SUB7	310	94.5	55	592	50	538	7000	33.7
SUB9	630	192.0	40	431	–	–	9000	43.3
240 V								
SUA3	140	42.7	40	431	–	–	2000	8.3
SUB2	240	73.1	50	538	40	431	4000	16.7
SUB3	280	58.3	55	592	40	431	5200	21.7
SUB4	320	97.5	55	592	45	484	6000	25.0
SUB6	375	114.3	55	592	45	484	7500	31.3
SUB8	550	167.6	50	538	40	431	9000	37.5
SUB9	630	192.0	55	592	45	484	12000	50.0
277 V								
SUA3	140	42.7	55	592	45	484	2740	9.9
SUB15	225	68.6	55	592	45	484	4250	15.3
SUB2	240	73.1	55	592	50	538	5300	19.1
SUB16	310	94.5	55	592	45	484	6180	22.3
SUB3	280	85.3	55	592	55	592	6850	24.7
SUB4	320	97.5	55	592	55	592	8000	28.9
SUB17	440	134.1	55	592	45	484	8700	31.4
SUB6	375	114.3	55	592	55	592	10200	36.8
SUB18	560	170.7	55	592	50	538	12000	43.3
480 V								
SUB19	245	74.7	55	592	45	484	4700	9.8
SUB20	340	103.6	55	592	45	484	6450	13.4
SUB21	440	134.1	55	592	45	484	8700	18.1
SUB22	525	160.0	55	592	50	538	11000	22.9
600 V								
SUB11	225	68.6	55	592	40	431	4100	6.8
SUB12	310	94.5	55	592	45	484	5800	9.7
SUB13	428	130.5	55	592	45	484	8000	13.3
SUB14	548	167.0	55	592	45	484	11000	18.3

[1] Based on stairs with a depth of 10.5–12 in (27–30 cm) and 3 runs of cable

[2] Based on stairs with a depth of less than 10.5 in (27 cm) and 2 runs of cable

Note: Type SUA cables supplied with 7 ft (2.1 m) cold lead. Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Wheel Tracks

The heating cables shown in Table 5 will allow for four runs of cable in each wheel track. Under the appropriate voltage, select a heating cable from the "Wheel track length" column for the wheel track length required. For wheel tracks outside the scope of this design guide, please contact your nVent representative for assistance in designing a custom engineered heating cable.

Example: Surface Snow Melting System for Wheel Tracks

Supply voltage	240 V, single-phase (from Step 1)
Wheel track length	28 feet (8.5 m)
Heating cable catalog number	**SUB2**
Cable wattage	4000 W
Cable voltage	240 V
Heating cable length	240 ft (73.1 m)
Number of cables	1

Table 5 Selection Table for Concrete and Asphalt Wheel Tracks

Heating cable catalog number	Wheel track length		Spacing (inches)		Spacing (cm)		Heating cable length		Heating cable output	Heating cable current
	(ft)	(m)	Normal heat	High heat	Normal heat	High heat	(ft)	(m)	(W)	(A)
208 V										
SUA7	8 – 11	2.4 – 3.4	7	5	18	13	95	29	2300	11.1
SUB1	12 – 15	3.5 – 4.6	7	5	18	13	132	40.2	3100	14.9
SUA8	16 – 21	4.7 – 6.4	4	3	10	8	177	54	2400	11.5
SUB5	22 – 31	6.5 – 9.5	6	5	15	13	260	79.2	5500	26.4
SUB7	32 – 38	9.6 – 11.6	6	5	15	13	310	94.5	7000	33.7
SUB6	39 – 46	11.7 – 14.0	4	3	10	8	375	114.3	5700	27.4
SUB8	47 – 68	14.1 – 20.7	4	3	10	8	550	167.7	6800	32.7
SUB9	69 – 78	20.8 – 23.8	4	3	10	8	630	192	9000	43.3
SUB10	79 – 88	23.9 – 26.8	5	4	13	10	717	218.5	13000	62.5
240 V										
SUA3	8 – 16	2.4 – 4.9	4	3	10	8	140	42.7	2000	8.3
SUA8	17 – 21	5.0 – 6.4	5	4	13	10	177	53.9	3200	13.3
SUB2	22 – 29	6.5 – 8.8	5	4	13	10	240	73.1	4000	16.7
SUB3	30 – 34	8.9 – 10.4	5	4	13	10	280	85.3	5200	21.7
SUB4	35 – 39	10.5 – 11.9	5	4	13	10	320	97.5	6000	25
SUB6	40 – 46	12.0 – 14.0	6	5	15	13	375	114.3	7500	31.3
SUB8	47 – 68	14.1 – 20.7	5	4	13	10	550	167.6	9000	37.5
SUB9	69 – 78	20.8 – 23.8	6	5	15	13	630	192	12000	50
SUB10	79 – 88	23.9 – 26.8	7	5	18	13	717	218.5	17000	70.8
277 V										
SUA3	11 – 16	3.4 – 4.9	6	5	15	13	140	42.7	2740	9.9
SUB15	17 – 27	5.0 – 8.2	6	5	15	13	225	68.6	4250	15.3
SUB16	28 – 38	8.3 – 11.6	6	5	15	13	310	94.5	6180	22.3
SUB17	39 – 54	11.7 – 16.5	6	5	15	13	440	134.1	8700	31.4
SUB18	55 – 69	16.6 – 21.0	6	5	15	13	560	170.7	12000	43.3
SUB9 [1]	70 – 78	21.1 – 23.8	7	6	18	15	630	192	16400	59.2

[1] Not for asphalt applications; for use when embedded in concrete only

Note: Type SUA cables supplied with 7 ft (2.1 m) cold lead. Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Table 5 Selection Table for Concrete and Asphalt Wheel Tracks

Heating cable catalog number	Wheel track length		Spacing (inches)		Spacing (cm)		Heating cable length		Heating cable output	Heating cable current
	(ft)	(m)	Normal heat	High heat	Normal heat	High heat	(ft)	(m)	(W)	(A)
480 V										
SUB19	20 – 29	6.1 – 8.8	6	5	15	13	245	74.7	4700	9.8
SUB20	30 – 41	8.9 – 12.5	6	5	15	13	340	103.6	6450	13.4
SUB21	42 – 54	12.6 – 16.5	6	5	15	13	440	134.1	8700	18.1
SUB22	55 – 64	16.6 – 19.5	6	5	15	13	525	160	11000	22.9
600 V										
SUB11	20 – 27	6.1 – 8.2	6	4	15	10	225	68.6	4100	6.8
SUB12	28 – 38	8.3 – 11.6	6	5	15	13	310	94.5	5800	9.7
SUB13	39 – 52	11.7 – 15.9	6	5	15	13	428	130.5	8000	13.3
SUB14	53 – 67	16.0 – 20.4	6	5	15	13	548	167	11000	18.3

[1] Not for asphalt applications; for use when embedded in concrete only

Note: Type SUA cables supplied with 7 ft (2.1 m) cold lead. Type SUB cables supplied with 15 ft (4.6 m) cold leads.
Tolerance on heating cable length is –0% to +3%.
To modify cold lead length, contact your nVent sales representative.

Surface Snow Melting

1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Step 5 Determine heating cable spacing

Surfaces

Determine the spacing between runs of heating cables using the formula below. For concrete installations, do not exceed 10 in (25 cm) spacing of cable, and for asphalt and paver installations do not exceed 6 in (15 cm) spacing. If the cable spacing for asphalt or pavers exceeds 6 in (15 cm), contact your nVent representative for assistance.

To determine heating cable spacing required for surface snow melting

$$\text{Cable spacing (in)} = \frac{\text{Area (ft}^2\text{) x 12 in}}{\text{Heating cable length (ft)}}$$

$$\text{Cable spacing (cm)} = \frac{\text{Area (m}^2\text{) x 100 cm}}{\text{Heating cable length (m)}}$$

Round to the nearest 1/2 in or nearest 1 cm to obtain cable spacing.

