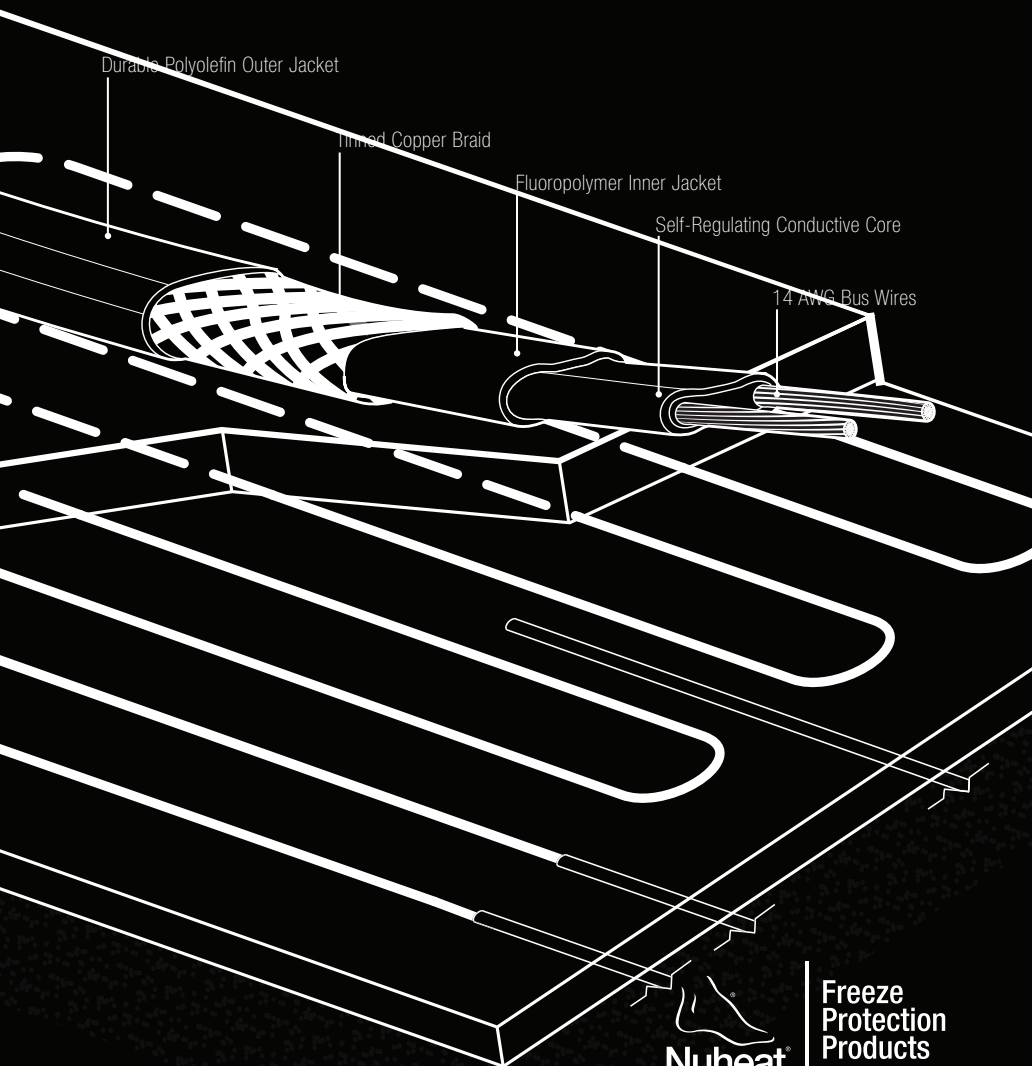


Nuheat

WEATHER-READY™ SNOW MELTING SYSTEM

Self-Regulating Heating Cable Installation Guide



Nuheat®

Freeze
Protection
Products

PIPE • ROOF & GUTTER • SLAB



**Freeze
Protection
Products**
PIPE • ROOF & GUTTER • SLAB

NUHEAT INDUSTRIES LIMITED

© 2013 Nuheat Industries Limited. All rights reserved.

The entire contents of this manual, including but not limited to text, images, and the selection and arrangement of information (collectively the "Materials"), are protected by copyright and other intellectual property laws under the laws of Canada and other countries.

ATTENTION:

- The installation of this heating product shall be in accordance with the manufacturer's instructions and in accordance with the Canadian Electrical Code Part 1 or the National Electrical Code (US) whichever is applicable.
- This equipment shall be installed only by qualified personnel who are familiar with the construction and operation of the apparatus and risks involved.
- Caution should be taken to guard against risk of electric shock, fire and bodily injury during the installation of this equipment.

TABLE OF CONTENTS

SECTION 1: INSTALLATION PREPARATION

1.1	Important Installation Guidelines.....	6
1.2	Preparing for Installation.....	8
1.3	Tools & Materials.....	9
1.4	Before You Start.....	10
1.5	Special Installation Considerations.....	11
1.6	Testing.....	14

SECTION 2: INSTALLATION

2.1	Planning the Installation.....	17
2.2	Concrete Pour Installations.....	20
2.3	Paving Stone Installations.....	24

SECTION 3: ELECTRICAL CONNECTIONS & CONTROLS

3.1	Confirming Electrical Requirements.....	29
3.2	Control Options.....	30
3.3	System Startup.....	31
3.4	Repairs & Maintenance.....	32
3.5	Typical Wiring Diagrams.....	33
3.6	Installation & Inspection Records.....	38

SECTION 1

INSTALLATION PREPARATION

1.1	IMPORTANT INSTALLATION GUIDELINES	6
1.2	PLANNING THE INSTALLATION	8
1.21	Use of the Manual	8
1.22	General Installation Guidelines	8
1.3	TOOLS & MATERIALS	9
1.4	BEFORE YOU START	10
1.5	SPECIAL INSTALLATION CONSIDERATIONS	11
1.51	Tire Tracks	11
1.52	Stairs	12
1.53	Waterproof Membranes	12
1.54	Trench Drains	13
1.6	TESTING	14
1.61	Visual Inspection Test	14
1.62	Insulation Resistance Test	14
1.63	Circuit Length Verification Test	15

1.1 IMPORTANT INSTALLATION GUIDELINES



Fire and shock hazard: This snow melting system must be installed correctly to ensure proper operation and to prevent shock and fire. Read these important warnings and carefully follow all the installation instructions.

- > Do not energize snow melting cable before installation is complete and topping material has fully cured as per manufacturer's instructions.
- > The snow melting cable must be installed in concrete or in other materials that have been designed to handle the expected load and environmental conditions over time.
- > Nuheat Weather-Ready™ SM32-2 Snow Melt Cable must be used with Nuheat-approved SMPC power connection kit, SMSK splice kit, SMES end seal kit, and SMEJ expansion joint kit only.
- > To prevent moisture damage, make all electrical connections above grade in properly sized UL listed and CSA approved outdoor rated junction boxes. Materials used for the housing (i.e. junction boxes) or supports on which the cables are installed should be grounded.
- > Cable terminations should be kept dry before, during and after installation.
- > Conduct insulation and resistance tests before, during and after installation.
- > All installations must be in compliance with the following electrical codes:
 - > Articles 426 and 500 of the NEC (National Electrical Code)
 - > Sections 62 and 18 of the CEC (Canadian Electrical Code)
- > The quality and preparedness of the base material must conform to generally accepted standards and specifications set by the American Society for Testing and Materials (ASTM) or Canadian Standards Association (CSA).
- > To minimize the risk of fire, installations must comply with Nuheat installation instructions and National Electrical Codes and Canadian Electrical Codes.
- > De-energise all power circuits before installation or servicing.
- > Damaged bus wires can overheat or short. Do not break bus wire strands when scoring the jacket or core.
- > Use only plastic cable ties to secure the snow melting cable to the reinforcement. Do not use metal attachments such as tie wire.

