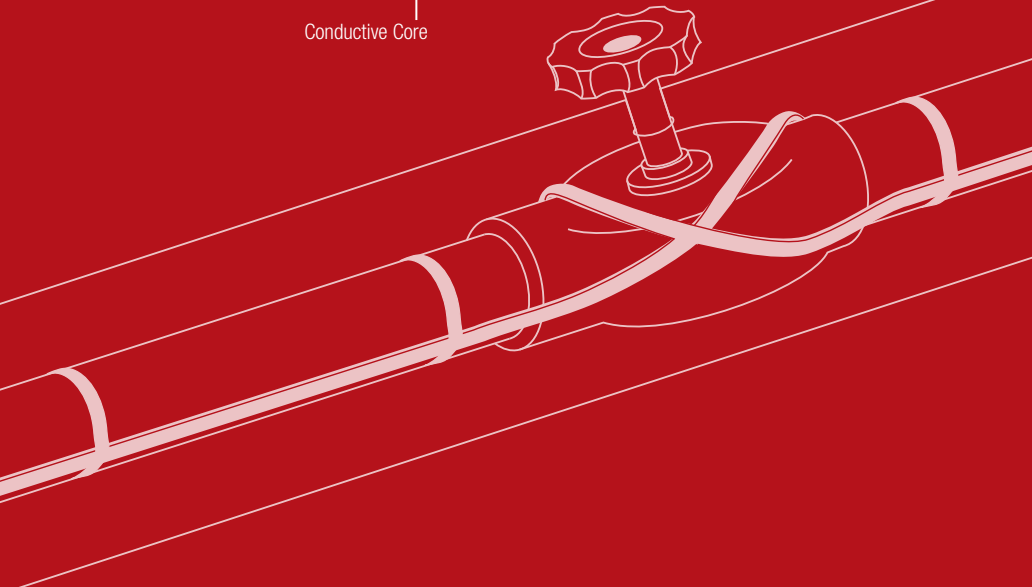
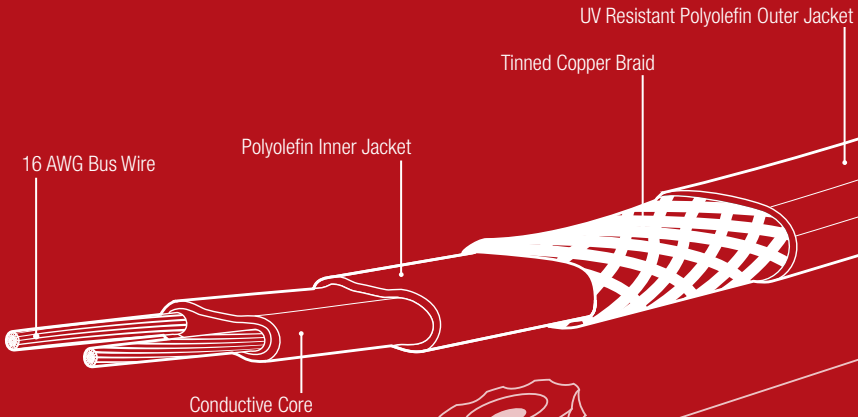


Nuheat

PIPE FREEZE PROTECTION SYSTEM

9mm & 13mm Self-Regulating Heating Cable



Freeze
Protection
Products
PIPE • ROOF & GUTTER • SLAB



NUHEAT INDUSTRIES LIMITED

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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.
- Indicate on the electrical panel which circuit is used for the Nuheat Freeze Protection Product.

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1.1 IMPORTANT INSTALLATION GUIDELINES

- > Do not energize the cable(s) before installation is complete.
- > Ensure bus wires of the same cable are separated. Bus wires will short if they contact each other when energized.
- > Cable ends must be terminated with Nuheat end seals. Bus wires cannot be left exposed.
- > Bus wires and cable terminations should be kept dry before, during, and after installation.
- > Ensure drip loops are made with the cables or conduits to prevent water from trailing into any electrical equipment, junction boxes, or controls.
- > Be careful not to break bus wire strands when isolating the bus wires during splice connections. Damaged bus wires can overheat or may cause a short circuit.
- > Only use Nuheat connection components to make splices and/or end terminations. Nuheat connection components are certified and approved for use with Nuheat self-regulating cables.
- > Observe the maximum circuit lengths of the cable (Appendix 3 on page 31) and do not exceed this limit during the installation. Exceeding the maximum circuit lengths will result in breaker trips which will prevent the heating cable from turning on in freezing conditions.
- > Conduct insulation and resistance tests at various times before, during, and after installation. Refer to testing procedures on page 10 of this guide.
- > Testing and visual inspections should be performed after any type of maintenance or repair including but not limited to cleaning, re-insulating, and installation/addition of pipe segments or features.
- > Test and ensure pipe freeze protection system is functioning properly prior to each winter season.
- > Materials used for the housing (i.e. junction boxes), support or on which the cables are installed shall be grounded in accordance with CSA standard C22.1, section 10.
- > All installations must be in compliance with the following electrical codes:
 - o Articles 426 and 500 of the NEC (National Electrical Code)
 - o Sections 62 and 18 of the CEC (Canadian Electrical Code)
 - o IEEE Standard 515.1-2005

NUHEAT INDUSTRIES AND NEC REQUIRE 30-MA EQUIPMENT GROUND-FAULT PROTECTION ON EACH HEATING CABLE BRANCH CIRCUIT.