Note: If a large area has been divided into subsections or if a three-phase voltage supply is used, the area in the above equations will be the subsection area and the heating cable length will be the length of the cable selected for the subsection area.

Example: Surface Snow Melting System

Subsection area	180 ft^2 (16.7 m^2) (from Step 3)
Heating cable catalog number	SUB20 (from Step 4)
Heating cable length	340 ft (103.6 m) (from Step 4)
Cable spacing	(180 ft^2 x 12 in) / 340 ft = 6.4 in **Rounded to 6.5 in** (16.7 m^2 x 100 cm) / 103.6 m = 16.1 cm **Rounded to 16 cm**

Stairs

For concrete stairs with a depth of 10.5 to 12 in (27 to 30 cm), use three runs of cable with one run 2 to 3 in (5 to 7.5 cm) maximum from the front edge of the stair (this is where snow and ice build-up is the most dangerous) and the remaining two runs spaced equally apart from this run of cable. For stairs with a depth of less than 10.5 in (27 cm), use two runs of cable with one run 2 to 3 in (5 to 7.5 cm) maximum from the front edge of the stair and the second run spaced 4 in (10 cm) from this run of cable. Up to 20 ft (6.1 m) of excess cable may be used up in an attached landing, preferably, or by adding an extra run to one or more stairs.

For attached landings, space heating cables 4.5 in (11.5 cm) apart; up to 20 ft (6.1 m) of excess cable may be used up in the landing, decreasing cable spacing as necessary to accommodate the extra cable.

Example: Surface Snow Melting System for Stairs

Heating cable catalog number	SUB1 (from Step 4)
Stair depth	11 in (28 cm) (from Step 1)
Cable spacing – stairs	3 runs per stair spaced as described above
Cable spacing – landing	4.5 in (11.5 cm)

Wheel Tracks

For wheel tracks, use the spacing shown in Table 5 on page 21 for “Normal” or “High” heat. Use the spacing for “High heat” for all asphalt applications, or where a watt density of 45 W/ft^2 (484 W/m^2) or higher is required.

Example: Surface Snow Melting System for Wheel Tracks

Paving material	Asphalt (from Step 1) – high heat required
Heating cable catalog number	SUB2 (from Step 4)
Cable spacing	4 in (10 cm) (from Table 5)

Step 6 Determine the electrical parameters

Determine Number of Circuits

For single phase circuits, individual heating cables are generally connected to separate circuit breakers. Multiple heating cables may be connected in parallel to reduce the number of circuits with permission from the Authority Having Jurisdiction. The single-phase heating cable current is shown in the appropriate selection table.

For three-phase circuits used in snow melting systems, the three heating cables are generally connected in the Delta configuration shown in Fig. 11 on page 30. Heating cables may also be connected using the Wye configuration shown in Fig. 12 on page 31, but this configuration is less common. For both Delta and Wye configurations, each set of three equal cables form a single circuit.

Select Branch Circuit Breaker

The safety and reliability of any snow melting system depends on the quality of the products selected and the manner in which they are installed and maintained. Incorrect design, handling, installation, or maintenance of any of the system components could damage the snow melting system and may result in inadequate snow melting, electric shock, or fire. To minimize the risk of fire, nVent and national electrical codes require a grounded metallic covering on all heating cables and that all heating cables must be protected with ground-fault equipment protection.

⚠ **WARNING**: To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with the requirements of nVent, agency certifications, and national electrical codes, ground-fault equipment protection must be used on each heating cable branch circuit. Arcing may not be stopped by conventional circuit protection.

The power output and heating cable current draw for the snow melting cables are shown in Table 2 through Table 5.

For single-phase circuits, the load current must not exceed 80% of the circuit breaker rating.

Load current = Heating cable current **(for a single circuit)**
Circuit breaker rating = Load current x 1.25

For a Delta connected three-phase circuit, shown in Fig. 11 on page 30, the load current can be determined by multiplying the heating cable current times 1.732 and it must not exceed 80% of the 3-pole circuit breaker rating.

Load current = Heating cable current x 1.732 **(for a single Delta connected circuit)**
Circuit breaker rating = Load current x 1.25

For a Wye connected three-phase circuit, shown in Fig. 12 on page 31, the load current is the same as the heating cable current and it must not exceed 80% of the 3-pole circuit breaker rating.

Load current = Heating cable current **(for a single Wye connected circuit)**
Circuit breaker rating = Load current x 1.25

Record the number and ratings of the circuit breakers to be used. Use ground-fault protection devices (GFPDs) for all applications. For three-phase circuits, ground fault may be accomplished using a shunt trip 3-pole breaker and a ground fault sensor.

Circuit breaker rating (A) __________ Number of circuit breakers __________

Determine Transformer Load

The total transformer load is the sum of the loads in the system. Calculate the Total Transformer Load as follows:

For cables of equal wattage:

$$\text{Transformer load (kW)} = \frac{\text{Cable (W) x Number of cables}}{1000}$$

When cable wattages are not equal:

$$\text{Transformer load (kW)} = \frac{\text{Cable}_1\text{ (W) + Cable}_2\text{ (W) + Cable}_3\text{ (W)... + Cable}_N\text{ (W)}}{1000}$$

Example: Surface Snow Melting System

Heating cable catalog number	SUB20 (from Step 4)
Heating cable current	13.4 A (from Table 2)
Load current	13.4 x 1.732 = 23.2 A
Circuit breaker rating	30 A breaker, 80% loading 24 A
Number of circuit breakers	1
Cable power output	6450 W (from Step 4)
Number of cables	3 (from Step 4)
Total transformer load	**(6450 W x 3) / 1000 = 19.4 kW**

Example: Surface Snow Melting System for Stairs

Heating cable catalog number	SUB1 (from Step 4)
Heating cable current	14.9 A (from Table 4)
Load current	14.9 A
Circuit breaker rating	20 A breaker, 80% loading 16 A
Number of circuit breakers	1
Cable power output	3100 W (from Step 4)
Number of cables	1 (from Step 4)
Total transformer load	**3100 W / 1000 = 3.1 kW**

Example: Surface Snow Melting System for Wheel Tracks

Heating cable catalog number	SUB2 (from Step 4)
Heating cable current	16.7 A (from Table 5)
Load current	16.7 A
Circuit breaker rating	30 A breaker, 80% loading 24 A
Number of circuit breakers	1
Cable power output	4000 W (from Step 4)
Number of cables	1 (from Step 4)
Total transformer load	**4000 W / 1000 = 4.0 kW**

Step 7 Select the control system and power distribution

Control System

Select a control system from the following three options keeping in mind that an automatic snow melting controller offers the highest system reliability and the lowest operating cost.

- Manual on/off control
- Slab sensing thermostat
- Automatic snow melting controller

If the current rating of the control means is exceeded, all three methods will require contactors sized to carry the load. Each method offers a tradeoff, balancing initial cost versus energy efficiency and ability to provide effective snow melting. If the system is not energized when required, snow will accumulate. If the system is energized when it is not needed, there will be unnecessary power consumption. Choose the control method that best meets the project performance requirements. For additional information, refer to "Power Distribution" on page 30 or contact your nVent representative for details.

Manual On/Off Control

A manually controlled system is operated by a switch that controls the system power contactor. This method requires constant supervision to work effectively. A manual system can be controlled by a building management system.

Slab Sensing Thermostat

A slab sensing thermostat can be used to energize the system whenever the slab temperature is below freezing, but is not energy efficient when used as the sole means of control. The slab sensing thermostat is recommended for all snow melting applications, even when an automatic snow controller is used, and is required for all asphalt and paver installations (for asphalt, it prevents surface damage due to overheating). The snow melting controllers shown in Table 6 include a slab temperature sensor.