1.1 IMPORTANT INSTALLATION GUIDELINES

- > Megohmmeters operate at high voltage. This voltage is hazardous and possibly lethal. Read and follow all instructions included with the instrument you are using.
- > The ground braid of this device shall not be utilized as a grounding conductor, but must be bonded to ground.
- > The minimum bending radius of the snow melting cable is 2" (49mm) at 68°F (20°C).
- > The snow melting cable is suitable to be used in wet location (-W).
- > Maximum Exposure Temperature: 90°C (194°F).

NUHEAT INDUSTRIES AND NEC REQUIRE EQUIPMENT GROUND-FAULT PROTECTION ON EACH SNOW MELTING CABLE BRANCH CIRCUIT.

1.2 PLANNING THE INSTALLATION

1.21 USE OF THE MANUAL

This manual covers the installation of Nuheat Weather-Ready™ Self-Regulating Snow Melt Cable and connection kits for residential and commercial snow melting and anti-icing for concrete and paving stone applications. Use of asphalt to embed Nuheat Weather-Ready™ Snow Melt Cable is **not permitted**.

1.22 GENERAL GUIDELINES

These guidelines are provided to assist the installer throughout the installation process and should be reviewed before the installation begins.

- > Do not energize cable before installation is complete.
- > Do not install cable if the temperature is below 32°F (0°C).
- > Do not repeatedly bend and straighten the cable.
- > Ensure snow melting cable is not in contact with an insulating material.
- > Ensure snow melting cable is installed a minimum ½" (13mm) away from any combustible surfaces.
- > Install snow melting cable at the designed spacing to ensure correct watt density.
- > Do not walk on cable.
- > Do not use sharp tools such as rakes, shovels, etc. when installing cable. Ensure the outer jacket of the snow melting cable is not damaged/nicked during installation. Do not use sharp objects.
- > All ends of snow melting cable circuits should be terminated outdoors and above grade in properly sized UL listed and CSA approved outdoor rated junction boxes. Keep covers on junction boxes when not working on them.
- > Junction boxes need to be minimum 400 cubic inches per circuit of snow melting cable (power connection and end seal).
- > Nuheat recommends the junction boxes installed a minimum of 12" above grade.
- > Nuheat requires snow melting cable to be routed to junction boxes via 1" rigid conduits.
- > Install temporary end seals such as electrical tape or heat shrink tubing on all exposed cable ends to prevent water and contaminants from entering the snow melting cable. Ensure all temporary end seals are removed before final installation.
- > When not being installed, store cable away from traffic to prevent damage by being walked on, cut and contaminated, etc.
- > Nuheat **STRONGLY SUGGESTS** taking a picture of the cable layout prior to covering the snow melting cable. Knowing the layout of the cable will help technicians troubleshoot the snow melting cable circuit in the future.

1.3 TOOLS & MATERIALS

The following tools are recommended to perform the various installation tasks. Connection kit and accessory instructions include a more detailed description of the tools required to assemble each kit.

- > Utility Knife
- > Diagonal cutters
- > Pliers (long-nosed)
- > Crimp tool for heat shrink connection kits
- > Measuring tape
- > Plastic zip ties
- > Propane torch or electric heat gun
- > 1000 Vdc Megohmmeter
- > Digital camera

1.4 BEFORE YOU START

Before beginning installation work, verify that all material required for the installation is on hand or on order. It is especially important to have the proper megohmmeter, propane torch and crimp tool available.

- > Review the snow melting cable design and compare the list of materials to the catalogue numbers of the snow melting cable and connection kits received.
- > Ensure that the service voltage available is correct for the snow melting cable selection. Nuheat Weather-Ready™ Self-Regulating Snow Melt Cable is rated for 208V-277V. Inspect the snow melting cable and connection kits to ensure there is no damage.
- > Verify that the snow melting cable jacket is not damaged by conducting the insulation resistance test on each cable. Refer to page 14 for insulation resistance testing procedures. Do not power the snow melting cable when it is on the reel.
- > Inspect the site for sharp objects and burrs on the wire mesh or rebar. Remove or round out sharp objects and burrs if found.

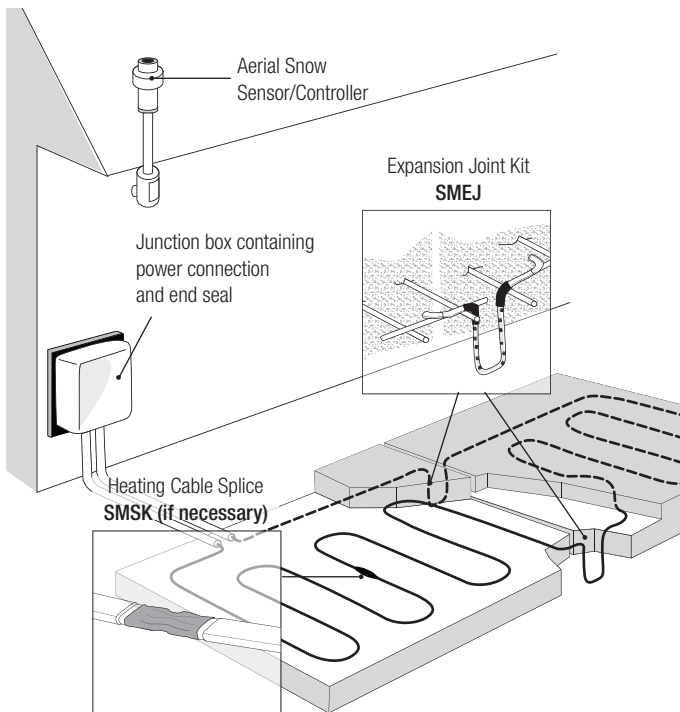


FIGURE 1.41: Heating Layout

1.5 SPECIAL INSTALLATION CONSIDERATIONS

1.51 TIRE TRACKS

Snow melting only the tire tracks of a driveway or path will reduce power consumption and electrical requirements.

Observe these important tips to ensure a proper installation:

- > Ensure the wheel track spacing is equal to the wheel spacing of the vehicle(s) which will commonly use the driveway.
- > The typical width of each individual tire track is 18" and will typically use three runs of snow melting cable per track.

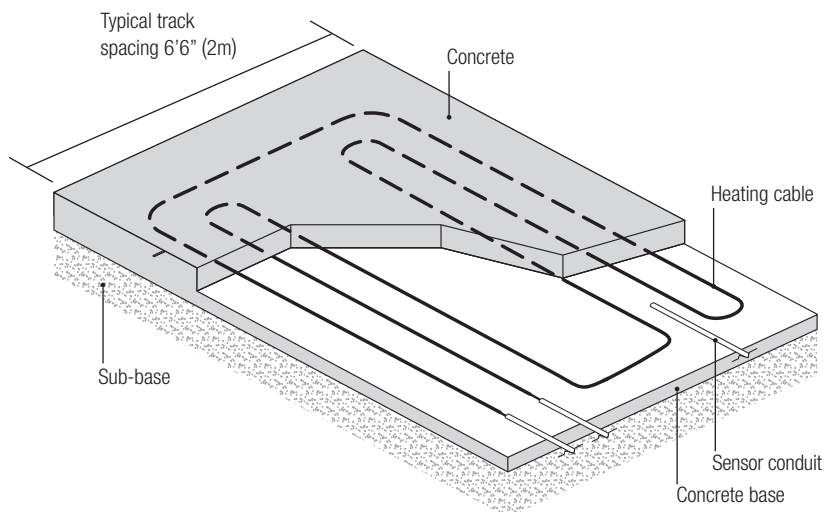


FIGURE 1.51: Heating Layout - Tire Tracks

1.5 SPECIAL INSTALLATION CONSIDERATIONS

1.5.2 STAIRS

When using Nuheat Weather-Ready™ Snow Melt Cable for stair applications, special precautions need to be observed in order to ensure cable does not get damaged:

- > Note the locations of any rail posts to be installed. The snow melting cable must be at least 4" (100mm) away from the front edge of stairs and all rail post mounts.
- > Stairs with run dimension/depth up to 12" require two runs of snow melting cable. Use closer snow melting cable spacing than usual as heat loss is greater on stairs.
- > If snow melting cable must go over sharp formed edges, round off sharp stair edges to prevent damage to snow melting cable.

