

HeatTape^{PRO}

HEATING CABLE SYSTEM

INSTALLATION MANUAL

V.0323



SCAN THIS CODE



FOR THE LATEST VERSION OF
OUR MANUAL

R RADIANT

SOLUTIONS COMPANY

Self-Regulating Heating Cables

Please read and save these instructions. Read carefully before attempting to assemble, install, operate or maintain the product described. Protect yourself and others by observing all safety information. Failure to comply with instructions could result in personal injury and/or property damage! Retain instructions for future reference. The guidelines detailed herein need to be followed to ensure warranty coverage.



Residential
Pipe Heating Cable
E488383
Parallel - W



Pipe Heating Cable
E330224
Parallel - W



DE-ICING AND SNOW
MELTING EQUIPMENT
E482897
Parallel - WS

W: With wet rating

WS: With wet test and weather resistance

QUESTIONS?

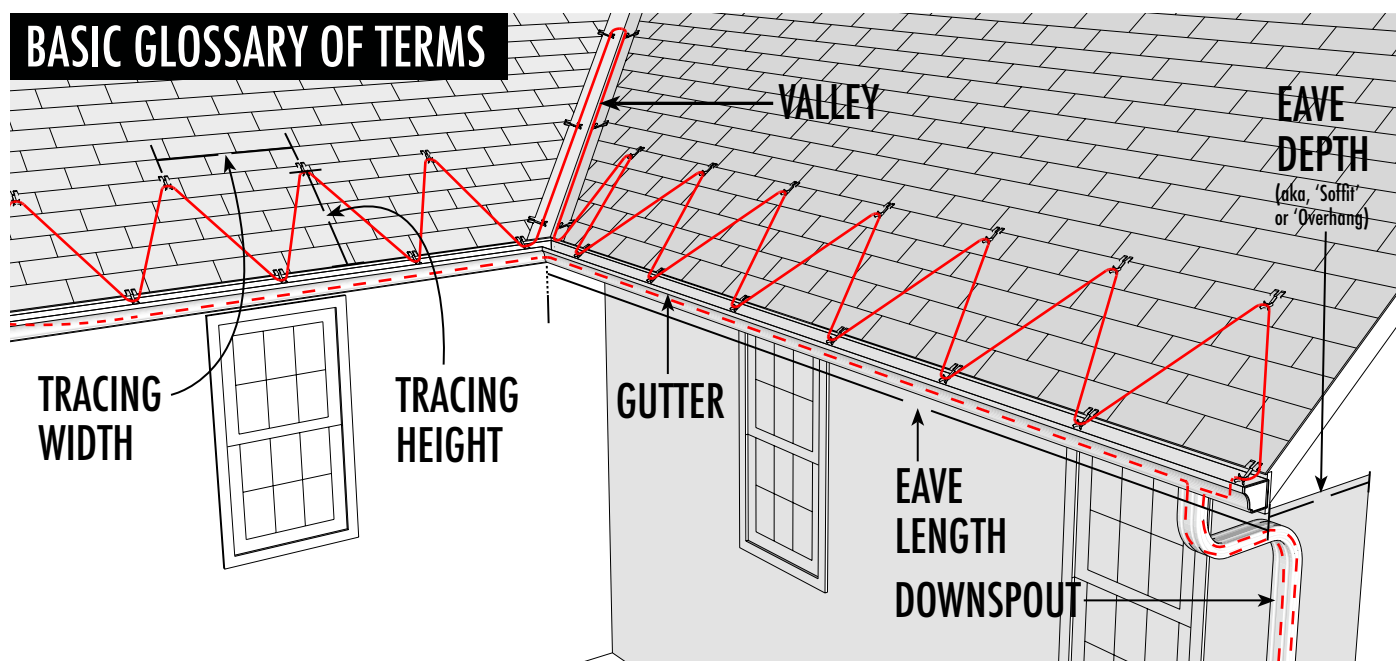
CALL US: 1-877-387-4218

OR VISIT: radiantsolutionscompany.com

TABLE OF CONTENTS



1.1 General Information & Cable Specifications	1
1.2 Getting Started: Receiving & Storing Heat Cable Products	1
1.3 The HTP Electric Heat Cable System	2
1.4 Do's & Dont's	2
1.5 Safeguards & Warnings	3
1.6 Measuring for Heat Cable	4
1.7 Gutters, Downspouts and Cable Calculations	4
1.8 Valleys and Cable Planning	4
1.9 Models, Usages and Ratings	5
2.0 General Installation Guidelines	5
2.1 Cable Testing and Maintenance	6
2.2 Installing Roof & Gutter De-Icing Cable	7
2.3 Installing Roof & Gutter De-Icing Cable with Grip Clips™	8
2.4 Installing Grip Clips™	9
2.5 Pipe Heat Trace Installation: General Guidelines	10
2.6 General Requirements for Finishing Heat Cable Installations	10
2.7 Industrial & Commercial Pipe Heat Trace Cable Lengths According to Breaker Size	11
2.8 Additional Items Required by Not Supplied	11
2.9 Residential Pipe Heat Trace Cable Lengths According to Breaker Size	12
3.0 Residential Pipe Heat Trace Circuit Adjustment Factors	12
3.1 Equipment Diagram	12
3.2 Pipe Heat Trace Cable Selection Help	13
3.3 Pipe Heat Trace Cable Installation	14
3.4 Thermal Insulation for Pipe Heat Trace	15
3.5 Pipe Heat Trace Diagram	15
3.6 Roof & Gutter De-Icing Installation Accessories	16
3.7 Visual Accessory Index	17
3.8 Warranty	18
3.9 Project Notes and Records	18
4.0 Project Notes and Records	19
4.1 Troubleshooting Guide	20



⚠ WARNING

The maximum size of the branch circuit shall not be less than 125% of the ampere load of the cable installed

⚠ AVERTISSEMENT

La taille maximale du circuit de dérivation ne doit pas être inférieure à 125 % de la charge en ampères du câble installé.