Automatic Snow Melting Controller

With an automatic snow melting controller, the snow melting system is automatically energized when both precipitation and low temperature are detected. When precipitation stops or the ambient temperature rises above freezing, the system is de-energized. In addition, a slab sensor de-energizes the system when the slab temperature reaches the slab sensor set point even if freezing precipitation is still present. Using an automatic snow controller with a slab sensor offers the most energy-efficient control solution. For additional information, refer to Fig. 10.

For areas where a large number of circuits are required, the nVent RAYCHEM ACS-30 can be used. The Surface Snow Melting control mode in the ACS-30 includes an External Device control option. This option allows a Snow/Moisture sensing controller (from Table 6) to be integrated into the ACS-30 system. Note that sensors (snow or gutter) cannot be directly connected to the ACS-30 system. Refer to the ACS-30 Programming Guide (H58692) for more information on system setup.

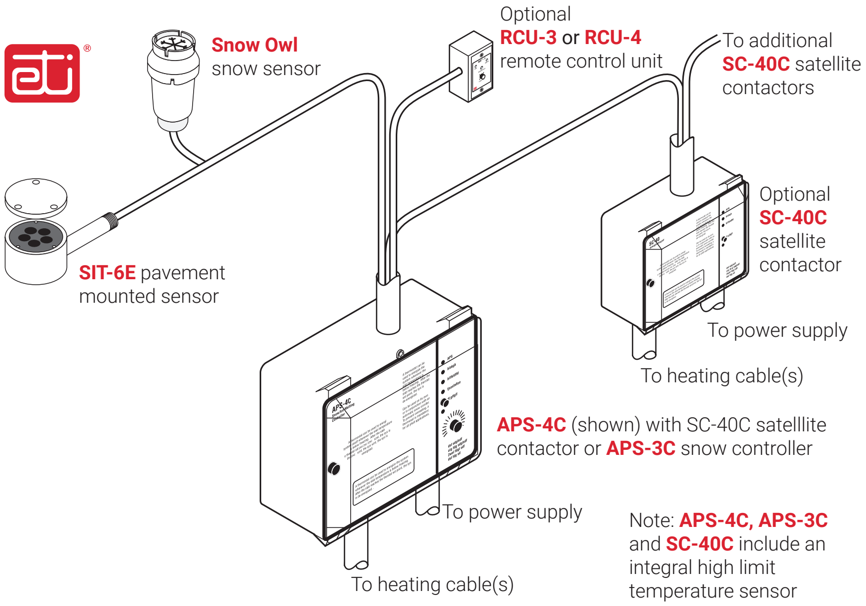


Fig. 10 Automatic snow melting control system

Table 6 Control Systems

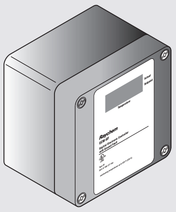
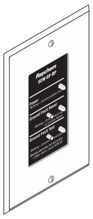
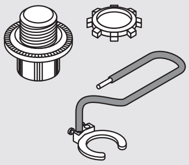
	Catalog number	Description
Slab Sensing Thermostat and Accessory		
	ECW-GF	Electronic sensing controller with 30-mA ground-fault protection. The controller can be programmed to maintain temperatures up to 200°F (93°C) at voltages from 100 to 277 V and can switch current up to 30 Amperes. The ECW-GF is complete with a 25-ft (7.6-m) temperature sensor and is housed in a Type 4X rated enclosure. The controller features an AC/DC dry alarm contact relay. An optional ground-fault display panel (ECW-GF-DP) that can be added to provide ground-fault or alarm indication in applications where the controller is mounted in inaccessible locations.
	ECW-GF-DP	An optional remote display panel (ECW-GF-DP) that can be added to provide ground-fault or alarm indication in applications where the controller is mounted in inaccessible locations.
	MI-GROUND-KIT	Grounding kit for nonmetallic enclosures.

Table 6 Control Systems

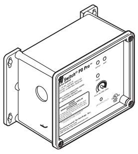
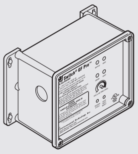
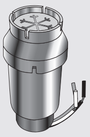
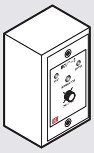
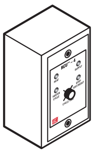
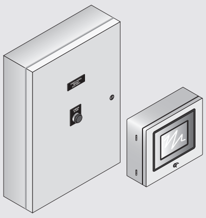
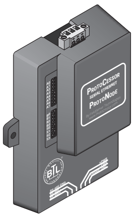
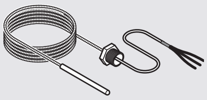
	Catalog number	Description
Automatic Snow Melting Controllers		
	APS-3C	Automatic snow melting controller housed in a Type 3R enclosure provides effective, economical automatic control of all snow melting applications. Features include: 120 V or 208–240 V models, 24-A DPDT output relay and an adjustable hold-on timer. Enclosure dimensions: 11-1/2 in x 9-1/8 in x 6-9/16 in (292 mm x 232 mm x 167 mm)
	APS-4C	Automatic snow melting controller housed in a Type 3R enclosure provides effective, economical automatic control of all snow melting applications. The APS-4C can operate with any number of SC-40C satellite contactors for larger loads. Features include: 277 V single-phase or 208–240, 277/480, and 600 V three-phase models, built-in 3-pole contactor, integral 30 mA ground-fault circuit interrupter and an adjustable hold-on timer. Enclosure dimensions: 11-1/2 in x 9-1/8 in x 6-9/16 in (292 mm x 232 mm x 167 mm)
	SC-40C	Satellite contactor power control peripheral for an APS-4C snow melting controller, housed in a Type 3R enclosure. Features include: 277 V single-phase or 208–240, 277/480 and 600 V three-phase models, built-in 3-pole contactor and integral 30 mA ground-fault circuit interrupter. Enclosure dimensions: 11-1/2 in x 9-1/8 in x 6 in (292 mm x 232 mm x 152 mm)
	PD Pro	Automatic snow and ice melting controller for pavement, sidewalks, loading docks, roofs, gutters and downspouts in commercial and residential environments. The PD Pro interfaces with up to two sensors, (any combination of Snow Owl, GIT-1 or SIT-6E) to meet site requirements. The PD Pro is housed in an environmentally-sheltered Type 4X enclosure and weighs only 3 pounds.
	GF Pro	Automatic snow and ice melting controller for pavement, sidewalks, loading docks, roofs, gutters and downspouts in commercial and residential environments. The GF Pro interfaces with up to two sensors, (any combination of Snow Owl, GIT-1 or SIT-6E) to meet site requirements. The GF Pro is housed in an environmentally-sheltered Type 4X enclosure and weighs only 3 pounds. Features a built-in 30-mA, self-testing Ground-Fault Equipment Protection (GFEP) capability, digitally filtered to minimize false tripping. A ground-fault alarm must be manually reset using the Test/Reset switch before heater operation can continue.
Snow Melting Sensors and Accessories		
	Snow Owl	Overhead snow sensor that detects precipitation or blowing snow at ambient temperatures below 38°F (3.3°C). For use with an APS-3C or APS-4C automatic snow controller, or an SC-40C satellite contactor.
	SIT-6E	Pavement-mounted sensor signals for the heating cable to turn on when the pavement temperature falls below 38°F (3.3°C) and precipitation in any form is present. Microcontroller technology effectively eliminates ice bridging while ensuring accurate temperature measurement. For use with either an APS-3C or APS-4C automatic snow melting controller.
	RCU-3	The RCU–3 provides control and status display to the APS–3C controller from a remote location. It has a 2, 4, 6 or 8 hour CYCLE TIME adjustment, independent of APS-3C setting.
	RCU-4	The RCU–4 provides control and status display to the APS–4C controller and SC-40C Satellite Contactor from a remote location. It has a 2, 4, 6 or 8 hour CYCLE TIME adjustment, independent of the APS-4C or SC-40C setting.