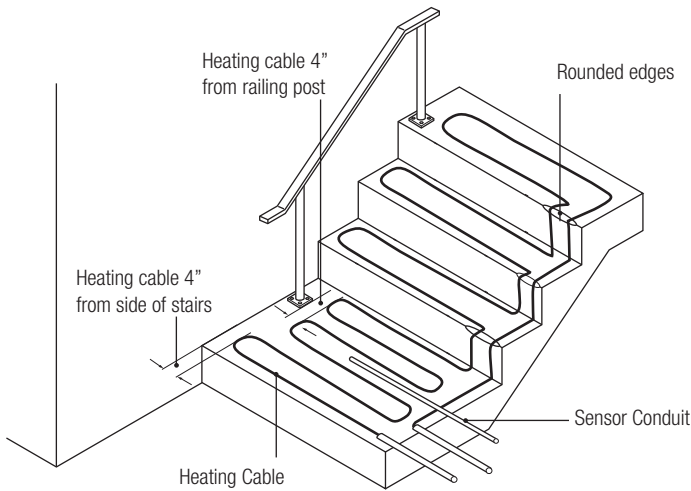


FIGURE 1.52: Heating Layout - Stairs

1.5.3 WATERPROOF MEMBRANES

Special consideration and certain precautions must be observed when waterproofing membranes are used within heated slabs:

- > Membranes must be installed below the snow melting cable.
- > Do not install snow melting cable directly on the waterproofing membrane. Snow melting cable must be attached to a metal mesh using plastic cable ties. Metal mesh and snow melting cable must be elevated a minimum of ½" (13mm) above the membrane using metal/plastic chair spacers.
- > Consult waterproofing membrane manufacturer's installation instructions for additional precautions.
- > Do not puncture the membrane.

1.5 SPECIAL INSTALLATION CONSIDERATIONS

1.54 TRENCH DRAINS

Snow melting cable should be installed at the bottom of trench drains to ensure melt water from slab will drain completely. One run of Nuheat Weather-Ready™ Snow Melt Cable is usually sufficient for trench drains up to 6" (150mm) wide. For trench drains wider than 6" (150mm), ensure multiple runs of snow melting cable is used.

THE CABLE MUST BE EMBEDDED IN CONCRETE INSIDE THE DRAIN



Failure to heat trench drains could lead to ice build-up in the drain.

1.6 TESTING

All test procedures are described in this manual. It is the installer's responsibility to perform these tests or have an electrician perform them. Record the results in the Installation and Inspection Record on pages 38-39.

1.61 VISUAL INSPECTION TEST

- > Check all power connections and splice kits for proper installation, overheating, corrosion, moisture or loose connections.
- > Check the electrical connections to ensure that ground and bus wires are insulated over their full length.
- > Junction boxes should be inspected for water or evidence of previous water ingress. If moisture is/was present, the enclosure should be dried and the cause of ingress identified and repaired.

1.62 INSULATION RESISTANCE TEST

Frequency

Insulation resistance testing is required during the installation process and as part of regularly scheduled maintenance, as follows:

1. Upon receipt of snow melting cable
2. Prior to installation
3. After splice kits, terminations or end seals are installed
4. Repeatedly during concrete pour
5. After concrete pour is complete
6. After any structural work or maintenance is performed on concrete in application area
7. As part of scheduled maintenance

1.6 TESTING

Procedure

1. De-energize the circuit.
2. Disconnect the controller if installed.
3. Disconnect bus wires from terminal block.
4. Set test voltage at 0 Vdc.
5. Connect the negative (-) lead to the snow melting cable metallic braid.
6. Connect the positive (+) lead to both snow melting cable bus wires at the same time.
7. Turn on the megohmmeter and set the voltage to 500 Vdc; apply the voltage for one minute. Meter needle should stop moving. Rapid deflection indicates a short. Record the insulation resistance value in the inspection record on pages 38-39.
8. Repeat Steps 4–7 at 1000Vdc.
9. Turn off the megohmmeter.
10. If the megohmmeter does not self-discharge, discharge phase connection to ground with a suitable grounding rod. Disconnect the megohmmeter.
11. Reconnect bus wires to terminal block.
12. Reconnect the controller (if installed already at this point).

1.63 CIRCUIT LENGTH VERIFICATION TEST

1. Connect the negative lead of capacitance meter to both bus wires and the positive lead to the braid wire. Set the meter to the 200 nF range. Multiply this reading by the capacitance factor below to determine the total circuit length.
2. Length (ft or m) = Capacitance Reading (nF) x Capacitance factor

Capacitance Factor	
Feet per nF	Meters per nF
5	1.5

SECTION 2 INSTALLATION

2.1	PLANNING THE INSTALLATION	17
2.11	Ensure Proper Depth of Snow Melting Cable	17
2.12	Determine Spacing of the Snow Melting Cable	17
2.13	Mark Obstructions	18
2.14	Locate Expansion Joints	18
2.15	Mark the Path of the Snow Melting Cable	18
2.16	Ensure Cable Lengths Do Not Exceed Maximum Circuit Lengths ..	19
2.17	Confirm Electrical Requirements	19
2.2	CONCRETE POUR INSTALLATION	20
2.21	Lay Out the Snow Melting Cable	20
2.22	Secure the Snow Melting Cable	20
2.23	Install Splices and Expansion Joint Kits	21
2.24	Install Conduit and Weatherproof Junction Boxes	21
2.25	Install Slab Sensor (if applicable)	22
2.26	Install Power Connection and End Seal Kits	22
2.27	Pour the Concrete	22
2.3	PAVING STONE INSTALLATION	24
2.31	Apply Base Layer	24
2.32	Lay Out the Snow Melting Cable	24
2.33	Secure the Snow Melting Cable	24
2.34	Install Splices and Expansion Joint Kits	25
2.35	Install Conduit and Junction Boxes	25
2.36	Install Slab Sensor (if applicable)	25
2.37	Install Power Connection and End Seal Kits	25
2.38	Cover the Snow Melting Cable	26

2.1 PLANNING THE INSTALLATION

2.1.1 ENSURE PROPER DEPTH OF SNOW MELTING CABLE

The snow melting cable is typically secured to the rebar or secured to metal mesh. The snow melting cable must be 2"– 3" (50mm–75mm) from the final pavement surface. If necessary, use metal/plastic chair spacers to elevate metal mesh to appropriate height. Grind out any sharp edges and burrs on the wire mesh or rebar.

2.1.2 DETERMINE SPACING OF THE SNOW MELTING CABLE

Nuheat Weather-Ready™ Snow Melt Cable spacing should be 8"– 10" apart depending on the geographic location and amount of annual snowfall. Use the table below and choose a city that is either geographically close to the installation location or has a climate that is similar to the installation location.