⚠ WARNINGS

This product must be installed by a qualified person in accordance with this installation handbook and with the National Electric Code (U.S.) as applicable. All electric connections must be made by a qualified electrician, according to the electrical and building codes effective in your region.

⚠ AVERTISSEMENT

Ce produit doit être installé par une personne qualifiée conformément au présent manuel d'installation. Tous les raccordements électriques doivent être effectués par un électricien qualifié, conformément aux codes de l'électricité et du bâtiment en vigueur dans votre région.

⚠ WARNINGS

Two copies of a caution notice indicating the presence of electric de-icing and snow-melting equipment on the premises are packed with this unit. One notice must be posted at the fuse or circuit-breaker panel and the other on or next to the on/off control for the cable unit. Both notices must be clearly visible

⚠ AVERTISSEMENT

Deux exemplaires d'un avis de mise en garde indiquant la présence d'équipement de dégivrage électrique et de fonte de neige sur les lieux sont emballés avec cet appareil. Un avis doit être affiché au niveau du panneau de fusibles ou de disjoncteurs et l'autre sur ou à côté de la commande marche/arrêt du câble. Les deux avis doivent être clairement visibles.

⚠ WARNINGS

Do not use damaged heating cables, power cord or plug. Remove and replace immediately to prevent a fire, shock or arcing hazard.

⚠ AVERTISSEMENT

Ne pas utiliser de câbles de chauffage, de cordon d'alimentation ou de fiche endommagés. Retirer et remplacer immédiatement pour éviter tout risque d'incendie, de choc ou d'arc électrique.

⚠ WARNINGS

Keep ends of heating devices and kit components dry before and during installation

⚠ AVERTISSEMENT

Garder les extrémités des appareils de chauffage et l'ensemble des composants au sec avant et pendant l'installation.

⚠ WARNINGS

The conductive layer of this heating device must be connected to a suitable grounding/earthing terminal.

⚠ AVERTISSEMENT

La couche conductrice de ce dispositif de chauffage doit être connectée à une borne de terre/terre appropriée.

⚠ WARNINGS

Never attempt to pull the heating cable tight or create tension in the heat cable system from one clip to the next as this will put unnecessary stress on the roof clips and the cable over time. The cable should be loosely laid on the roof with just enough tension to maintain the proper serpentine pattern and keep the heat cable stable in the roof clips.