1.2 BEFORE YOU START

The following tools/materials are required for the Nuheat Pipe Freeze Protection System installation:

1.21 TOOLS

- > 1000Vdc megohmmeter
- > Multimeter
- > Method to payout/unreel the heating cable
- > Cutting pliers

1.22 MATERIALS

- > Tape used to secure heating cable to the pipe
 - o Glass cloth tape
- > Aluminum tape (for plastic pipes only)
- > Materials needed for electrical connections
 - o Nuheat approved connection kits
 - o Junction boxes
 - o Suitable conduit for various connections
- > Pipe insulation
- > Weatherproof cladding (for outdoor pipe applications only)

1.3 SYSTEM COMPONENTS

1.31 PIPE FREEZE PROTECTION SYSTEM OVERVIEW

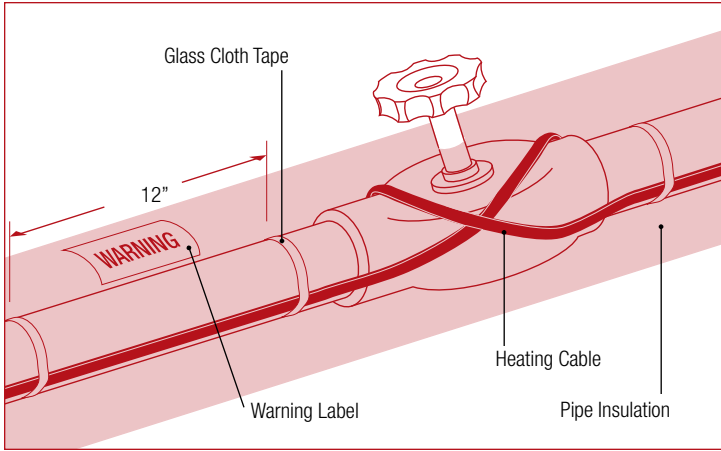


FIGURE 1.31: Pipe Freeze Protection System

Nuheat pipe freeze protection cables are fastened to plastic or metallic pipes. The heating cable may be installed in single or in multiple runs based on design requirements. Nuheat pipe freeze protection cables are self-regulating and may be overlapped and crossed if necessary without risk of overheating or burnout.

1.32 PIPE FREEZE PROTECTION HEATING CABLE

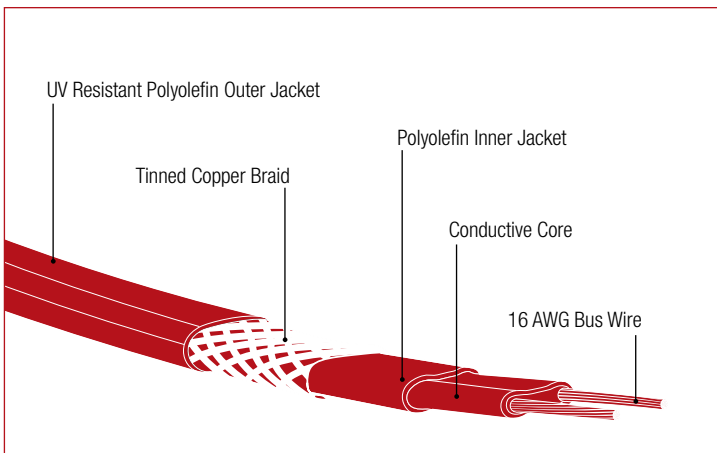


FIGURE 1.32: Pipe Freeze Protection Self-Regulating Heating Cable

1.3 SYSTEM COMPONENTS

1.33 POWER CONNECTIONS, SPLICES, END SEALS

Specific connection kits are required to connect heating cables to power, splice/split cables along piping branches, and terminating cable ends.

1.34 TAPE

Nuheat pipe freeze protection cables are fastened to the pipes using glass cloth tape.

1.35 PIPE INSULATION

After the heating cables are fastened to the pipes, the pipe must be insulated. Fiberglass pipe insulation is commonly used.

1.36 WARNING LABELS/STICKERS

Warning labels and stickers are placed above the pipe insulation to indicate the location of splices and end seals and also to indicate the presence of electric heat tracing cables.

1.37 CONTROL

Line-sensing (recommended) or ambient-sensing thermostats can be used to control when the heating cables turn on/off.

1.4 INSULATION & CONTINUITY TESTS

Insulation resistance tests must be performed on each circuit before, during and after installation of the Nuheat Pipe Freeze Protection System. Insulation resistance readings must be recorded in the tables in Section 1.5

Before performing any tests, disconnect all electrical components to the heating cable including power, thermostats, and contactors. The two bus wires and metal ground braid needs to be separated prior to conducting any tests.

To separate the bus wires and ground braid:

1. Lightly score around and down the outer jacket 3" from the end of the heating cable. Bend heating cable to break jacket at score; peel off outer jacket.
2. Push back braid to loosen. Spread apart braid, bend the heating cable and work it through the opening in the braid.
3. Position braid on one side of the cable and twist into a pigtail.
4. Lightly score around and down the inner jacket 1.5" from the end of the heating cable and remove.
5. Cut down the center of the conductive core and trim away ½" of the conductive core from the tip of the cable exposing the bus wires.