USA	SPACING	CANADA	SPACING
Baltimore, MD	10"	Calgary, AB	9"
Boston, MA	10"	Edmonton, AB	8"
Buffalo, NY	9"	Fredericton, NB	10"
Chicago, IL	10"	Halifax, NS	10"
Cincinnati, OH	10"	Moncton, NB	10"
Cleveland, OH	10"	Montreal, QC	9"
Denver, CO	10"	Ottawa, ON	9"
Detroit, MI	10"	Prince George, BC	8"
Great Falls, MT	8"	Québec City, QC	9"
Greensboro, NC	10"	Regina, SK	8"
Indianapolis, IN	10"	Saskatoon, SK	8"
Minneapolis, MN	8"	St. John, NB	9"
New York, NY	10"	St. John's, NF	10"
Omaha, NE	8"	Sudbury, ON	9"
Philadelphia, PA	10"	Thunder Bay, ON	8"
Salt Lake City, UT	10"	Toronto, ON	10"
Seattle, WA	10"	Vancouver, BC	10"
St. Louis, MO	10"	Winnipeg, MB	8"

21 PLANNING THE INSTALLATION

2.13 MARK OBSTRUCTIONS

Note the planned location of structures such as flagpoles, rail posts, benches or parking meters. These are typically installed after concrete cures and their installation requires cutting into the concrete. Snow melting cable should be laid out to avoid such areas.

2.14 LOCATE EXPANSION JOINTS

Snow melting cable should be kept approximately 4" away from expansion joint locations to avoid potential damage to the snow melting cable. Expansion joint kits (Nuheat Part # SMEJ) must be used to cross expansion joints.

2.15 MARK THE PATH OF THE SNOW MELTING CABLE

Mark the designed snow melting cable path on the reinforcement. Ensure spacing between cable runs is kept consistent.

Note the power connection location(s) and end seal location(s). Both power connection and end seal ends of the snow melting cable need to be brought above ground via 1" rigid conduit into an accessible weatherproof junction box. The terminated end of the snow melting cable should be brought into the same junction box as the power connection for troubleshooting and testing purposes.

2.1 PLANNING THE INSTALLATION

2.16 ENSURE CABLE LENGTHS DO NOT EXCEED MAXIMUM CIRCUIT LENGTHS

Check that the planned path for the snow melting cable does not exceed the maximum circuit lengths allowed for each snow melting cable circuit based on the circuit breaker size. Refer to the maximum circuit length table. Lengths are stated in feet (meters).

	START UP TEMPERATURE	CIRCUIT BREAKER SIZE				
		15A	20A	30A	40A	50A
208V	32°F (0°C)	85 (26)	115 (35)	175 (53)	235 (72)	270 (82)
	20°F (-7°C)	80 (24)	110 (34)	165 (50)	220 (67)	270 (82)
	0°F (-18°C)	70 (21)	95 (29)	145 (44)	195 (59)	245 (75)
240V	32°F (0°C)	95 (29)	125 (38)	190 (58)	250 (76)	300 (91)
	20°F (-7°C)	85 (26)	115 (35)	175 (53)	235 (72)	295 (90)
	0°F (-18°C)	80 (24)	105 (32)	160 (49)	210 (64)	265 (81)
277V	32°F (0°C)	105 (32)	140 (43)	215 (66)	285 (87)	345 (105)
	20°F (-7°C)	100 (30)	130 (40)	200 (61)	265 (81)	335 (102)
	0°F (-18°C)	90 (27)	120 (37)	180 (55)	240 (73)	300 (91)

2.17 CONFIRM ELECTRICAL REQUIREMENTS

Confirm that the proper supply voltage and adequate circuit breakers will be used. Conduct a coordination meeting with the electrical contractors to ensure all parties are aware of the design and the design requirements.

2.2 CONCRETE POUR INSTALLATION

2.21 LAY OUT THE SNOW MELTING CABLE

Place the spool of cable on a cable payout mechanism. The cable payout mechanism should allow the cable to be unspooled smoothly without excessive pulling or tugging. Place the payout mechanism at a distance that allows the cable to untwist easily. Loosely lay the cable according to your installation plan.

Leave extra cable in areas where there will be power connection, splice or expansion joint kits installed. Refer below for amount of extra cable that is needed:

- > Power connection kit - 3ft of extra cable
- > Splice kit - 1ft of extra cable
- > Expansion joint kit - 1½ft of extra cable

The cable has numbered markers printed on the jacket at 1ft intervals. Use this to ensure cable lengths do not exceed maximum circuit lengths as identified in section 2.16.

2.22 SECURING THE SNOW MELTING CABLE

Secure snow melting cable to the reinforcement with plastic cable ties at approximately 2ft (24") intervals.

Ensure snow melting cable is at least 4" (40mm) from the edge of the pavement and from obstacles such as pipes, drains, and anchors. Conduct insulation and resistance tests.

2.2 CONCRETE POUR INSTALLATION

2.2.3 INSTALL SPLICES AND EXPANSION JOINT KITS

Install any splices and expansion joint kits that may be required. Refer to the installation instructions included in the splice kits (Nuheat Part # SMSK) and/or expansion joint kits (Nuheat Part # SMEJ). Conduct insulation and resistance tests.

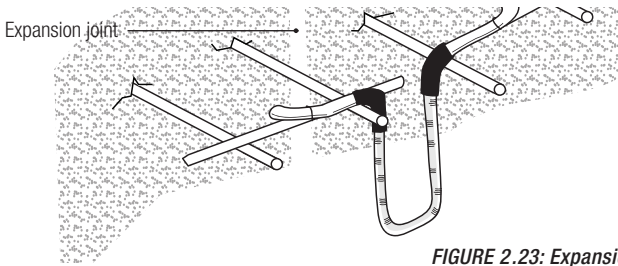


FIGURE 2.23: Expansion joint

2.2.4 INSTALL CONDUIT AND WEATHERPROOF JUNCTION BOXES

- > Mount the UL listed and CSA approved outdoor use junction boxes above grade. Junction boxes need to be minimum 400 cubic inches per circuit of snow melting cable (power connection and end seal). Nuheat recommends the junction boxes be installed a minimum of 12" above grade.
- > Install/secure UL/CSA approved watertight 1" rigid metal conduit to the rebar reinforcement and route it to the junction box(es). Nuheat recommends the conduit be extended approximately 6" into the heated area.
- > Provide UL/CSA approved watertight protective bushings on both ends of each conduit.
- > Do not install more than one run of snow melting cable per conduit.
- > Do not insulate the conduit.

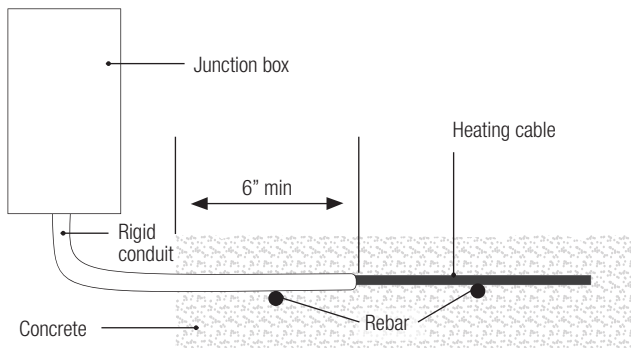


FIGURE 2.24: Conduit and junction box

2.2 CONCRETE POUR INSTALLATION

2.25 INSTALL SLAB SENSOR (IF APPLICABLE)

If a slab temperature sensor(s) is also being installed, check the sensor's installation guidelines for additional conduit requirements. The end of the conduit inside the heated area (the sensor location) must be in an area exposed to regular precipitation and/or traffic. Avoid placing the sensor near external heat sources (i.e. a fan).

2.26 INSTALL POWER CONNECTION AND END SEAL KITS

Run the snow melting cable through the 1" rigid conduits and into the junction boxes. Terminate the snow melting cable using the power connection kits (Nuheat Part # SMPC) using minimum 75°C rated supply conductors. Refer to the installation instructions included in the kits.