⚠ AVERTISSEMENT

Ne tentez jamais de serrer le câble de chauffage ou de créer une tension dans le système de câbles de chauffage d'une pince à la suivante, car cela exercera une pression inutile sur les attaches de toit et le câble au fil du temps. Le câble doit être lâchement posé sur le toit avec juste assez de tension pour maintenir le bon motif de serpentine et garder le câble de chaleur stable dans les clips de toit.

⚠ WARNINGS

SHOCK AND FIRE HAZARD. If the cable system is not installed properly and/or damaged, fire or shock can occur and can result in serious personal injury or damage to property.

⚠ AVERTISSEMENT

RISQUE DE CHOC ET D'INCENDIE. Si le système de câbles n'est pas installé correctement et/ou endommagé, un incendie ou un choc peut se produire et entraîner des blessures graves ou des dommages matériels.

⚠ WARNINGS

De-energize all power circuits before installation or servicing

⚠ AVERTISSEMENT

Mettre hors tension tous les circuits d'alimentation avant l'installation ou la maintenance.

⚠ WARNINGS

The presence of the heating devices shall be made evident by the posting of caution signs or markings where clearly visible.

⚠ AVERTISSEMENT

La présence des dispositifs de chauffage doit être mise en évidence par l'apposition de panneaux de mise en garde ou de marques bien visibles.

This guide describes the Radiant Solutions Company Plug-In Self-Regulating HeatTapePro™ Cables and how to install the system. It is important to review this guide. These instructions are for qualified persons involved in the designs, installation, operation and maintenance of electric trace heating cable systems. For additional information regarding any aspect of this product, contact Radiant Solutions Company.

1.1 GENERAL INFORMATION & CABLE SPECIFICATIONS

HeatTapePro™ self-regulating heat cables are designed to be used for a variety of roof de-icing, gutter de-icing and pipe freeze applications. Self-regulating heat cable automatically calls for more energy when ambient outdoor temperatures are lower and conversely, less energy when outdoor temperatures are higher. HeatTapePro™ self-regulating heat cables are approved for use on all common roofing materials (both sloped and flat) including asphalt shingles, wood shakes and shingles, synthetic shakes and slate, membranes such as EPDM and TPO, tile, concrete tiles, tar, slate and metal as well as gutters made of both metal and plastic. HeatTapePro™ can be used for industrial, commercial and residential pipe freeze applications on all common pipe materials including copper, PEX, PVC, ABS and galvanized and may be used inside non-pressurized water drain pipes.

Radiant Solutions Company offers a full range of connection and termination kits, including power connection, tee or splice connection, and end seal kits. Use of these connection kits as recommended to ensure proper functioning and service life of the heat cable system. Each circuit requires either a PPK-319 Plug-in Power Connection Kit or HCK-M-1 Hard-Wired Connection Kit. PPK-319 is designed to provide a cord-and-plug power connection with a grounded plug to a standard 120v outlet (15amp maximum), while HCK-M-1 provides a permanent hard-wired power connection (40amp maximum).

HTP CABLE SPECIFICATIONS		
Cable Construction:	Self-regulating	
Rated Voltage:	120V, 208V-277V	
Bending Radius (min.):	1.0 inch @ 5°F (-15°C)	
Cable Dimensions:	6 mm thick x 12 mm wide	
Max. Exposure Temp*:	185°F (85°C)	
Min. Install Temp.:	5°F (-15°C)	
Bus Wires:	16 gauge AWG	(A)
Conductor Insulation:	Self-regulating conductive core	(B)
Inner Jacket:	Modified Polyolefin	(C)
Braid:	Tinned copper	(D)
Outer Jacket:	Modified PE	(E)

*This is the maximum temperature the cable should be exposed to for extended periods of time. Prolonged exposure to higher temperatures may cause premature cable degradation.