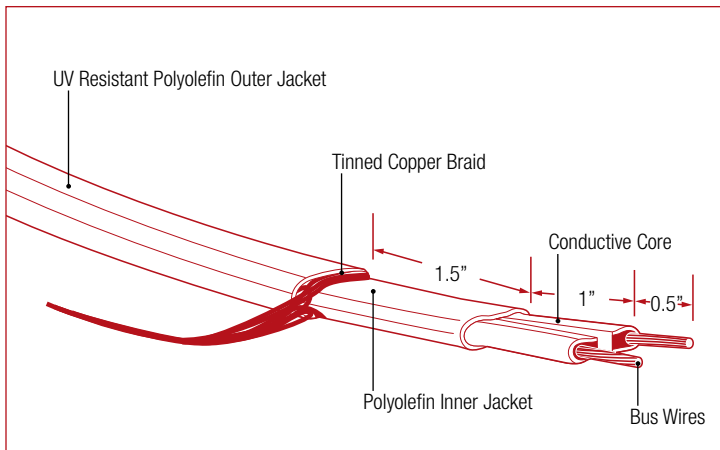


FIGURE 1.4: Separating Heating Cable Bus Wires

1.4 INSULATION & CONTINUITY TESTS

1.41 INSULATION RESISTANCE TEST

1. Set the megohmmeter voltage to 0 Vdc.
2. Connect the negative alligator clip to the metallic braid of the heating cable.
3. Connect the positive alligator clip to the both heating cable bus wires.
4. Turn on the megohmmeter and set the voltage to 500 Vdc.
5. Apply voltage for one (1) minute.
6. Check the resistance reading.
7. Confirm that the resistance is greater than 20 megaohms.
8. Record insulation resistance reading in table in Section 1.5.
9. Repeat step 4-7 at 1000 Vdc.
10. Confirm that the resistance value is within +/- 10% of each other regardless of the voltage applied.
11. Record insulation resistance reading in table in Section 1.5.

1.42 CONTINUITY TEST

1. Set the multimeter to measure resistance.
2. Connect the positive alligator clip to one of the bus wires.
3. Connect the negative alligator clip to the other bus wire.
4. Confirm that the resistance reading is less than 3 ohms. Resistance readings of 1000 ohms or greater generally indicate damage to the bus wire or improperly installed connection kits.

1.43 FREQUENCY OF TESTING

Insulation resistance and continuity tests should be performed:

- > Before installing the heating cable
- > After installing connection kits (refer to connection kits instructions)
- > Before installing the thermal insulation
- > Before initial start-up (commissioning)

Testing should also be included as part of regular system inspections, as well as after any maintenance or repair work.

1.43 CIRCUIT LENGTH VERIFICATION TEST

1. Set megohmmeter to measure capacitance and set meter to 200 nF range.
2. Connect positive alligator clip to braid wire.
3. Connect negative alligator clip to both bus wires.
4. Multiply this reading by capacitance factor indicated on the right to determine total circuit length (in feet).

Heating Cable	Capacitance Factor
	ft/nF
13mm	5.3
9mm	7.1

1.5 INSULATION RESISTANCE TABLE

If the reading on the insulation resistance test does not pass the requirements at any point of the installation, halt installation immediately and contact Nuheat Technical Services at 1.800.778.WARM(9276).

Record heating cable insulation resistance test in the table below and leave with the end user for warranty purposes:

INSULATION RESISTANCE		BEFORE INSTALLING HEATING CABLE	AFTER INSTALLING CONNECTION KITS	BEFORE INITIAL START-UP (COMMISSIONING)
Run 1	@ 500 Vdc			
	@ 1000Vdc			
Run 2	@ 500 Vdc			
	@ 1000Vdc			
Run 3	@ 500 Vdc			
	@ 1000Vdc			
Run 4	@ 500 Vdc			
	@ 1000Vdc			
Run 5	@ 500 Vdc			
	@ 1000Vdc			

Failure to record insulation resistance tests in the above table will void the Nuheat Pipe Freeze Protection System warranty.

The Nuheat standard limited warranty for freeze protection products applies to Pipe Freeze Protection and roof & Gutter De-icing products.

Nuheat self-regulating cable is eligible for an additional seven (7) year warranty (total period of ten [10] years) provided the online warranty form (available at www.nuheat.com) is fully completed and registered within thirty (30) days from the date of installation.

1.7 SPECIAL INSTALLATION CONSIDERATIONS

1.7.1 PIPES ENTERING A BUILDING

When a pipe enters a building, freezing conditions of the pipe may permeate past the exterior wall of the building. To prevent the pipes from freezing, the heating cable should extend along the pipe at least 12" into the building.

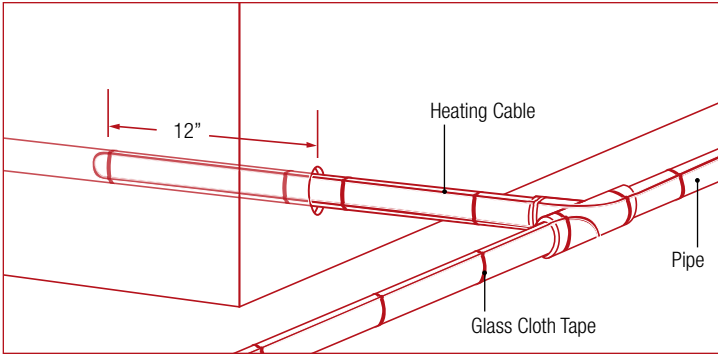


FIGURE 1.71: Pipes Entering a Building

1.7.2 PIPES ENTERING UNDERGROUND

When a pipe enters the ground, freezing conditions of the pipe will permeate below ground to the frost line depth. To prevent the pipes from freezing, create a loop with the heating cable and extend to the frost line depth for your geographic region. Terminate the end of the heating cable above the normal water line with a heat shrink end seal.

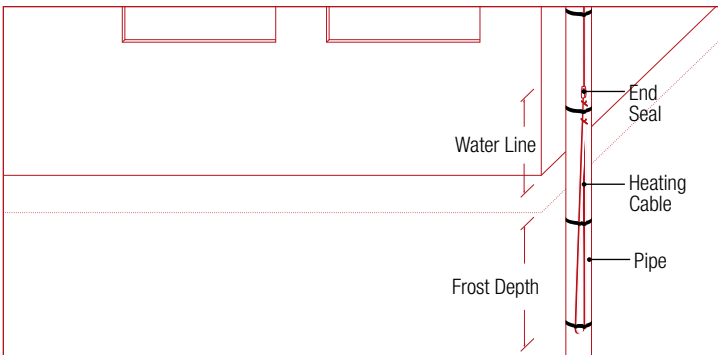


FIGURE 1.72: Pipes Entering Underground

1.8 PRE-INSTALLATION CHECKS

PLAN INSTALLATION LAYOUT

- [] It is VERY IMPORTANT to plan the installation before securing any part of the heating cable system to the roof and/or gutter system. Note the location of the controls and/or junction boxes.