Conduct insulation resistance and circuit length verification tests.

2.27 POUR THE CONCRETE

Prior to pouring the concrete, Nuheat strongly suggests taking a picture of the cable layout for reference during troubleshooting and testing. Knowing the layout of the cable will help technicians troubleshoot the snow melting cable circuit in the future.

Coordinate the pouring of the concrete with the contractor. Concrete should be poured so that the snow melting cable is 2"–3" (50mm–75mm) from the surface. Conduct insulation resistance tests at 1000Vdc repeatedly during the concrete pour.


Follow the precautions outlined below to ensure the snow melting cable was not damaged during the concrete pour:

- > Do not use sharp tools such as rakes, shovels, etc. when installing cable. Ensure the outer jacket of the snow melting cable is not damaged/nicked during installation.
- > Do not walk on the snow melting cable.
- > Do not energize the snow melting cable during the concrete curing period.
- > Ensure the concrete delivery speed does not dislodge the snow melting cable.

2.2 CONCRETE POUR INSTALLATION

If damage to the snow melting cable is suspected, stop the concrete pour immediately and inspect/test the cable for damage. If necessary, replace damaged portions of the snow melting cable by splicing the snow melting cable with a splice kit (Nuheat Part # SMSK) or replace the damaged circuit entirely.

The presence of the snow melting cables shall be made evident by the posting of caution signs or markings where clearly visible. Install at least one Nuheat Snow Melting System Caution Plaque (Nuheat Part # SM-PLQ) on the surface of the heated slab in a visible location. This will notify contractors that an electric snow melting system is embedded in the concrete below.

 **Record the insulation resistance rating after the concrete is poured.**

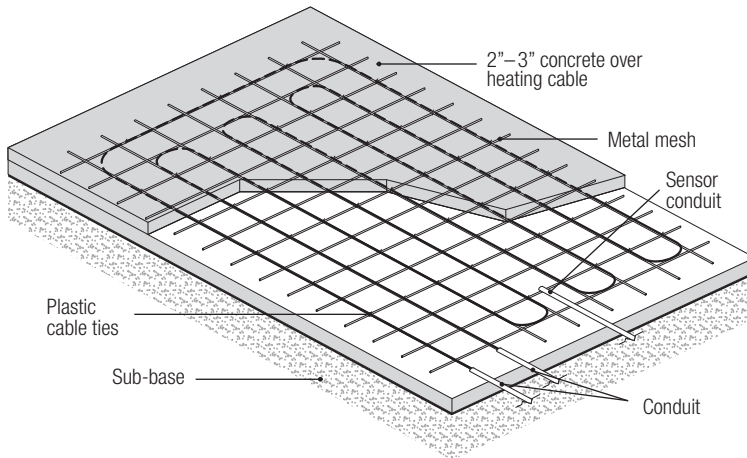


FIGURE 2.27: Concrete pour installation

2.3 PAVING STONE INSTALLATION

2.31 APPLY BASE LAYER

Evenly spread a 1½" (40mm) layer of sand/limestone screening onto the base.



Use limestone screening for sloped areas. Do not use sand for sloped areas.

Compact and level the sand/limestone screening layer to 1" (25mm) using hand tamper or plate compactor. Add more sand/limestone if necessary.

Lay metal wire mesh over the compacted sand/limestone screening layer. Trim metal wire mesh to fit. Use metal mesh that can assist the spacing of the snow melting cable. Example: 4" x 4" metal mesh for 8" spacing and 5" x 5" metal mesh for 10" spacing.

2.32 LAY OUT THE SNOW MELTING CABLE

Place the spool of cable near the junction box(es) where the cable will be terminated. The cable payout mechanism should allow the cable to be unspooled smoothly without excessive pulling or tugging. Loosely lay the cable according to your installation plan.

Leave extra cable in areas where there will be a power connection, splice or expansion joint kit installed. Refer to the table below for amount of extra cable that is needed:

- > Power connection kit - 3ft of extra cable
- > Splice kit - 1ft of extra cable
- > Expansion joint kit - 1½ft of extra cable

The cable has numbered markers printed on the jacket at 1ft intervals. Use this to ensure cable lengths do not exceed maximum circuit lengths as identified in section 2.16.

2.33 SECURE THE SNOW MELTING CABLE

Secure snow melting cable with plastic cable ties or electrical tape at approximately 2ft (24") intervals.

Ensure snow melting cable is at least 4" (40mm) from the edge of the pavement and from obstacles such as pipes, drains and anchors.

Conduct insulation resistance tests.

2.3 PAVING STONE INSTALLATION

2.34 INSTALL SPLICES AND EXPANSION JOINT KITS

Install any splices and expansion joint kits that may be required. Refer to the installation instructions included in the splice kits (Nuheat Part # SMSK) and/or expansion joint kits (Nuheat Part # SMEJ).

2.35 INSTALL CONDUIT AND JUNCTION BOXES

- > Mount the UL listed and CSA approved outdoor use junction boxes above grade. Junction boxes need to be minimum 400 cubic inches per circuit of snow melting cable (power connection and end seal). Nuheat recommends the junction boxes be installed a minimum of 12" above grade.
- > Install/secure UL and CSA approved watertight 1" rigid metal conduit and connect it to the junction boxes. Nuheat recommends the conduit be extended approximately 6" into the heated area.
- > Provide UL and CSA approved watertight protective bushings on both ends of each conduit.
- > Do not install more than one run of snow melting cable per conduit.
- > Do not insulate the conduit.

2.36 INSTALL SLAB SENSOR (IF APPLICABLE)

If a slab temperature sensor(s) is also being installed, check the sensor's installation guidelines for additional conduit requirements. The end of the conduit inside the heated area (the sensor location) must be in an area exposed to regular precipitation and/or traffic. Avoid placing the sensor near external heat sources (ie. a fan).

Conduct insulation and resistance tests.

2.37 INSTALL POWER CONNECTION AND END SEAL KITS

Run the snow melting cable through the 1" rigid conduits and into the junction boxes. Terminate the snow melting cable using the power connection kits (Nuheat Part # SMPC) using minimum 75°C rated supply conductors. Refer to the installation instructions included in the kits.

Conduct insulation resistance and circuit length verification tests.

2.3 PAVING STONE INSTALLATION

2.38 COVER THE SNOW MELTING CABLE

Prior to covering the snow melting cable, Nuheat strongly suggests taking a picture of the cable layout for reference during troubleshooting and testing. Knowing the layout of the cable will help technicians troubleshoot the snow melting cable circuit in the future.

Apply a second 1½" (40mm) thick layer of sand/limestone screening.



Use limestone screening for sloped areas.

Do not use sand for sloped areas.

Compact and level the sand/limestone screening layer to 1" (25mm) using hand tamper or plate compactor. Add more sand/limestone if necessary.

Conduct insulation and resistance tests.

Install paving stones and tamp per manufacturer's instructions. Fill in grooves between the paving stones with polymeric sand.

Follow the precautions outlined below to ensure the snow melting cable is not damaged during the paving stone installation:

- > Do not use sharp object such as rakes, shovels, etc. when installing cable. Ensure the outer jacket of the snow melting cable is not damaged/nicked during installation. Do not use sharp objects.
- > Do not walk on the snow melting cable.

2.3 PAVING STONE INSTALLATION

If damage to the snow melting cable is suspected, stop the installation immediately and inspect/test the cable for damage. If necessary, replace damaged portions of the snow melting cable by splicing the snow melting cable with a splice kit (Nuheat Part # SMSK) or replace the damaged circuit entirely.

The presence of the snow melting cables shall be made evident by the posting of caution signs or markings where clearly visible. Install at least one Nuheat Snow Melting System Caution Plaque (Nuheat Part # SM-PLQ) on the surface of the heated slab in a visible location. This will notify contractors that an electric snow melting system is located below the paving stones.