1.2 GETTING STARTED: RECEIVING AND STORING HEAT CABLE PRODUCTS

When you receive your HTP cable and components, compare the list of materials received to the catalog numbers of heating cables and components to confirm you have the proper materials for your project. Always verify that you have received the proper cable type and voltage (that information is printed on the jacket of the cable). Verify that the cable voltage rating is suitable for the service voltage available. Closely inspect the heating cable and components for any damage caused in transit. Always conduct insulation resistance tests as recommended of each spool of cable (see section 2.1 for details) immediately upon receiving the cable. Record those test values in the table(s) on page 6 in the 'Test Record Tables'. HTP cables and connecting components must be stored in a clean, dry place at temperatures between 140 °F (60 °C) and - 40 °F (- 40 °C). Contact with chemicals and petrochemical products should be avoided. Protect cables against mechanical damage and moisture during storage.

1.3 THE HTP ELECTRIC HEAT TRACE SYSTEM

A complete electric heat trace system includes following components:

- A. HTP Self-Regulating Heating Cable
- B. Radiant Solutions Company Connection Kits suitable for use with the HTP Heating Cable System
 1. Power Connection Kits:
 - i. PPK-319 Plug-In Power Connection Kit:

Per the National Electrical Code (NEC), Clause 426.50 (B), cord and plug construction products are limited to 20 A circuit breaker maximum. Make sure your branch circuit is limited to a maximum 20 A for PPK-319. Per UL 2049, Section 5.1, a 240 V grounding type attachment plug is required for residential applications.
 - ii. HCK-M-1 Hard-wired Power Connection Kit
 2. TSK-723 Tee or Splice Kit
 3. ESK-215 End Seal Kit or ESK-GC-12 End Seal Kit
- C. "Warning" or "Caution" labels (Provided in Radiant Solutions power connection kits).

Installation instructions are included in each connection kit. Steps for preparing and connecting to connection kits must be followed to ensure safety. Follow all connection kit installation requirements, including:

1. Heating cables must be installed over, not under, pipe straps used to secure pipe mounted metal bracket.
2. Keep components and heating cable ends dry before and during installation
3. Do not damage or break braid and bus wire strands when scoring the jacket or core as damaged bus wires can overheat or short.
4. Heat-damaged components can short. Use a heat gun to shrink the tubes. Keep the heat gun moving from side to side even after tube has shrunk to melt adhesive inside tube. A small amount of adhesive should ooze out around the heat shrink tubing.
5. Avoid heating other components with heat gun. Replace any damaged parts.

1.4 DO'S AND DONT'S

THINGS YOU SHOULD **NEVER** DO:

- Use fasteners such as nails, staples or screws to secure the cable to a surface (roof, gutter or pipe). Use approved clips only.
- Attempt to install the cable system if it is damaged.
- Install or repair a cable that is energized (plugged in).
- Allow the sharp edge of a tool to nick or bang into the cable.
- Use the heating cable for any purpose other than what is described in this manual.
- Install the heating cable under roofing material, in walls or in hidden areas.
- Install a cable designed for a 120 V power source on a 208/240/277 V power source.
- Exceed maximum circuit lengths as this will result in breaker trips and prevent heating cable from turning on in freezing conditions.
- Install HTP Self-Regulating Heat Cable on surfaces or pipes that may exceed 185°F (85°C).
- Use HTP cable on pipes carrying anything other than water. Cable is not intended for use with hazardous materials.
- Install heat cable in temperatures below 5°F (-15°C)

THINGS YOU SHOULD **ALWAYS** DO:

- Consult a roofing contractor in your area for recommendations on proper adhesives for your roof material.
- Maintain a minimum 1" bending radius on the cable.
- Ensure drip loops are made to prevent water from trailing into any electrical equipment, junction boxes or controls.
- Ensure gutters and downspouts are free of leaves and other debris prior to each winter season.
- Verify that the cable system is grounded and protected by GFCI technology.
- Ensure that this product is installed by a qualified person in accordance with this installation handbook and with the National Electric Code (U.S.) as applicable. All electric connections must be made by a qualified electrician, according to the electrical and building codes effective in your region.
- Perform testing and visual inspections of the heating cable after any type of roof maintenance or repairs including but not limited to roof/gutter/downspout repair, manual snow removal or installation or addition of roof features.
- Perform a bi-annual inspection of the cable system to determine if the cable is damaged and/or still operational.
- De-energize the cable system before the warm season (above 60°F)