DESIGN NOTES

- [] Review any design notes provided by Nuheat's Customer Care Team. Note specific installation instructions and plan which direction/sequence the cable will be installed.

CIRCUIT LENGTHS

- [] Observe the maximum circuit lengths of the cable (Appendix 3 on page 31) and do not exceed these limits during the installation. Exceeding the maximum circuit lengths will result in breaker trips which will prevent the heating cable from turning on in freezing conditions.

ACCESSORIES

- [] Ensure you have all the necessary connection/splice kits and accessories.

VISUALLY INSPECT HEATING CABLE

- [] Unpack and perform visual inspection of the entire heating cable for any visible damage. If the heating cable is damaged, do not begin installation. Contact Nuheat Customer Care Team at 1.800.778.WARM (9276).

INSULATION RESISTANCE AND CONTINUITY TESTS

- [] Perform insulation resistance and continuity tests. Refer to testing procedures on page 10 of this manual.

CONFIRM WATTAGE

- [] Confirm wattage output of cable is adequate for your design and installation conditions. The wattage output of the heating cable should exceed the heat loss per foot value indicated in Appendix 1 & 2 (page 29-30).

CONFIRM VOLTAGE


- [] Ensure supply voltage matches voltage rating on heating cable.

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2.1 INSTALLATION: OVERVIEW

2.11 PIPE FREEZE PROTECTION INSTALLATION OVERVIEW

 For plastic pipes, apply aluminum tape along the length of the pipe before securing the heating cable to the pipe. The heating cable should be secured on top of the aluminum tape.

1. Loosely run the cable along the length of the pipe.
2. Attach the heating cable to the pipe and pipe features using glass cloth tape.
3. Install splices, end seals and power connections.
4. Install thermostat sensor onto the pipe.
5. Install pipe insulation and warning labels/stickers.

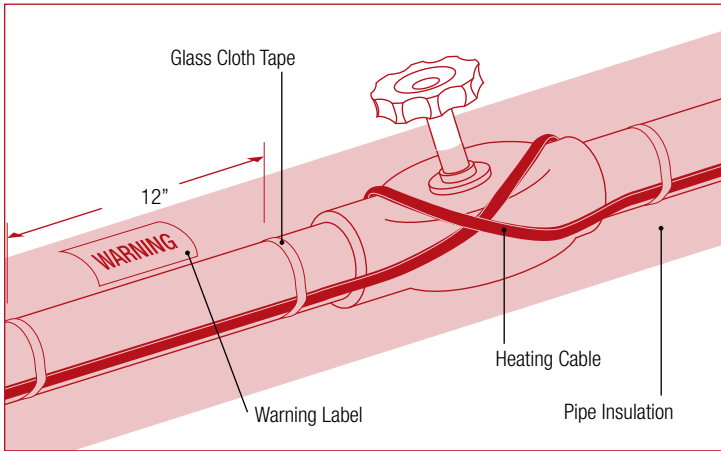


FIGURE 2.1: Pipe Freeze Protection Installation Overview

2.2 INSTALLATION: CABLE LAYOUT

2.21 UNSPOOLING THE CABLE

Place spool of cable near end of pipe to be traced. Cable payout mechanism should allow cable to unspool smoothly without excessive pulling or tugging. Loosely string cable along entire length of pipe.

2.22 INCORPORATING PIPE FEATURES

Metal features commonly attached to pipes are heat sinks that will draw heat from the heating cable. Extra cable is required to heat pipe features and/or navigate obstacles.

The table below shows how many feet of heating cable should be used to heat trace common pipe features:

PIPE DIAMETER (INCHES)	GLOBE/BALL/BUTTERFLY VALVES	GATE VALVES	PIPE SUPPORTS	FLANGES	VENT DRAINS
0.5	1	1	1	0.5	1
0.75	1	1.5	1.5	0.5	1
1	1	2	1.5	0.5	1
1.25	1.5	2.5	2	0.5	1
1.5	1.5	2.5	2	0.5	1
2	2	2.5	2	0.5	1
2.5	2.5	3	2	0.5	1
3	2.5	3	2	0.5	1
4	3	4	2.5	0.5	1
6	3.5	5	2.5	1	1
8	4	7	2.5	1	1
10	4.5	8	3	1	1

FIGURE 2.22a: Heat Cable Length Requirements for Common Pipe Features

2.2 INSTALLATION: CABLE LAYOUT

If the branch/tee pipe(s) are less than 20ft long, it is easier and more economical to loop/double-back the heating cable. This eliminates the labor and cost of installing a tee splice kit.

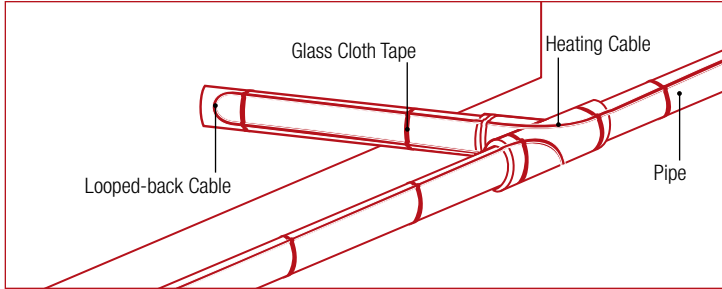


FIGURE 2.22b: Loop/Double-back Method

2.23 POWER CONNECTIONS, SPLICES AND END SEALS

Any splices or power connections will require extra heating cable. Refer to the list below for heating cable allowances required to complete common heat shrink connections.

Power Connection

Allow 6" (inches) of heating cable at the location of the connection.