 **Record the insulation resistance rating after the concrete is poured.**

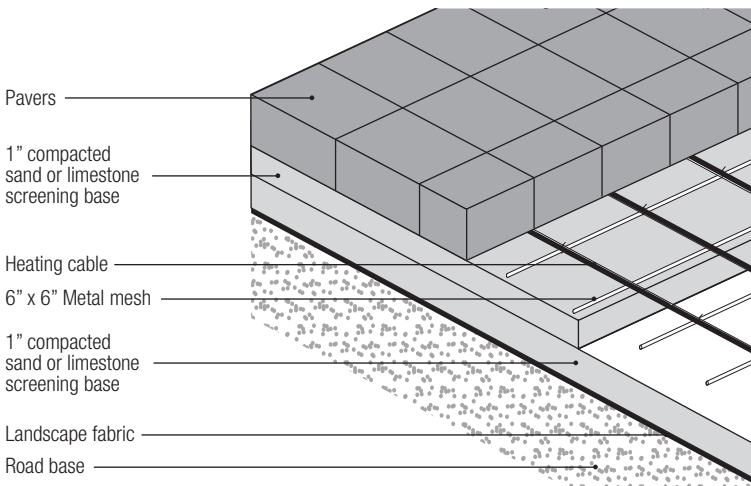


FIGURE 2.38: Pavers / Paving Stones on Sand Base

SECTION 3 ELECTRIC CONNECTIONS & CONTROLS

3.1	CONFIRMING ELECTRICAL REQUIREMENTS	29
3.11	Install Electrical Equipment	29
3.2	CONTROL OPTIONS	30
3.21	Automatic Snow Controllers	30
3.22	Slab Sensing Thermostat	30
3.23	Manual On/Off Control.....	30
3.3	SYSTEM STARTUP	31
3.4	REPAIRS & MAINTENANCE	32
3.5	TYPICAL WIRING DIAGRAMS	33
3.51	Single-Phase Parallel Connection	33
3.52	Delta Connection.....	34
3.53	WYE Connection.....	35
3.54	Multiple WYE Connections with APS Panel	36
3.55	Multiple Delta Connections with APS Panel	37
3.6	INSTALLATION & INSPECTION RECORDS	38

3.1 CONFIRMING ELECTRICAL REQUIREMENTS

3.11 INSTALL ELECTRICAL EQUIPMENT

Contact an electrical contractor to install the electrical equipment, such as supply panels, breakers, thermostats/snow controllers and sensors. Note any changes to the original design which may require changes to the electrical requirements (i.e. larger breaker needed due to increased length of cable).

NUHEAT INDUSTRIES AND NEC REQUIRE EQUIPMENT GROUND FAULT PROTECTION ON EACH SNOW MELTING CABLE BRANCH CIRCUIT.

To minimize the danger of fire from sustained electrical arcing if the snow melting cable is damaged or improperly installed, and to comply with Nuheat Industries requirements and electrical code, ground fault equipment protection (GFEP) must be used on each snow melting cable branch circuit. Arcing may not be stopped by conventional circuit breakers.

3.2 CONTROL OPTIONS

There are several options available to control the Nuheat Weather-Ready™ Snow Melt Cable. Consult the electrical contractor to determine the most suitable option. Selecting the proper control option will limit the power consumption of the snow melting system by turning on the snow melting cables only when it is needed. All snow melting controls need to be UL listed and CSA approved for use with snow melting systems. Snow sensors should be located in an area where there is direct line-of-sight to the sky.

3.21 AUTOMATIC SNOW CONTROLLER

- > Turns on the snow melting cable when both precipitation AND low temperatures are detected.
- > System remains "ON" once precipitation or low temperature have ceased, allowing the surface to completely dry, preventing the formation of surface ice.
- > When combined with a slab sensing thermostat, the system will de-energize once the slab has reached the preset or user-defined temperature setpoint.
- > Using an automatic snow controller in conjunction with a slab sensing thermostat offers the most energy efficient control solution.

3.22 SLAB SENSING THERMOSTAT

- > Turns on the snow melting cable when the slab temperature drops below a preset or user-defined temperature (usually set at freezing point).
- > Not energy efficient if used as a sole means of control. Slab temperature may be below freezing but no snowfall is present.
- > Option is more energy efficient when used in conjunction with an automatic snow controller.

3.23 MANUAL ON/OFF CONTROL

- > Low initial cost
- > Recommended only for small areas
- > Requires manual monitoring
- > Prone to be left on accidentally

3.3 SYSTEM STARTUP

 **The snow melting cable should not be energized until the concrete has cured.**

The startup of the snow melting system will be simple if the snow melting cable has been installed carefully and tested at each step as recommended in the installation instructions.

Follow these steps to ensure a proper system startup:

1. Before applying power, conduct an insulation resistance test at 1000Vdc from the distribution panel. This final insulation resistance test ensures that no ground faults exist in the power wiring or the snow melting cable due to insulation damage.
2. Verify that the entire branch circuit including the snow melting cable has an insulation resistance of 1000 megohms minimum when tested with a 1000 Vdc megohmmeter.
3. Visually inspect all electrical equipment and connections that are part of the snow melting system, including junction boxes, sensors, thermostats/snow controllers, circuit breakers and supply wiring.
4. Verify proper rating on all over current protection devices. Verify that the contactor coil operating voltage is correct for control device used.
5. Verify that all snow melting cable terminations are closed, and that a snow melting equipment label is affixed to the cover of the junction boxes and distribution panel.
6. Energize the system controller. Apply power to the control device (manual switch, ambient thermostat or automatic snow controller). Check for proper operation. Do not energize the snow melting system until the controller is operating properly. Turn the controller off before applying power to the snow melting cable.
7. Turn on the circuit breakers and/or GFEP devices. Test the GFEP following the instructions packaged with the device. If the ground-fault detection feature does not function properly, replace the device before energizing the snow melting cable.
8. Energize the snow melting cable and check that circuit breakers did not trip. Wait one to three hours for the pavement to warm up. Verify that each snow melting cable circuit is providing heat by touching the surface of the pavement.

It may be necessary to fine-tune and make adjustments to the snow controller settings to ensure effective and efficient snow melting performance. This should be done at the beginning of each snow season as weather patterns and snow characteristics may change each year.

3.4 REPAIRS & MAINTENANCE

Your system may be subject to concrete cracking, concrete modifications and rework, or electrical maintenance that might affect the snow melting and de-icing system. Perform insulation resistance testing on each branch circuit before the first use of the system, each winter season, to detect changes or damage that might affect the operation of the system. For applications classified as critical, inspection is recommended in both the autumn and the spring. All observations and measured values should be recorded on a log sheet. Checklist items include:

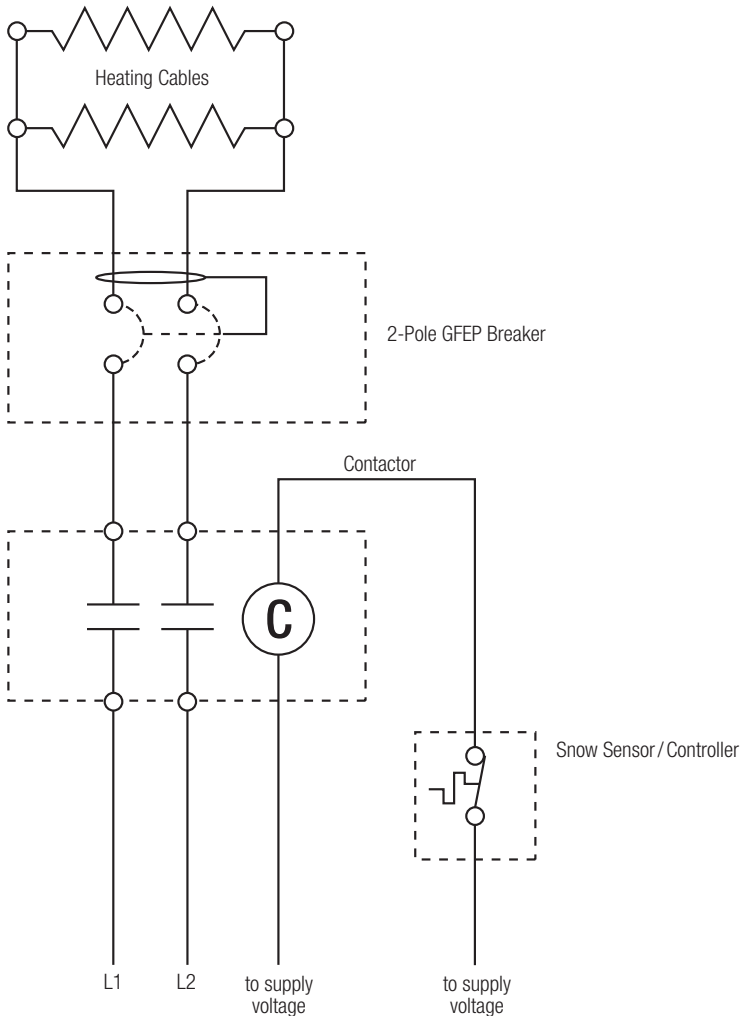
- a. Junction boxes should be inspected for water or evidence of previous water ingress. If moisture is present, the enclosure should be dried and the cause of ingress identified and repaired.
- b. Control equipment set points and functionality should be checked as per control manufacturer's instructions. It may be necessary to fine tune and make adjustments to the snow controller settings to ensure effective and efficient snow melting performance. This should be done at the beginning of each snow season as weather patterns and snow characteristics may change each year.

If any part of the cable becomes damaged at any time, please contact Nuheat Customer Care Team immediately at 1.800.778.WARM(9276).

3.5 TYPICAL WIRING DIAGRAMS

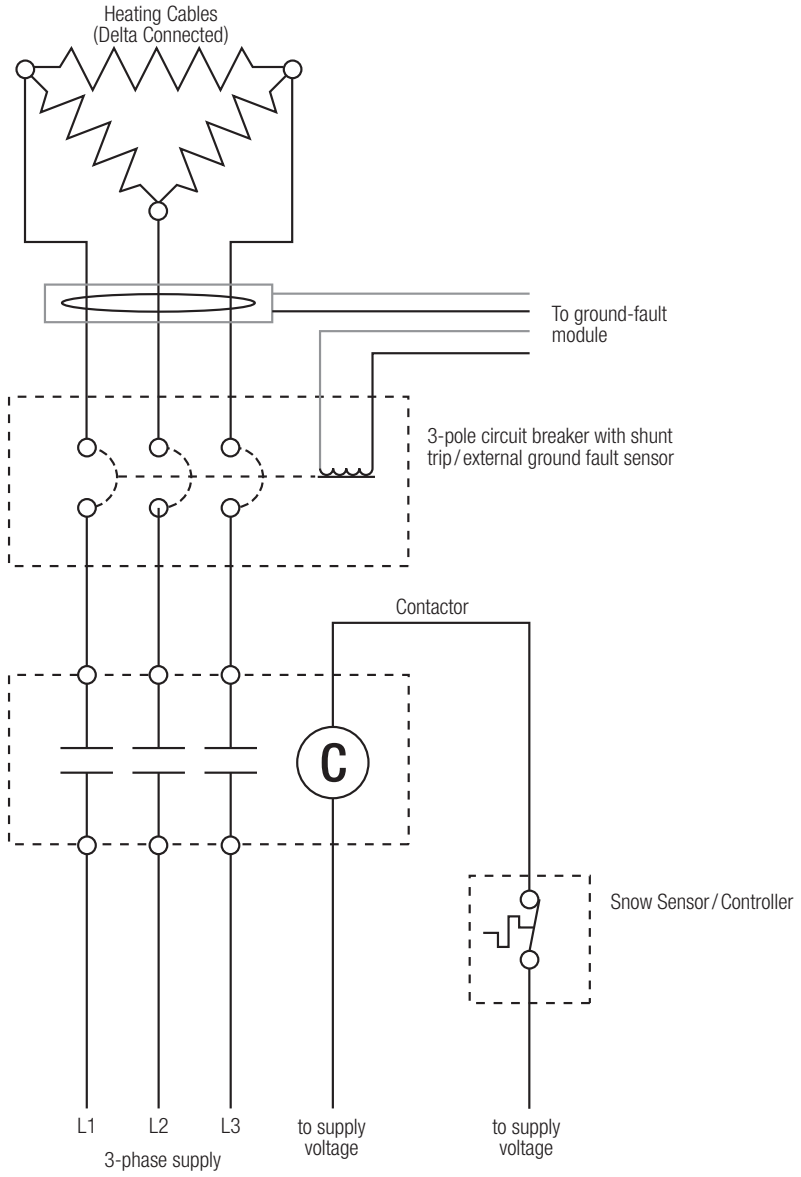
The following are typical wiring diagrams for the Nuheat Weather-Ready™ Self-Regulating Snow Melt Cable. Wiring connections should only be made qualified personnel familiar with industry standards for snow melting systems. Installation and wiring must be in accordance with local building codes.