1.5 SAFEGUARDS AND WARNINGS

GENERAL

Read and understand all instructions in this manual and Safety Warnings. Electrical cables, if not installed correctly or are damaged, can present a fire, shock and arcing hazard. Sections 426 (outdoor electric deicing and snow-melting equipment) and 427 (pipelines and vessels) of the National Electrical Code (NEC), and Part 1 of the Canadian Electrical Code, Sections 62 (Fixed Electric Space and Surface Heating), govern the installation of electrical heat-tracing systems. All heat-tracing-system installations must be in compliance with these and any other applicable national or local codes.

ADDITIONAL GUIDELINES:

1. Do not use extension cords.
2. 30-mA ground fault protection of equipment is required for each heating cable branch circuit for maximum protection, especially for fixed outdoor electric de-icing and snow-melting equipment.
3. Before installing or servicing cable, ensure that all power to supply circuit(s) is OFF.
4. Do not twist cable during installation.
5. On roof de-icing applications, do not install cable under roofing materials. Install only in accessible locations; do not install cable behind walls or where the cable will be hidden or where it might be warmed by sources of heat, such as exhaust vents or chimneys.
6. Do not expose cable to temperatures above 185°F (85°C), as this will damage the cable.
7. Installation must be in compliance with National Electrical Codes (NEC).
8. On pipe freeze applications, use only fire-resistant insulation, such as preformed foam. Do not embed cable in spray foam insulation. Do not use standard fiberglass batt insulation.
9. On pipe freeze applications, use 1/2" to 1" fiberglass tape and/or plastic cable ties when attaching cable to pipe. Do not use wire or metal clamps or vinyl tape, duct tape or similar.
10. For roof and gutter applications, HTP Self-Regulating Heat Cable is designed to create ice-free pathways, not prevent accumulated snow or ice in large areas adjacent to cables.
11. For the warranty to be valid, the installer must comply with the requirements outlined in this manual.
12. Protect all cable that protrudes past the lower opening of all downspouts and in other areas where it is likely to be damaged.
13. Use only watertight construction or enclosure Type 3, 3S, 4, 4X, 6, or 6P junction boxes when installing.
14. The conductive layer of this heating device must be connected to a suitable grounding terminal.
15. We recommend that you turn your heat cable on before temperatures drop below 32°F (0°C) or before any freezing precipitation occurs. This will reduce the likelihood of tripped circuits due to amperage spikes.
16. Approvals and performance of the heat-tracing systems are based on the use of Radiant Solution Company specified parts only. Do not substitute parts.
17. Bus wires will short if they contact each other. Keep bus wires separated at all times.
18. Components and cable ends must be kept dry before and during installation.
19. The black heating cable core is conductive and can short. It must be properly kept dry.
20. Damaged bus wires can overheat or short. Do not break bus wire strands when preparing the cable for connection.
21. Only use HTP heating cables only in areas subject to low risk of mechanical damage.
22. Do not bury heat cable underground.
23. Do not run the heating cable through walls, ceilings, or floors.
24. The presence of the heating devices shall be made evident by the posting of caution signs or markings where clearly visible.
25. When possible, all power connection boxes should be located in a protected area (such as under eaves) and cable entry should be at the bottom of the box. In all cases, a drip loop should be created to keep water out of junction boxes.

BEFORE INSTALLATION

1. Review and perform insulation resistance ('Megger') testing according to section 2.1, page 6.
2. Coordinate the installation of the HTP heating cable system with other installation work including roofing, gutters and electrical.
3. Review the list of all required tools and materials required for the project and verify you have everything you need.