Table 6 Control Systems

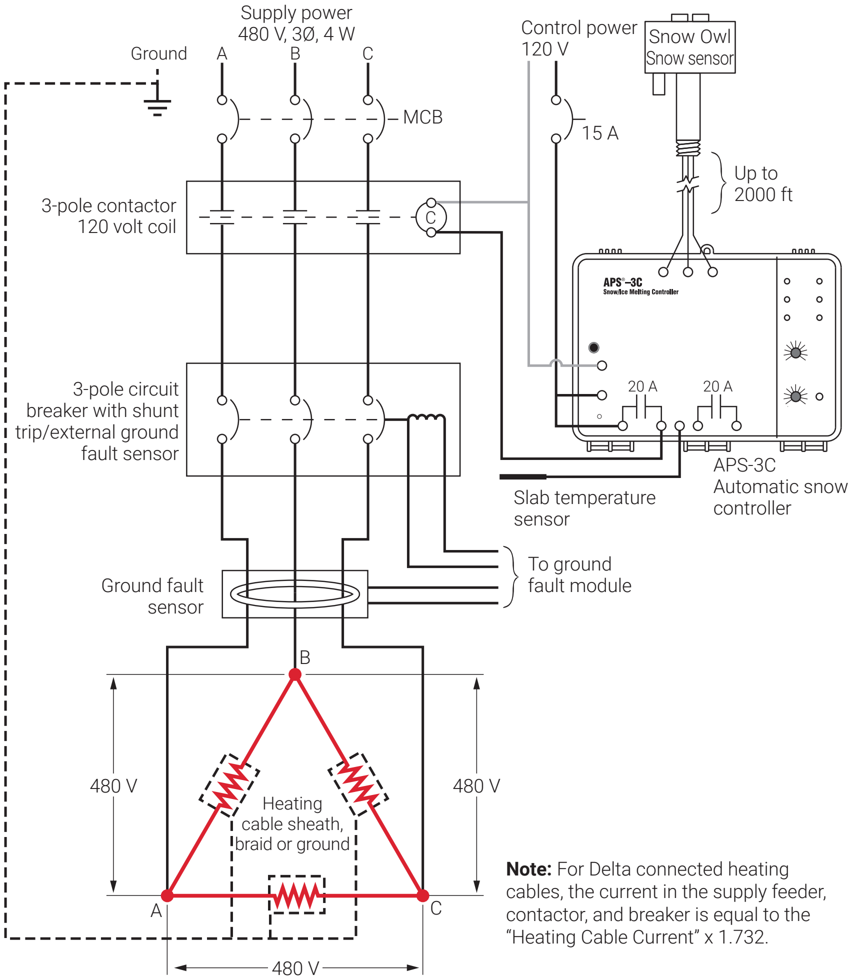
	Catalog number	Description
Electronic Controllers		
	ACS-UIT3 ACS-PCM2-5	The ACS-30 Advanced Commercial Control System is a multipoint electronic control and monitoring system for heat-tracing used in various commercial applications such as pipe freeze protection, roof and gutter de-icing, surface snow melting, hot water temperature maintenance and floor heating. The ACS-30 system can control up to 260 circuits with multiple networked ACS-PCM2-5 panels, with a single ACS-UIT3 user interface terminal. The ACS-PCM2-5 panel can directly control up to 5 individual heat-tracing circuits using electromechanical relays rated at 30 A up to 277 V.
	ProtoNode-RER-1.5K ProtoNode-RER-10K	ProtoNode is an external, high performance multi-protocol gateway for customers needing protocol translation between building management systems (BMS) using BACnet® or Metasys® N2 and the C910-485, ACS-30 controller. ProtoNode-RER-1.5K (Part No P000002008) is for C910-485 or ACS-30 systems with up to 5 PCM panels. ProtoNode-RER-10K (Part No P000001983) is for ACS-30 systems with up to 34 PCM panels.
	RTD-200 RTD10CS RTD50CS	Stainless steel jacketed three-wire RTD (Resistance Temperature Detector) used with C910-485 and ACS-30 controllers. RTD-200: 3-in (76 mm) temperature sensor with a 6-ft (1.8 m) lead wire and 1/2-in NPT bushing RTD10CS: temperature sensor with a 10-ft (3 m) flexible armor, 18-in (457 mm) lead wire and 1/2-inch NPT bushing RTD50CS: temperature sensor with a 50-ft (15.2 m) flexible armor, 18-in (457 mm) lead wire and 1/2-in NPT bushing

Power Distribution

Three-phase, 4-wire voltage supplies such as 208 V, 480 V, and 600 V are commonly used for snow melting applications, especially for large areas. Designing the snow melting system using a three-phase voltage supply results in a balanced heating system load, since three identical cables are used in each circuit. In addition, since three cables are used in each circuit, the result is a system with fewer circuits. For small areas, it may not be possible to select three cables, and one or two heating cables, single-phase connected, must be used.

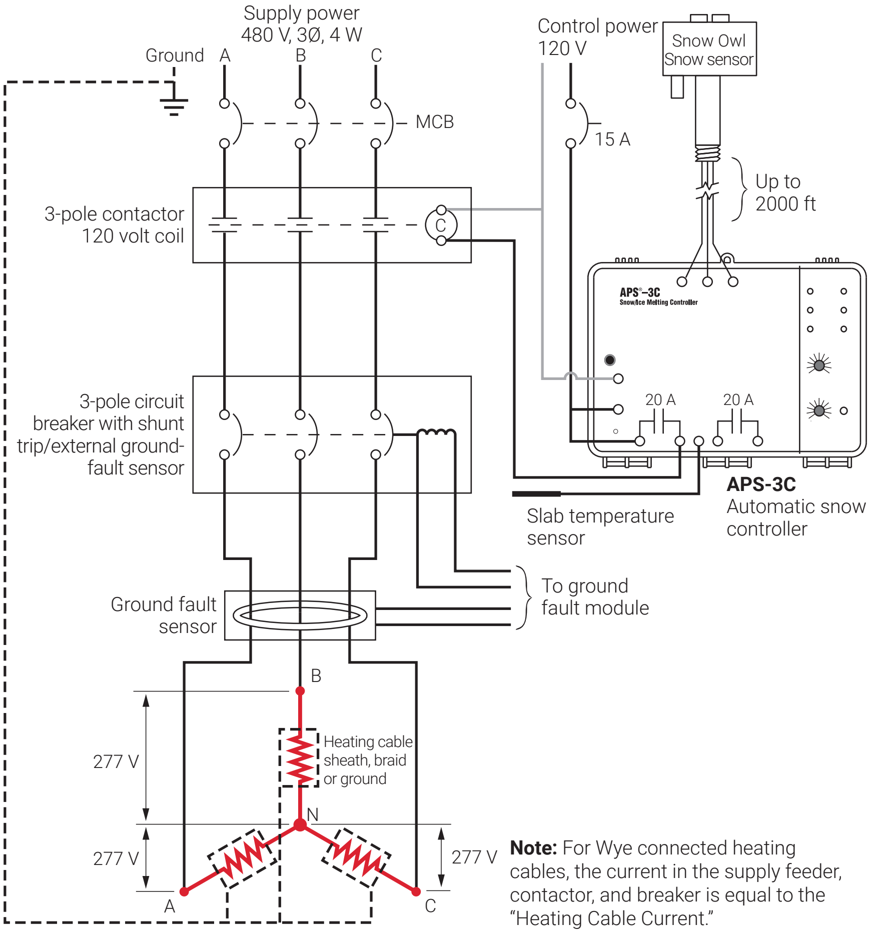
The Delta wiring configuration shown in Fig. 11 is commonly used for three-phase snow melting circuits. Each circuit comprises three heating cables of equal wattage and connected as shown.

Fig. 12 shows the less common Wye wiring configuration. In this case, the three heating cables are also of equal wattage, but most important is that the heating cable voltage must equal the phase-to-neutral supply voltage.