3.5.1 SINGLE-PHASE PARALLEL CONNECTION



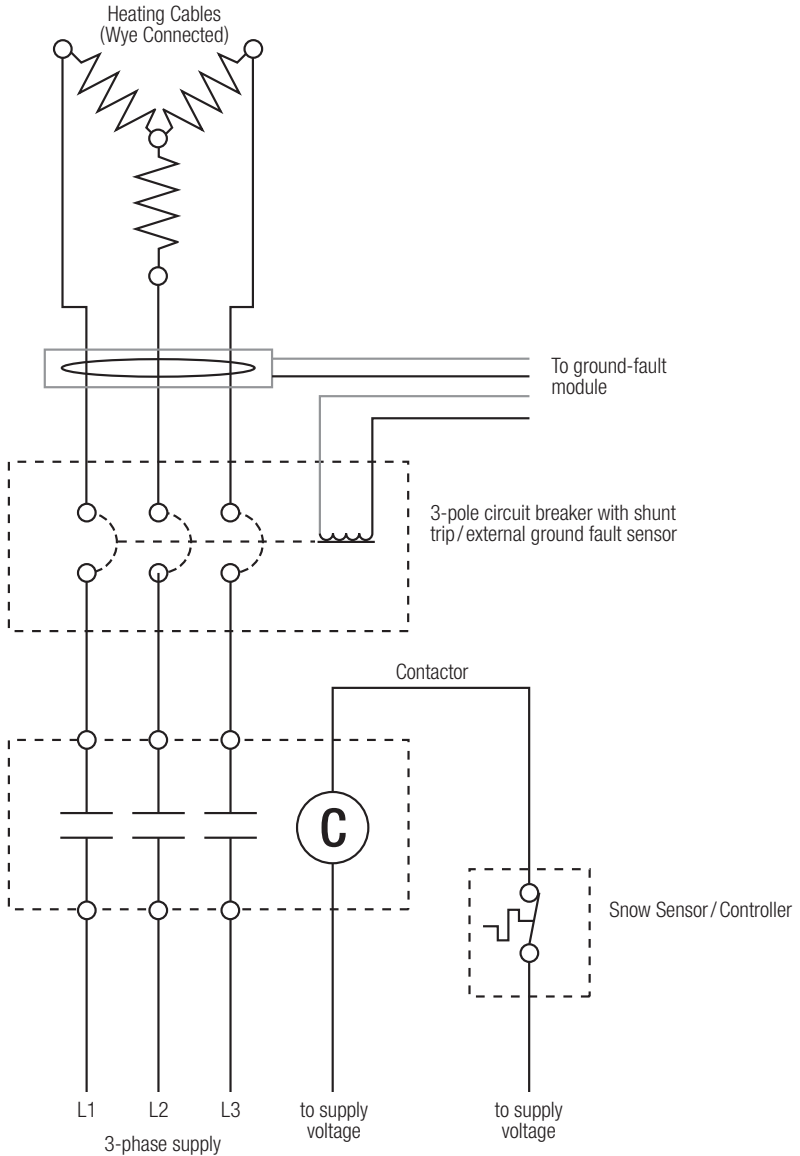
3.5 TYPICAL WIRING DIAGRAMS

3.52 DELTA CONNECTION



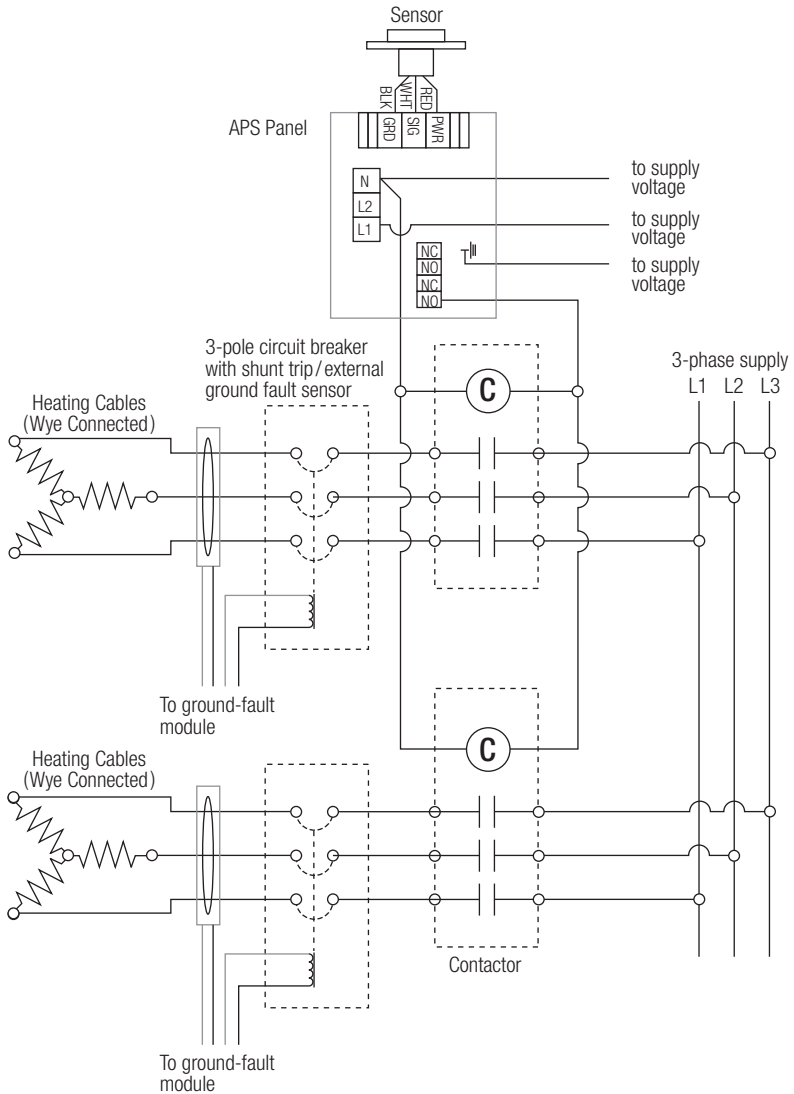
3.5 TYPICAL WIRING DIAGRAMS

3.53 WYE CONNECTION



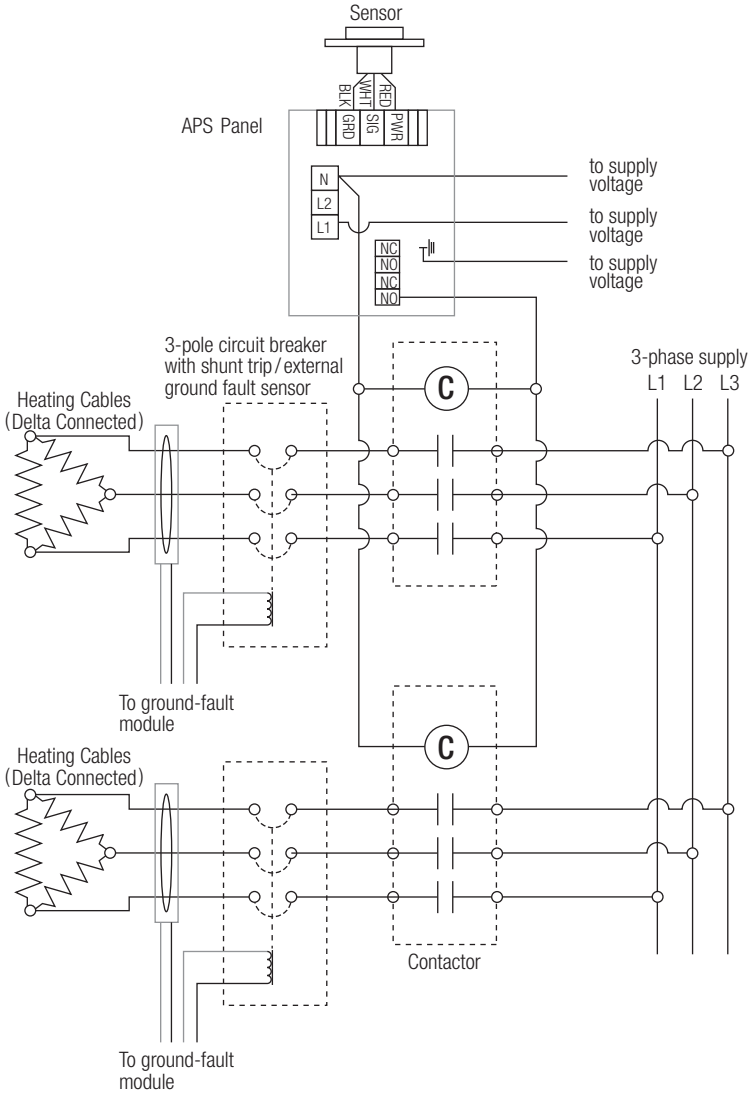
3.5 TYPICAL WIRING DIAGRAMS

3.54 MULTIPLE WYE CONNECTIONS WITH APS PANEL



3.5 TYPICAL WIRING DIAGRAMS

3.5.5 MULTIPLE DELTA CONNECTIONS WITH APS PANEL



3.6 INSTALLATION & INSPECTION RECORDS

Circuit #/Description	Cable Spacing (in)	Circuit Length (ft)	Breaker Size (amps)	Voltage	Insulation Resistance Readings (Conduct with megohmmeter at 500Vdc & 1000Vdc)					Visual Check	GFEP Check	Junction Box Check
					Test 1	Test 2	Test 3	Test 4	Test 5			



**Freeze
Protection
Products**

PIPE • ROOF & GUTTER • SLAB

Nuheat Freeze Protection Products
toll free 1.800.778.WARM (9276)
fax 604.529.4404
www.nuheat.com
info@nuheat.com

Nuheat™ is the registered Trademark of Nuheat Industries Ltd.

Printed in Canada

August 2013