ROOF & GUTTER HEATING SYSTEM DESIGN & INSTALLATION

1.6 MEASURING FOR HEAT CABLE SYSTEM

STEP BY STEP

- ① Measure the depth of your eave (also known as the soffit)
- ② Measure the length of each eave area to be protected
- ③ Measure the length each gutter to be protected
- ④ Measure the length of each downspout to be protected
- ⑤ Account for any special considerations
- ⑥ Use Calculator below to derive your cable per foot of eave
- ⑦ Do the math

THE MATH

Sample Calculation for a heat cable system on a roof with 12" eave depths:

Eave Length	20 ft x 2.8	= 56 ft
Gutter Length	40 ft	= 40 ft
Downspout Length	24 ft	= 24 ft
Special (Extra for distance to outlet)	5 ft	= 5 ft

A 12" eave requires a multiplier of 2.8 from the Calculator below. Keep in mind, it never hurts to order a slightly longer cable than you think you might need. Running short is a bummer.

= 125 ft
(Cable Footage)

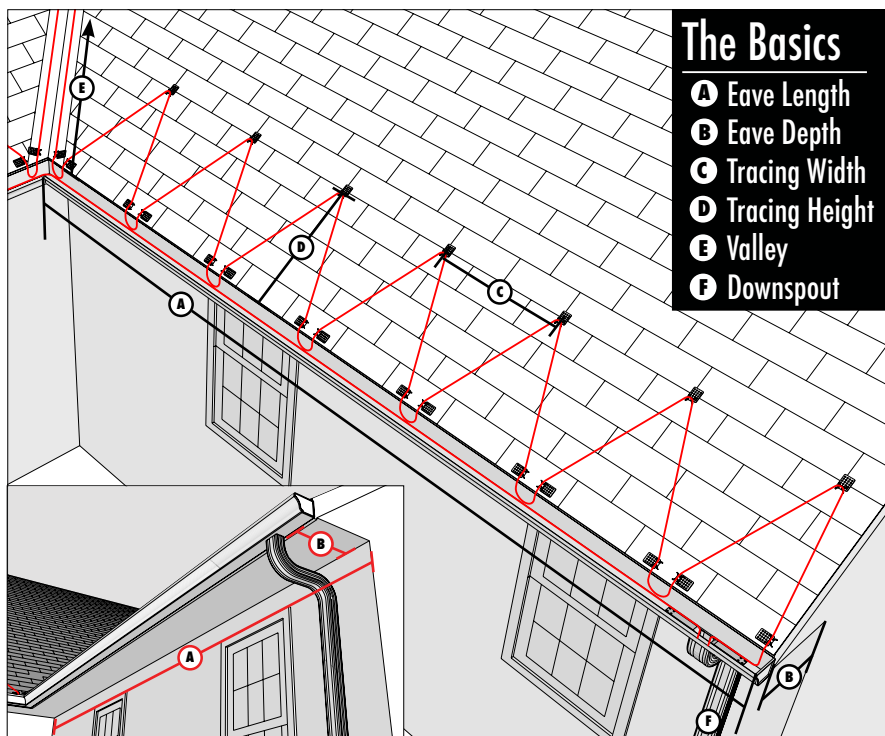
HeatTape^{PRO} Calculator

Eave Depth	Tracing Width	Tracing Height	Cable per Ft. of Eave
>12"	24"	18"	2.0 Ft
12"	24"	18"	2.8 Ft
24"	24"	30"	3.8 Ft
36"	24"	42"	4.8 Ft
48"	24"	54"	5.8 Ft

Special Considerations

- Valleys:** We recommend running the cable up the valley at least 6 feet (12' of cable total)
- Gutters:** Add 1 foot of cable for each running foot of gutter
- Downspouts:** Assume standard tracing patterns on dormers and add to cable length needed
- Power Supply:** Allow for extra cable to reach the outlet or junction box supplying power to the cable
- Cut to Length:** Systems using custom cut cables will require extra footage for special connections
 - Add 1 foot for Power connections, 2 feet for each splice, 3 feet for tee connections
- Downspouts:** Downspouts in the middle of a gutter require a cable loop up and down. Simply double the length of the downspout to determine the footage needed

ACCESSORIES: Remember to order a CableGuard (CG-24) for each location a heat cable drops into a downspout.