Splice (regular splice or tee splice)

Allow 12" (inches) of heating cable at the location of the connection from each cable run that will be spliced together.

2.3 INSTALLATION: SECURING THE CABLE

2.3.1 SECURING HEATING CABLE TO PIPE

For plastic pipes, apply aluminum tape along the length of the pipe before securing the heating cable to the pipe. The heating cable should be secured on top of the aluminum tape.

Starting at the end and working towards the cable payout mechanism, begin fastening the heating cable to the pipe using glass cloth tape. Plastic cable ties may also be used to secure heating cable to pipe, but must only be hand-tightened.

 **Do not use vinyl electrical tape to secure heating cable to pipe.**

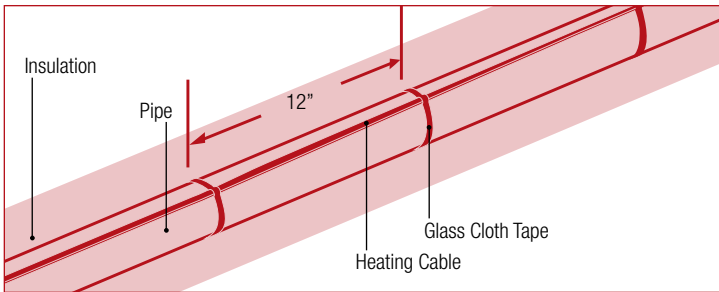


FIGURE 2.31a: Heating Cable Secured to Pipe

Whenever possible, the heating cable should be positioned on the lower section of the pipe typically at the 4 o'clock and/or 8 o'clock positions.

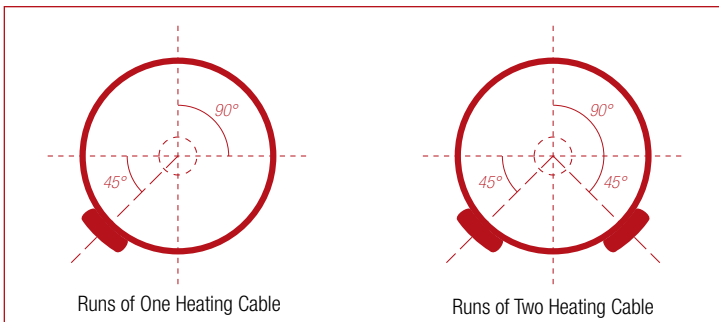



FIGURE 2.32b: Heating Cable Secured at 4 and 8 o'clock position

 **Install splice or tee splice connections only. Do not make power connections at this point of the installation.**

2.3 INSTALLATION: SECURING THE CABLE

2.3.2 SECURING HEATING CABLE TO PIPE HANGER

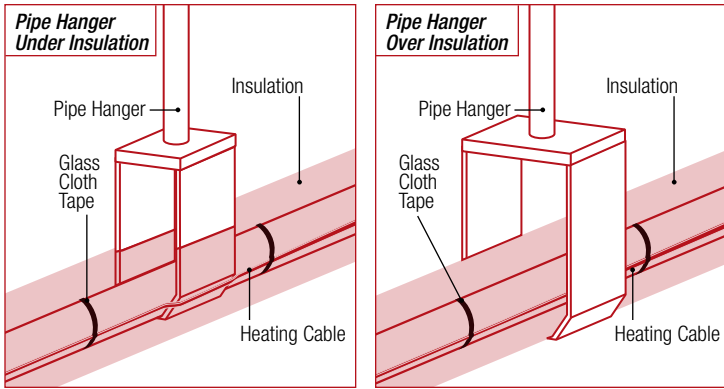


FIGURE 2.32: Securing Heating Cable to Pipe Hanger

⚠ Install splice or tee-splice connections only. Do not make power connection at this point of the installation.

2.3.3 SECURING HEATING CABLE TO PIPE FLANGE

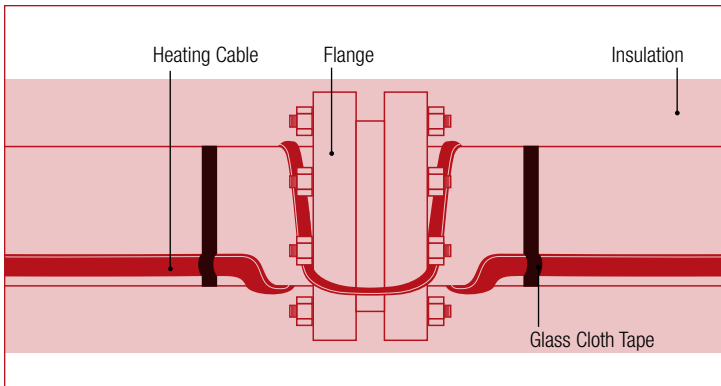


FIGURE 2.33: Securing Heating Cable to Pipe Flange

⚠ Install splice or tee-splice connections only. Do not make power connection at this point of the installation.

2.3 INSTALLATION: SECURING THE CABLE

2.3.4 SECURING HEATING CABLE TO PIPE SUPPORTS

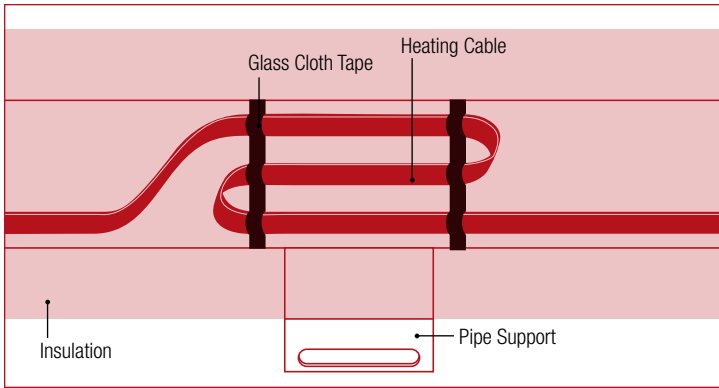


FIGURE 2.34: Securing Heating Cable to Pipe Supports



Install splice or tee-splice connections only. Do not make power connection at this point of the installation.