Note: For Delta connected heating cables, the current in the supply feeder, contactor, and breaker is equal to the "Heating Cable Current" x 1.732.

Fig. 11 Typical three-phase DELTA connected heating cables with automatic snow melting controller



Note: For Wye connected heating cables, the current in the supply feeder, contactor, and breaker is equal to the "Heating Cable Current."

Fig. 12 Typical three-phase WYE connected heating cables with automatic snow melting controller

Connecting heating cables in Delta or Wye configuration using three-phase voltage supplies reduces the number of circuits required because three heating cables are used in each circuit. For example, if you select three heating cables to operate on 480 V, single-phase (i.e. 480 V across each cable), you need three 2-conductor feeders, three 2-pole contactors, and three 2-pole breakers (i.e. three circuits) as shown in Fig. 13. If the same three heating cables are connected in Delta configuration to the 480 V, three-phase supply, you need one 3-conductor feeder, one 3-pole contactor, and one 3-pole breaker (i.e. one circuit) as shown in Fig. 11. In addition, decreasing the number of circuits will reduce the cost of the distribution system.

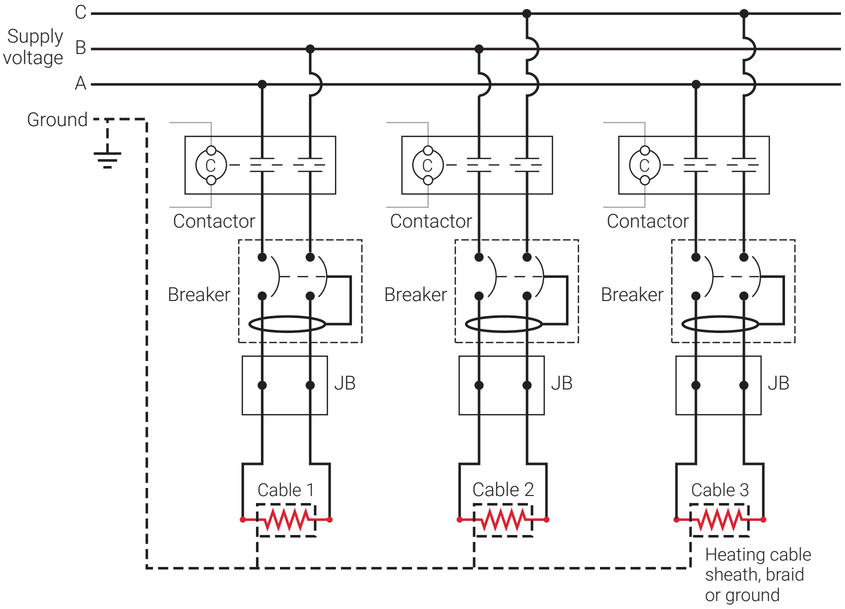


Fig. 13 Simplified single-phase connected heating cables

Single Circuit Control

Heating cable circuits that do not exceed the current rating of the selected controller can be switched directly. Fig. 14 shows a typical single-phase circuit where the heating cable is controlled by a thermostat. When the total electrical load exceeds the rating of the controller or if a single-pole controller is used to control a three-phase circuit, an external contactor is required. In Fig. 11 and Fig. 12, the snow melting controller is used to control the three-phase connected heating cables through a contactor.

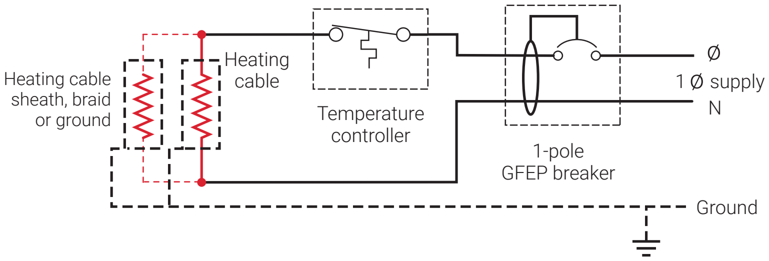


Fig. 14 Single circuit control

Group Control

Multiple single-phase or three-phase circuits may be activated by a single snow melting controller or thermostat (group control).

The SMPG power distribution panel is designed to control snow melting circuits installed in medium sized areas. This panel is available in single-phase (SMPG1) and three-phase (SMPG3) versions and includes ground fault protection, monitoring, and control for snow melting systems. The snow melting system is energized after the integrated snow controller receives an input from any of the remote sensors.