The Basics

- A** Eave Length
- B** Eave Depth
- C** Tracing Width
- D** Tracing Height
- E** Valley
- F** Downspout

1.7 GUTTERS, DOWNSPOUTS AND CABLE LENGTH CALCULATIONS

Add one foot of cable for every foot of standard residential gutter. Add two feet of cable per foot of large, commercial gutter to accommodate two cable runs inside the gutter. Add one foot of cable for every foot of downspout if the downspout is where the cable system begins or ends. If the downspout is in the middle of the cable system, add two feet of cable per foot of downspout to loop down and back up the downspout if necessary. In other words, double the length of the downspout to determine the footage of cable needed when the downspout is in the middle of the heat cable run.

1.8 VALLEYS AND HEAT CABLE PLANNING

We recommend running your heat cable a minimum of six feet up and down any valleys in your system. Generally speaking, steeper roof systems (i.e., 6/12 and up) require six feet or less. Lower pitch roofs (i.e., 2/12 through 5/12) may require more than six feet to provide adequate ice dam prevention coverage. Never drive nails within 6" of the center of the valley flashing to secure nail-on roof clips.

1.9 MODELS, USAGES AND RATINGS FOR ROOF & GUTTER APPLICATIONS

Refer to the following charts to determine the appropriate HTP cable model, voltages, circuit lengths, etc.. HTP heating cables are approved for use in commercial and residential applications with 120v, 208v, 240v and 277v circuits. HTP is for usage in WS environments (ordinary locations) with wattage output up to 10w/ft.

MAXIMUM CABLE CIRCUIT LENGTH ACCORDING TO CIRCUIT BREAKER SELECTION: Table 3.1

Model Number	Start-Up Temp	120V				240V			
		15A	20A	30A	40A	15A	20A	30A	40A
5HTP	32°F (-18°C)	166'	222'	302'	302'	333'	444'	604'	604'
		126'	168'	252'	302'	252'	336'	504'	604'
6HTP	32°F (-18°C)	150'	197'	279'	279'	295'	394'	561'	561'
		113'	150'	226'	279'	226'	301'	451'	561'
8HTP	32°F (-18°C)	131'	175'	243'	243'	262'	350'	482'	482'
		104'	138'	207'	243'	207'	276'	415'	482'
10HTP	32°F (-18°C)	110'	146'	207'	207'	220'	293'	410'	410'
		90'	120'	179'	207'	179'	239'	359'	410'

Note: PPK-319 Plug-in Power Connection Kit is limited to a 15A circuit breaker maximum and therefore shall not exceed maximum circuit length values given under 15A circuit breaker size in the chart (above).

CIRCUIT LENGTH ADJUSTMENT FACTOR

	5HTP-2	6HTP-2	8HTP-2	10HTP-2
208V	0.944	0.938	0.922	0.902
240V	1.000	1.000	1.000	1.000
277V	1.064	1.083	1.097	1.098

Using the Circuit Length Adjustment Factor: Simply use the value for the chosen HTP cable model and circuit voltage then multiply against the recommended circuit length footage from Table 3.1, above. For example, if you are using 8HTP-2 on a 208 volt circuit with a 30 amp breaker, multiply .922 x 482' = 444'. It is therefore safe to install 444' of 8HTP-2 on a 30amp circuit breaker.

2.0 GENERAL INSTALLATION GUIDELINES

HTP heating cable is designed create melted pathways through snow and ice. It is not designed to remove large areas of accumulated snow and ice. It should be noted that HTP heat cable will not prevent snow or ice from falling off the roof. It is recommended to use snow and ice arrest systems such as snow fencing on areas where avalanching snow and ice may occur to prevent damage to the roof heat cable system. Other considerations:

1. HTP heating cable may be used in gutters and downspouts made from standard materials, including metal and plastic, as well as roofs made from all types of standard roofing materials, including wood shakes, asphalt shingles, rubber, tar, synthetic, metal, and plastics.
2. All actual lengths installed should be recorded for future reference.
3. Use only listed components (wire, connectors, etc.) that have suitable ratings for the application.
4. This heating system must be installed per ANSI/NFPA 70, National Electrical Code(NEC) and CAN/CSA-C22.1, Canadian Electrical Code, Part I(CEC).
5. All penetrations made on the surface of any style of roof should be moisture proofed by using a suitable sealant or sealing type fasteners. The installation of any heating system should not affect the overall integrity of the roof or gutter but you should check with the manufacturer of the roof or gutter prior to installing heat cable to verify compatibility.
6. Use a stable holding device for unwinding the heating cable from the coil and remove the heating cable in a straight line from the coil. This helps with preventing cable twisting and other types of damage.
7. Do not bend or pinch the heating cable, or pull it over sharp edges and do not tread on or drive over the heating cable.
8. The ends of the heating cable should always be protected against moisture intrusion before installation.