2.3.5 SECURING HEATING CABLE TO PIPE VALVES AND GAUGES

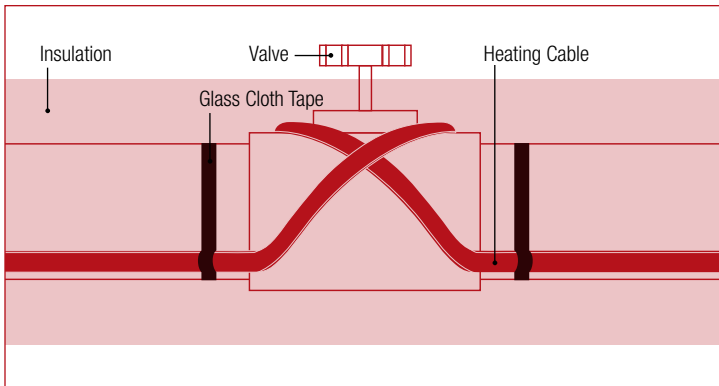


FIGURE 2.35: Securing Heating Cable to Pipe Valves and Gauges



Install splice or tee-splice connections only. Do not make power connection at this point of the installation.

2.4 INSTALLATION: POWER CONNECTION

2.41 POWER CONNECTION

After all the cable runs are secured to the piping, confirm that the length of the cable(s) on each circuit does not exceed the maximum circuit length in Appendix 3 (page 31) by performing a Circuit Length Verification test (page 11).

Install heat shrink end seals and power connections. Refer to the installation instructions that accompany the heat shrink kit.

Perform insulation resistance and continuity tests. Refer to testing procedures on page 10 of this guide.

2.5 INSTALLATION: THERMOSTAT

2.51 INSTALL PROBE

Install the thermostat as per installation instructions. Place the thermostat probe onto the pipe. The sensing bulb should be placed on the pipe at least 90° around the circumference from the heating cable or at least 50mm from the heating cable.



Sensing line should exit through lower portion of thermal insulation.

2.52 INSTALL THERMOSTAT

Follow instructions provided with thermostat for proper thermostat wiring. Ensure controller or contactor is appropriate for electrical load. For technical support, contact the Nuheat Customer Care Team at 1.800.778.9276.

2.6 INSTALLATION: INSULATION

2.61 INSTALL INSULATION

Install the pipe insulation suitable for the specific application. If the pipe is outdoors, a moisture-proof weather barrier surrounding the thermal insulation must be installed.



Do not use staples to seal the insulation as staples can damage the heating cable. Use tape or adhesive to ensure that the insulation seam remains sealed.

2.62 INSTALL WARNING LABELS

While installing the insulation, mark the location of the splices, tees, and end seals on the outside of the insulation or weather barrier using the labels/stickers provided in the connection kits. Electrical code also requires “Electric Heat Tracing” warning labels to be applied over top of the insulation or weather barrier at regular intervals (10-foot intervals recommended).

2.7 POST-INSTALLATION CHECKS

WARNING LABELS

- [] Ensure locations of splices, tees, and end seals are clearly marked. Electrical code requires "Electric Heat Tracing" warning labels to be applied over top of the insulation or weather barrier at regular intervals [10' (foot) intervals recommended].

INSULATION RESISTANCE AND CONTINUITY TESTS

- [] Perform insulation resistance and continuity tests. Refer to testing procedures on page 10 of this manual.

CIRCUIT LENGTHS VERIFICATION TESTS

- [] Perform circuit length verification tests on each circuit of heating cable. Refer to testing procedures on page 11 of this manual.

Observe the maximum circuit lengths of the cable (Appendix 1 on page 32) and do not exceed this limit during the installation. Exceeding the maximum circuit lengths will result in breaker trips which will prevent the heating cable from turning on in freezing conditions.

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3.1 TYPICAL WIRING DIAGRAM

3.1.1 SINGLE CIRCUIT CONTROL

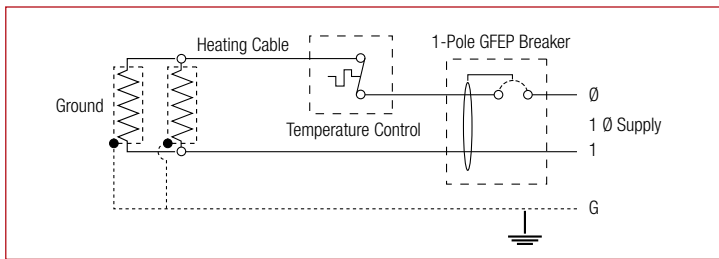


FIGURE 3.11: Single Circuit Control

3.1.2 GROUP CONTROL

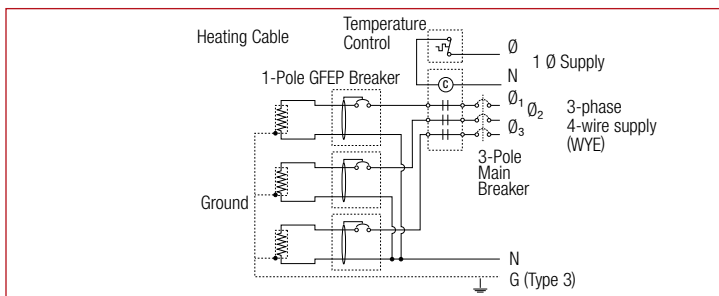


FIGURE 3.12: Group Control

3.2 REPAIRS AND MAINTENANCE

3.2.1 REPAIRS & MAINTENANCE

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

Testing and visual inspections should be performed after any type of maintenance or repair including but not limited to cleaning, re-insulating, and installation/addition of pipe segments or features.