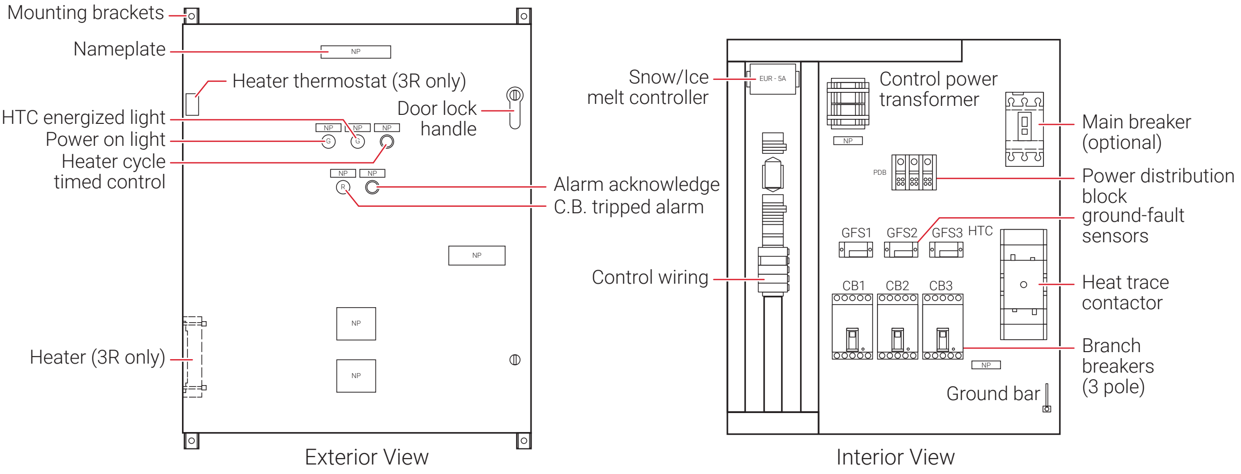


Fig. 15 SMPG3 power distribution panel

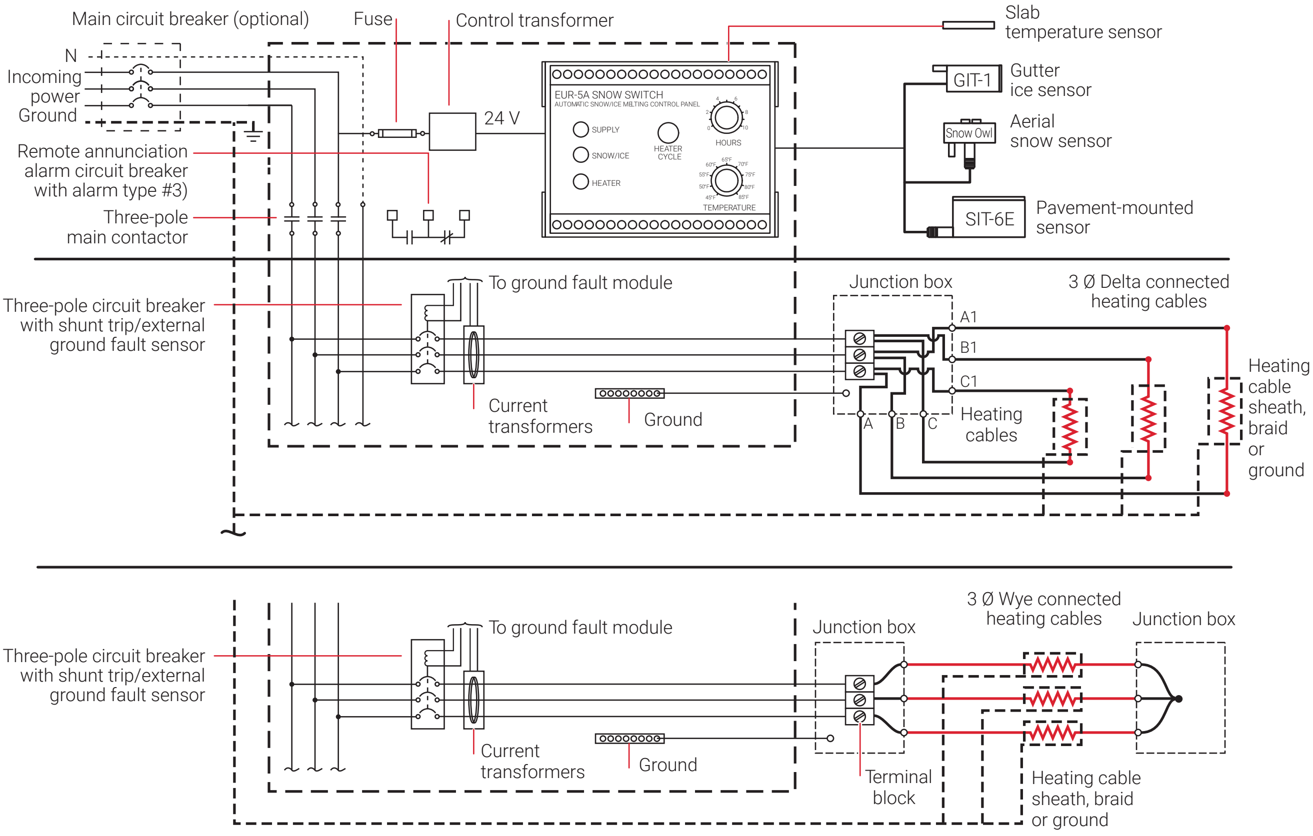
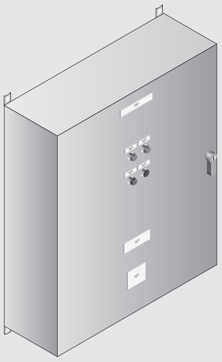
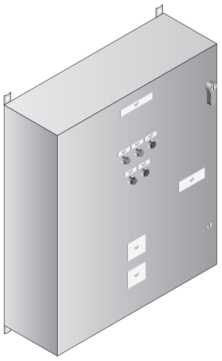


Fig. 16 Typical wiring diagram of group control with SMPG3

Table 7 Power Distribution

	Catalog number	Description
Power Distribution and Control Panels		
	SMPG1	Single-phase power distribution panel that includes ground-fault protection, monitoring, and control for snow melting systems. Single-phase voltages include 208 and 277 V. Refer to the SMPG1 data sheet (H57680) for information on selecting a control panel. If standard configurations do not meet your requirements, contact your nVent representative for a quotation on a custom SMPG1 panel.
	SMPG3	Three-phase power distribution panel that includes ground-fault protection, monitoring, and control for snow melting systems. Three-phase voltages include 208, 480, and 600 V. Refer to the SMPG3 data sheet (H57814) for information on selecting a control panel. If standard configurations do not meet your requirements, contact your nVent representative for a quotation on a custom SMPG3 panel.

Example: Surface Snow Melting System

Automatic snow melting controller	APS-4C
Quantity	1
Pavement-mounted sensor	SIT-6E
Quantity	1

Example: Surface Snow Melting System for Stairs

Slab sensing thermostat	ECW-GF
Quantity	1

Example: Surface Snow Melting System for Wheel Tracks

Automatic snow melting controller	APS-4C
Quantity	1
Aerial snow sensor	Snow Owl
Quantity	1

Surface Snow Melting

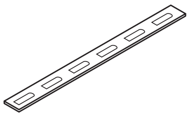
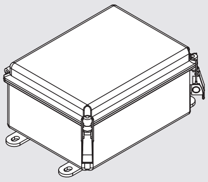
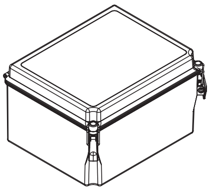
1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Step 8 Select the accessories

A typical snow melting system consists of several accessories. All of the accessories work together to provide a safe and reliable snow melting system that is easy to install and maintain.

We recommend using the following as appropriate.

Table 8 Accessories

	Catalog number	Description	Standard packaging	Usage
	SPACERGALV	HARD-SPACER-GALV-25MM-25M galvanized steel prepunched strapping	82 ft (25 m) rolls	No. rolls = 0.005 x area (ft^2) No. rolls = 0.05 x area (m^2)
	107826-000	HARD-SPACER-SS-25MM-25M stainless steel prepunched strapping	82 ft (25 m) rolls	No. rolls = 0.005 x area (ft^2) No. rolls = 0.05 x area (m^2)
	SMCS	Snow melt caution sign Dimensions 6 x 4 in (150 x 100 mm)	1	1 minimum per system
	MIJB-864-A	Junction box with pre-drilled earth plate for use with MI heating units. Typical uses - Power, splice and end box for three-phase systems. Hazardous locations: CID2 Groups B, C and D. Maximum operating voltage 600Vac. Maximum 35A per terminal, rated 18AWG to 6AWG, Type 4X. Entries: Up to 8 x ½" and 3 x ¾". Power cable gland and hubs not included. Two mounting brackets (MBRP-B) and two pipe straps must be ordered separately for installation. Enclosure dimensions: 8" x 6" x 4" (200 x 150 x 100 mm).	1	For MI systems only
	MIJB-1086-B	Junction box with pre-drilled earth plate for use with MI heating units. Accommodates up to 7 outgoing heating cables and one incoming power cable. It can also be used as a marshalling box – one incoming power cable and 5 outgoing power cables. Typical uses - Power or marshalling, splice and end box for three-phase systems. Hazardous locations: CID2 Groups B, C and D. Maximum operating voltage 600Vac. Maximum 35A per terminal, rated 18AWG to 6AWG, Type 4X. Entries: Up to 11 x ½" and 8 x ¾". Power cable gland and hubs not included. Two mounting brackets (MBRP-B) and two pipe straps must be ordered separately for installation. Order a separate MIJB-LPWR-KIT for #2 or #4AWG power cable to downsize to #6AWG (35A). Enclosure dimensions: 10" x 8" x 6" (250 x 200 x 150 mm).	1	For MI systems only

Example: Surface Snow Melting System

Junction box	MIJB-864-A
Prepunched strapping [1]	SPACERGALV
Quantity	3
Snow melt caution sign	SMCS
Quantity	2

[1] Only required for two-pour slab construction

Example: Surface Snow Melting System for Stairs

Junction box	MIJB-864-A
Quantity	1
Prepunched strapping [1]	SPACERGALV
Quantity	1
Snow melt caution sign	SMCS
Quantity	1

[1] Only required for two-pour slab construction

Example: Surface Snow Melting System for Wheel Tracks

Junction box	MIJB-864-A
Quantity	1
Prepunched strapping [1]	SPACERGALV
Quantity	1
Snow melt caution sign	SMCS
Quantity	1

[1] Only required for two-pour slab construction

Surface Snow Melting

1. Determine design conditions
2. Determine the required watt density
3. Determine the total area to be protected
4. Select the heating cable
5. Determine heating cable spacing
6. Determine the electrical parameters
7. Select the control system and power distribution
8. Select the accessories
9. Complete the Bill of Materials

Step 9 Complete the Bill of Materials

If you used the Design Worksheet to document all your design parameters, you should have all the details you need to complete the Bill of Materials.

MI SYSTEM SURFACE SNOW MELTING DESIGN WORKSHEET

Step 1 Determine design conditions

Application and environment	Size and layout	Supply voltage	Phase	Control method
☐ Surface snow melting Geographical location: ______ **Paving material** ☐ Concrete ☐ Asphalt ☐ Pavers	Slab surface area (ft^2 / m^2): ______ Ramp surface area (ft^2 / m^2): ______ Stairs Number of stairs: ______ Stair width (ft/m): ______ Riser height (in/cm): ______ Stair depth (in/cm): ______ Landing surface area (ft^2 / m^2): ______ Wheel tracks Track length (ft/m): ______ Concrete joints: ______ Surface drains: ______ Location of area structures: ______ Other information as appropriate: ______ ______ ______	☐ 120 V ☐ 208 V ☐ 240 V ☐ 277 V ☐ 347 V ☐ 480 V ☐ 600 V	☐ Single-phase ☐ Three-phase	☐ Automatic snow melting controller ☐ Slab-sensing thermostat ☐ Manual on/off control
Example: **✓ Surface snow melting** **✓ Philadelphia, PA** **✓ Concrete ramp**	**Ramp surface: 45 ft x 12 ft**	**✓ 480 V**	**✓ Three-phase**	**✓ Automatic snow melting controller**

Step 2 Determine the required watt density

Surface snow melting system for slabs, ramps, stairs, and wheel tracks: See Table 1

Geographical location: ______

Paving material: ______

Required watt density: ______

Example: Surface Snow Melting System

Ramp surface

Geographical location:	Philadelphia, PA (from Step 1)
Paving material:	Concrete (from Step 1)
Required watt density:	**35 W/ft^2** (from Table 1)

Step 3 Determine the total area to be protected

Total ramp/slab surface area

__________ x __________ = ——————→ __________

Length (ft/m) Width (ft/m) **Surface area to be protected (ft^2/m^2)**

For large areas and areas using a three-phase voltage supply

__________ / No. of subsections = __________ x __________ = __________

Length (ft/m) Length of each subsection (ft/m) Width (ft/m) **Subsection area to be protected (ft^2/m^2)**

Note: For three-phase voltage supplies, use multiples of three equal subsections.

Example: Surface Snow Melting System

Ramp

Calculate the surface area of the ramp for three-phase application

45 ft / 3 = **15 ft** x **12 ft** = **180 ft^2**

Length (ft) Length of each subsection (ft) Width (ft) **Subsection area to be protected (ft^2)**

Stairs

Calculate the heating cable needed for stairs and landing

Determine the number of cable runs needed

Stair depth: < 10.5 in (27 cm): 2 cable runs

Stair depth: 10.5–12 in (27–30 cm): 3 cable runs

Cable runs needed: __________

Calculate the heating cable length for stairs

__________ x [(__________ x __________) + (2 x __________)] = __________

No. of stairs No. runs per stair Stair width (f/m) Riser height (ft/m) **Length of cable for stairs (ft/m)**

Landing (attached to stairs)

Calculate the heating cable length for landing

(__________ x 12) / 4.5 = ——————→ __________

Landing area (ft^2) **Length of cable for attached landing (ft)**

(__________ x 1000) / 115 = ——————→ __________

Landing area (m^2) **Length of cable for attached landing (m)**

__________ + __________ = ——————→ __________

Length of cable for stairs (ft/m) Length of cable for landing (ft/m) **Total heating cable length required (ft/m)**

Wheel tracks

Wheel track length: __________

Step 4 Select the heating cable

Surfaces: See Table 2 and Table 3.

Supply voltage: ______________________ (from Step 1)

Required watt density: ______________________ (from Step 2)

Subsection area: ______________________ (from Step 3)

______________ x ______________ = ______________

Watt density (W/ft^2) (W/m^2) Area (ft^2/m^2) **Required watts for area (W)**

Heating cable catalog number: ______________________

Cable wattage: ______________________

Cable voltage: ______________________

Heating cable length: ______________________

Number of cables = Number of subsection areas

Example: Surface Snow Melting System

Supply voltage:	480 V, three-phase (from Step 1)
Required watt density for ramp:	35 W/ft^2 (from Step 2)
Subsection area (for 3 equal areas):	180 ft^2 (from Step 3)
Required watts (for each subsection):	35 W/ft^2 x 180 ft^2 = 6300 W
Heating cable catalog number:	**SUB20**
Cable wattage:	6450 W
Cable voltage:	480 V (for cables connected in Delta configuration)
Heating cable length:	340 ft
Number of cables:	3 (one cable required for each subsection)

Stairs: See Table 4

Supply voltage: ______________________ (from Step 1)

Required watt density: ______________________ (from Step 2)

Total heating cable length required: ______________________ (from Step 3)

Heating cable catalog number: ______________________

Cable wattage: ______________________

Cable voltage: ______________________

Heating cable length: ______________________

Number of cables: ______________________

Installed watt density: ______________________ (from Table 4)

Wheel Tracks: See Table 5

Supply voltage: ______________________ (from Step 1)

Wheel track length: ______________________

Heating cable catalog number: ______________________

Cable wattage: ______________________

Cable voltage: ______________________

Heating cable length: ______________________

Number of cables: ______________________

Step 5 Determine the heating cable spacing

Surfaces

Imperial $$\left(\underset{\text{Surface area (ft}^2\text{)}}{\underline{\qquad\qquad\qquad}} \times 12 \text{ in}\right) / \underset{\text{Heating cable length (ft)}}{\underline{\qquad\qquad\qquad\qquad\qquad\qquad}} = \xrightarrow{\qquad\qquad\qquad} \underset{\textbf{Heating cable spacing (in)}}{\underline{\qquad\qquad\qquad\qquad}}$$

Metric $$\left(\underset{\text{Surface area (m}^2\text{)}}{\underline{\qquad\qquad\qquad}} \times 100 \text{ cm}\right) / \underset{\text{Heating cable length (m)}}{\underline{\qquad\qquad\qquad\qquad\qquad\qquad}} = \xrightarrow{\qquad\qquad\qquad} \underset{\textbf{Heating cable spacing (cm)}}{\underline{\qquad\qquad\qquad\qquad}}$$

Round to the nearest 1/2 in or 1 cm to obtain cable spacing.

Example: Surface Snow Melting System

Subsection area:	180 ft^2 (from Step 3)
Heating cable catalog number:	SUB20 (from Step 4)
Heating cable length:	340 ft (from Step 4)

Cable spacing

$$\left(\underset{\text{Surface area (ft}^2\text{)}}{\underline{\textbf{180 ft}^2}} \times 12\right) / \underset{\text{Heating cable length (ft)}}{\underline{\qquad\qquad\textbf{340 ft}\qquad\qquad}} = \xrightarrow{\qquad\qquad\qquad} \underset{\textbf{Heating cable spacing (in)}}{\underline{\textbf{6.4 in rounded to 6.5 in}}}$$

Stairs

Stair depth: ______________________ (from Step 1)

Cable spacing – stairs: ______________________ (refer to Step 5)

Cable spacing – landing: ______________________ (refer to Step 5)

Wheel Tracks: See Table 5

Paving material: ______________________ (from Step 1)

Heating cable catalog number: ______________________ (from Step 4)

Cable spacing: ______________________ (refer to Step 5)

Step 6 Determine the electrical parameters

Determine circuit breaker rating and number of circuits

Circuit breaker rating (A) ____________ Number of circuit breakers ____________

For single-phase circuit

Load current = Heating cable current (from selection tables) ____________ → ____________

(____________ x 1.25) = ____________ ____________ → = ____________
Load current (A) **Minimum circuit breaker rating (A)** **Circuit breaker rating (A)**

For Delta connected three-phase circuit

Load current = Heating cable current (from selection tables) x 1.732 ____________ → ____________

(____________ x 1.25) = ____________ ____________ → = ____________
Load current (A) **Minimum circuit breaker rating (A)** **Circuit breaker rating (A)**