Test and ensure pipe freeze protection system is functioning properly prior to each winter season.

3.3 APPENDIX 1: HEAT LOSS FOR METAL PIPES

Pipe Diameter	Minimum Ambient Temperature		Insulation Thickness						
	° F	° C	0.5"	1"	1.5"	2"	2.5"	3"	4"
0.5"	0	-18	2.0	1.3	1.0	1.0	1.0	0.8	0.7
	-10	-23	2.5	1.6	1.3	1.2	1.0	1.0	0.8
	-20	-29	2.9	2.0	1.6	1.4	1.2	1.0	1.0
	-40	-40	3.9	2.5	2.0	1.8	1.6	1.5	1.3
0.75"	0	-18	2.3	1.5	1.2	1.0	1.0	0.8	0.7
	-10	-23	2.9	1.9	1.5	1.3	1.0	1.0	0.9
	-20	-29	3.5	2.2	1.8	1.5	1.4	1.3	1.0
	-40	-40	4.5	2.9	2.3	2.0	1.8	1.6	1.4
1"	0	-18	2.8	1.7	1.4	1.2	1.0	1.0	0.8
	-10	-23	3.4	2.1	1.7	1.4	1.3	1.2	1.0
	-20	-29	4.1	2.5	2.0	1.7	1.5	1.4	1.2
	-40	-40	5.3	3.3	2.6	2.2	2.0	1.8	1.6
1.25"	0	-18	3.3	2.0	1.6	1.3	1.0	1.1	0.9
	-10	-23	4.1	2.5	2.0	1.6	1.4	1.3	1.1
	-20	-29	4.9	3.0	2.3	1.9	1.7	1.6	1.3
	-40	-40	6.4	3.9	3.0	2.5	2.2	2.0	1.8
1.5"	0	-18	3.7	2.2	1.7	1.4	1.3	1.1	1.0
	-10	-23	4.5	2.7	2.1	1.8	1.5	1.4	1.2
	-20	-29	5.4	3.3	2.5	2.0	1.8	1.7	1.4
	-40	-40	7.1	4.3	3.3	2.7	2.4	2.2	1.9
2"	0	-18	4.4	2.6	2.0	1.6	1.4	1.3	1.1
	-10	-23	5.5	3.2	2.4	2.0	1.8	1.6	1.4
	-20	-29	6.5	3.8	2.9	2.4	2.1	1.9	1.6
	-40	-40	8.6	5.0	3.8	3.1	2.7	2.5	2.1
2.5"	0	-18	5.2	3.0	2.3	1.8	1.6	1.4	1.2
	-10	-23	6.4	3.7	2.8	2.3	2.0	1.8	1.5
	-20	-29	7.6	4.4	3.3	2.7	2.4	2.1	1.8
	-40	-40	10.0	5.8	4.3	3.6	3.0	2.8	2.3
3"	0	-18	6.1	3.5	2.6	2.1	1.8	1.6	1.4
	-10	-23	7.6	4.3	3.2	2.6	2.3	2.0	1.7
	-20	-29	9.0	5.2	3.8	3.0	2.7	2.4	2.0
	-40	-40	11.9	6.8	5.0	4.0	3.5	3.1	2.6
4"	0	-18	7.6	4.3	3.1	2.5	2.2	1.9	1.6
	-10	-23	9.5	5.3	3.9	3.1	2.7	2.3	1.9
	-20	-29	11.3	6.3	4.6	3.7	3.2	2.8	2.3
	-40	-40	14.9	8.3	6.0	4.9	4.1	3.7	3.0
6"	0	-18	11.0	6.0	4.6	3.4	2.8	2.5	2.0
	-10	-23	13.5	7.4	5.3	4.2	3.5	3.1	2.5
	-20	-29	16.0	8.8	6.3	5.0	4.2	3.7	3.0
	-40	-40	21.1	11.6	8.2	6.5	5.5	4.8	3.9
8"	0	-18	14.0	7.5	5.3	4.2	3.5	3.0	2.4
	-10	-23	17.2	9.3	6.6	5.2	4.3	3.8	3.0
	-20	-29	20.5	11.0	7.8	6.2	5.2	4.5	3.6
	-40	-40	27.0	14.6	10.3	8.1	6.8	5.9	4.7
10"	0	-18	17.0	9.2	6.4	5.0	4.2	4.0	3.0
	-10	-23	21.0	11.4	8.0	6.2	5.2	5.0	4.0
	-20	-29	26.0	13.6	10.0	7.4	6.2	5.3	4.2
	-40	-40	34.0	18.0	13.0	10.0	8.1	7.0	6.0

For pipe diameters greater than 10" (inch), contact Nuheat at 1.800.778.WARM(9276)