For Wye connected three-phase circuit

Load current = Heating cable current (from selection tables) ____________ → ____________

(____________ x 1.25) = ____________ ____________ → = ____________
Load current (A) **Minimum circuit breaker rating (A)** **Circuit breaker rating (A)**

Determine transformer load

For cables of equal wattage

(____________ x ____________) / 1000 ____________ → = ____________
Cable (W) Number of cables **Transformer load (kW)**

When cable wattages are not equal

(____________ + ____________ + ____________ + ____________) / 1000 = ____________
Cable$_1$ (W) Cable$_2$ (W) Cable$_3$ (W)... Cable$_N$ (W) **Transformer load (kW)**

Example: Surface Snow Melting System

For Delta connected three-phase circuit

Heating cable catalog number:	SUB20 (from Step 4)
Number of heating cables:	3 (from Step 4)
Cable power output:	6450 W (from Step 4)
Load current:	13.4 A (from Table 2) x 1.732 = 23.2 A

(**23.2 A** x 1.25) = **29.0 A** → = **30 A**
Load current (A) **Minimum circuit breaker rating (A)** **Circuit breaker rating (A)**

(**6450 W** x **3**) / 1000 → = **19.4 kW**
Cable (W) Number of cables **Transformer load (kW)**

Step 7 Select the control system and power distribution

Control Systems

See Table 6 Control Systems.

Thermostats, controllers and accessories	Description	Quantity
☐ ECW-GF	Electronic thermostat with 25-ft sensor	____________
☐ ECW-GF-DP	Remote display panel for ECW-GF	____________
☐ PD Pro	Automatic snow and ice melting controller	____________
☐ GF-Pro	Automatic snow and ice melting controller	____________
☐ MI-GROUND-KIT	Grounding kit for nonmetallic enclosures	____________
☐ APS-3C	Automatic snow melting controller	____________
☐ APS-4C	Automatic snow melting controller	____________
☐ SC-40C	Satellite contactor	____________
☐ Snow Owl	Aerial snow sensor	____________
☐ SIT-6E	Pavement-mounted sensor	____________
☐ RCU-3	Remote control unit for APS-3C	____________
☐ RCU-4	Remote control unit for APS-4C	____________
☐ ACS-UIT3	ACS-30 user interface terminal	____________
☐ ACS-PCM2-5	ACS-30 power control panel	____________
☐ ProtoNode-RER	Multi-protocol gateway	____________
☐ RTD10CS	Resistance temperature device for ACS-30	____________
☐ RTD200	Resistance temperature device for ACS-30	____________
☐ RTD50CS	Resistance temperature device for ACS-30	____________

Power Distribution and Control Panels

See Table 7 Power Distribution.

Power distribution and control panels	Description	Quantity
☐ SMPG1	Single-phase power distribution panel	____________
☐ SMPG3	Three-phase power distribution panel	____________

Example: Surface Snow Melting System

✓ APS-4C	Automatic snow melting controller	1
✓ SIT-6E	Pavement-mounted sensor	1

Step 8 Select the accessories

See Table 8 Accessories.

Accessories	Description	Quantity
☐ SPACERGALV	Galvanized steel prepunched strapping	____________
☐ 107826-000	Stainless steel prepunched strapping	____________
☐ SMCS	Snow melt caution sign	____________
☐ MIJB-864-A	Fiberglass junction box (for MI cable only)	____________
☐ MIJB-1086-B	Fiberglass junction box (for MI cable only)	____________

Example: Surface Snow Melting System

✓ **MIJB-864-A**	Fiberglass junction box (for MI cable only)	**1**
✓ **SPACERGALV**[1]	Prepunched strapping	**3**
✓ **SMCS**	Snow melt caution sign	**2**

[1] Only required for two-pour slab construction

Step 9 Complete the Bill of Materials

Use the information recorded in this worksheet to complete the Bill of Materials.

Surface Snow Melting System Estimate Form

Email completed form to your nVent Sales Rep for a complete Bill of Materials and quote!

CHECK OUT SNOCALC, OUR ONLINE SURFACE SNOW MELTING DESIGN TOOL
at **https://www.nVent.com/RAYCHEM/resources/design-tools/tracecalc-pro-buildings**

1. Building Type:	☐ House	☐ Small shop / strip mall	☐ High-rise residential / multi-use bldg.	☐ Commercial building
2. Project City, State:				
3. Area Name:				
4. Voltage:	☐ 120 V ☐ 208 V ☐ 240 V ☐ 277 V	☐ 120 V ☐ 208 V ☐ 240 V ☐ 277 V	☐ 120 V ☐ 208 V ☐ 240 V ☐ 277 V	☐ 120 V ☐ 208 V ☐ 240 V ☐ 277 V
	☐ 347 V ☐ 480 V ☐ 600 V	☐ 347 V ☐ 480 V ☐ 600 V	☐ 347 V ☐ 480 V ☐ 600 V	☐ 347 V ☐ 480 V ☐ 600 V
5. Voltage Configuration:	☐ 1 Phase ☐ 3 Phase	☐ 1 Phase ☐ 3 Phase	☐ 1 Phase ☐ 3 Phase	☐ 1 Phase ☐ 3 Phase
6. Breaker Size:	☐ 20 A ☐ 30 A ☐ 40 A ☐ 50 A	☐ 20 A ☐ 30 A ☐ 40 A ☐ 50 A	☐ 20 A ☐ 30 A ☐ 40 A ☐ 50 A	☐ 20 A ☐ 30 A ☐ 40 A ☐ 50 A
	☐ 60 A ☐ 80 A ☐ 100 A	☐ 60 A ☐ 80 A ☐ 100 A	☐ 60 A ☐ 80 A ☐ 100 A	☐ 60 A ☐ 80 A ☐ 100 A
7. Area Type:	☐ Concrete	☐ Concrete	☐ Concrete	☐ Concrete
	☐ Asphalt	☐ Asphalt	☐ Asphalt	☐ Asphalt
	☐ Pavers	☐ Pavers	☐ Pavers	☐ Pavers
	☐ Stairs (on grade)	☐ Stairs (on grade)	☐ Stairs (on grade)	☐ Stairs (on grade)
	☐ Stairs (elevated)	☐ Stairs (elevated)	☐ Stairs (elevated)	☐ Stairs (elevated)
	☐ Wheel Tracks (concrete)	☐ Wheel Tracks (concrete)	☐ Wheel Tracks (concrete)	☐ Wheel Tracks (concrete)
	☐ Wheel Tracks (asphalt)	☐ Wheel Tracks (asphalt)	☐ Wheel Tracks (asphalt)	☐ Wheel Tracks (asphalt)
8. Number of Steps:				
9. Stair Width:	____________ ft	____________ ft	____________ ft	____________ ft
10. Stair Depth:	____________ in	____________ in	____________ in	____________ in
11. Riser Height:	____________ in	____________ in	____________ in	____________ in
12. Landing Area:	____________ sq ft	____________ sq ft	____________ sq ft	____________ sq ft
13. Total Area (not including landing):	____________ sq ft	____________ sq ft	____________ sq ft	____________ sq ft
14. Number of Expansion Joints:				
15. Feet from Junction Box to Slab:	____________ ft	____________ ft	____________ ft	____________ ft
16. Junction Box Height Above Grade:	____________ ft	____________ ft	____________ ft	____________ ft
17. If Wheel Track Design, Length of Tracks:	____________ ft	____________ ft	____________ ft	____________ ft
18. Control:	☐ Control Only	☐ Control Only	☐ Control Only	☐ Control Only
	☐ Control w/ Power Dist	☐ Control w/ Power Dist	☐ Control w/ Power Dist	☐ Control w/ Power Dist
19. Controls Provide GFPD?	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No
20. Notes:			**BUSINESS CARD**	
21. Customer name:				
Company:				
Phone:				
Email:				
Project name:				

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