3.3 APPENDIX 2: HEAT LOSS FOR PLASTIC PIPES

Pipe Diameter	Minimum Ambient Temperature		Insulation Thickness						
	° F	° C	0.5"	1"	1.5"	2"	2.5"	3"	4"
0.5"	0	-18	2.5	1.6	1.3	1.3	1.3	1.0	0.9
	-10	-23	3.1	2.0	1.6	1.5	1.3	1.3	1.0
	-20	-29	3.6	2.5	2.0	1.8	1.5	1.3	1.3
	-40	-40	4.9	3.1	2.5	2.3	2.0	1.9	1.6
0.75"	0	-18	2.9	1.9	1.5	1.3	1.3	1.0	0.9
	-10	-23	3.6	2.4	1.9	1.6	1.3	1.3	1.1
	-20	-29	4.4	2.8	2.3	1.9	1.8	1.6	1.3
	-40	-40	5.6	3.6	2.9	2.5	2.3	2.0	1.8
1"	0	-18	3.5	2.1	1.8	1.5	1.3	1.3	1.0
	-10	-23	4.3	2.6	2.1	1.8	1.6	1.5	1.3
	-20	-29	5.1	3.1	2.5	2.1	1.9	1.8	1.5
	-40	-40	6.6	4.1	3.3	2.8	2.5	2.3	2.0
1.25"	0	-18	4.1	2.5	2.0	1.6	1.3	1.4	1.1
	-10	-23	5.1	3.1	2.5	2.0	1.8	1.6	1.4
	-20	-29	6.1	3.8	2.9	2.4	2.1	2.0	1.6
	-40	-40	8.0	4.9	3.8	3.1	2.8	2.5	2.3
1.5"	0	-18	4.6	2.8	2.1	1.8	1.6	1.4	1.3
	-10	-23	5.6	3.4	2.6	2.3	1.9	1.8	1.5
	-20	-29	6.8	4.1	3.1	2.5	2.3	2.1	1.8
	-40	-40	8.9	5.4	4.1	3.4	3.0	2.8	2.4
2"	0	-18	5.5	3.3	2.5	2.0	1.8	1.6	1.4
	-10	-23	6.9	4.0	3.0	2.5	2.3	2.0	1.8
	-20	-29	8.1	4.8	3.6	3.0	2.6	2.4	2.0
	-40	-40	10.8	6.3	4.8	3.9	3.4	3.1	2.6
2.5"	0	-18	6.5	3.8	2.9	2.3	2.0	1.8	1.5
	-10	-23	8.0	4.6	3.5	2.9	2.5	2.3	1.9
	-20	-29	9.5	5.5	4.1	3.4	3.0	2.6	2.3
	-40	-40	12.5	7.3	5.4	4.5	3.8	3.5	2.9
3"	0	-18	7.6	4.4	3.3	2.6	2.3	2.0	1.8
	-10	-23	9.5	5.4	4.0	3.3	2.9	2.5	2.1
	-20	-29	11.3	6.5	4.8	3.8	3.4	3.0	2.5
	-40	-40	14.9	8.5	6.3	5.0	4.4	3.9	3.3
4"	0	-18	9.5	5.4	3.9	3.1	2.8	2.4	2.0
	-10	-23	11.9	6.6	4.9	3.9	3.4	2.9	2.4
	-20	-29	14.1	7.9	5.8	4.6	4.0	3.5	2.9
	-40	-40	18.6	10.4	7.5	6.1	5.1	4.6	3.8
6"	0	-18	13.8	7.5	5.8	4.3	3.5	3.1	2.5
	-10	-23	16.9	9.3	6.6	5.3	4.4	3.9	3.1
	-20	-29	20.0	11.0	7.9	6.3	5.3	4.6	3.8
	-40	-40	26.4	14.5	10.3	8.1	6.9	6.0	4.9
8"	0	-18	17.5	9.4	6.6	5.3	4.4	3.8	3.0
	-10	-23	21.5	11.6	8.3	6.5	5.4	4.8	3.8
	-20	-29	25.6	13.8	9.8	7.8	6.5	5.6	4.5
	-40	-40	33.8	18.3	12.9	10.1	8.5	7.4	5.9
10"	0	-18	21.3	11.5	8.0	6.3	5.3	5.0	3.8
	-10	-23	26.3	14.3	10.0	7.8	6.5	6.3	5.0
	-20	-29	32.5	17.0	12.5	9.3	7.8	6.6	5.3
	-40	-40	42.5	22.5	16.3	12.5	10.1	8.8	7.5

For pipe diameters greater than 10" (inch), contact Nuheat at 1.800.778.WARM(9276)

3.3 APPENDIX 3: MAXIMUM CIRCUIT LENGTH

9MM HEATING CABLE

	START UP AMBIENT		120V				240V			
	°F	°C	15A	20A	30A	40A	15A	20A	30A	40A
9FP05W	50	10	225	270	270	270	450	545	545	545
	32	0	180	240	270	270	370	495	545	545
	14	-10	150	200	270	270	310	415	545	545
	0	-18	135	175	265	270	275	365	545	545
	-20	-29	115	155	230	270	235	315	475	545
9FP08W	50	10	140	185	210	210	285	380	420	420
	32	0	120	160	210	210	240	325	420	420
	14	-10	105	140	210	210	190	255	385	420
	0	-18	95	130	195	210	160	215	325	420
	-20	-29	85	115	175	210	135	180	275	365

13MM HEATING CABLE

	START UP AMBIENT		120V				240V			
	°F	°C	15A	20A	30A	40A	15A	20A	30A	40A
13FP03W	50	10	335	335	335	335	665	665	665	665
	32	0	295	335	335	335	595	665	665	665
	14	-10	245	330	335	335	495	560	665	665
	0	-18	215	290	335	335	435	580	665	665
	-20	-29	185	245	335	335	370	495	665	665
13FP05W	50	10	230	275	275	275	460	550	550	550
	32	0	190	255	275	275	380	510	550	550
	14	-10	160	215	275	275	325	430	550	550
	0	-18	140	190	275	275	285	385	550	550
	-20	-29	125	165	250	275	250	330	500	550
13FP08W	50	10	110	145	215	275	215	290	435	550
	32	0	145	195	215	215	215	285	430	435
	14	-10	110	145	215	215	165	220	335	435
	0	-18	100	135	200	215	150	205	305	410
	-20	-29	90	120	180	215	135	185	275	370
13FP10W	50	10	80	105	160	215	125	165	250	335
	32	0	100	130	185	185	100	130	200	265
	14	-10	90	120	180	185	90	120	180	245
	0	-18	80	110	165	185	85	110	165	225
	-20	-29	75	100	155	185	75	105	155	210
	-20	-29	70	90	140	185	70	95	145	195
	-40	-40	60	85	125	170	65	90	135	180



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