2.1 CABLE TESTING AND MAINTENANCE

The insulation resistance test ('Megger Test') verifies the electrical integrity of your HTP Heating Cable by checking the resistance between the heating cable bus wires and the braid. This test should be performed with a megger capable of delivering at least 1000 Vdc.

IR Testing should be completed at THREE stages throughout the installation process:

Test One: When you receive the cable (before installation).

Test Two: After cable is installed on the roof OR on pipe but BEFORE installing components such as connection kits, terminations or thermal insulation (in pipe trace projects).

Test Three: After installing all components and accessories but BEFORE initial system start-up.



How to Perform a Megger Test:

Always use a 1000vDC megohmmeter set to 1000 volts

1. Strip both bus wires at one end of the cable (twist together), twist a small area of braid together into a pigtail as well.
2. Connect the megger's positive lead (+) to both cable bus wires that are twisted together (A).
3. Connect the megger's negative lead (-) to the cable pigtail braid (B).
4. Set the megger test voltage to 1000 vDC and energize the megger for 60 seconds. The needle should stop moving. A needle that bounces around indicates a short in the cable.
5. Record the insulation resistance value on the project notes in the Test Record Tables provided below.
6. Repeat Steps 1-5 at the THREE stages outlined above.

All insulation resistant values should be greater than 1000 megohms. Readings below 1000 megohms usually indicate that the electrical insulation of the heating cable has been compromised. Check the heat cable for signs of physical damage between the braid and the heating element. Small cuts or scuff marks on the outer jacket will not affect the megger reading unless there is penetration through the braid and dielectric insulation jacket. Testing should be performed yearly. A history of resistance readings can be useful in spotting moisture ingress into the cable.

Test Record Tables

Use these tables to record your megger test results for every section of cable installed. Test notes can also be recorded on the 'Project Notes' page near the end of this manual.

Cable One			
	Test One	Test Two	Test Three
Test Voltage			
Megger Value			
Date Performed			
Performed By			

Cable Three			
	Test One	Test Two	Test Three
Test Voltage			
Megger Value			
Date Performed			
Performed By			

Cable Two			
	Test One	Test Two	Test Three
Test Voltage			
Megger Value			
Date Performed			
Performed By			

Cable Four			
	Test One	Test Two	Test Three
Test Voltage			
Megger Value			
Date Performed			
Performed By			

Note: Always perform additional tests after any maintenance or repair work has been done on or around the heat cable system.

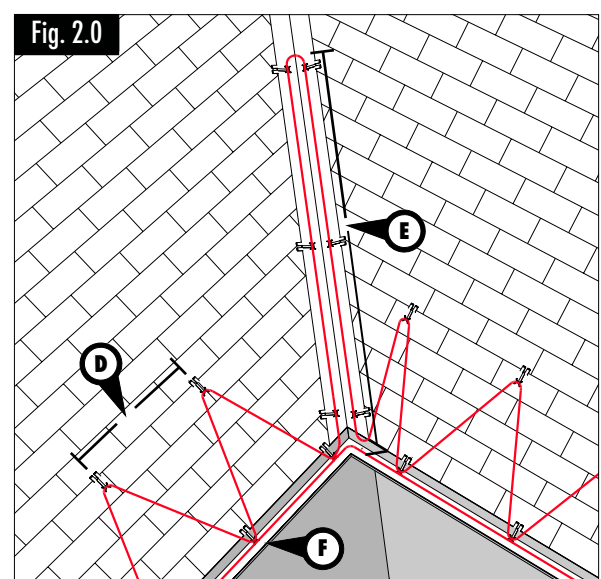
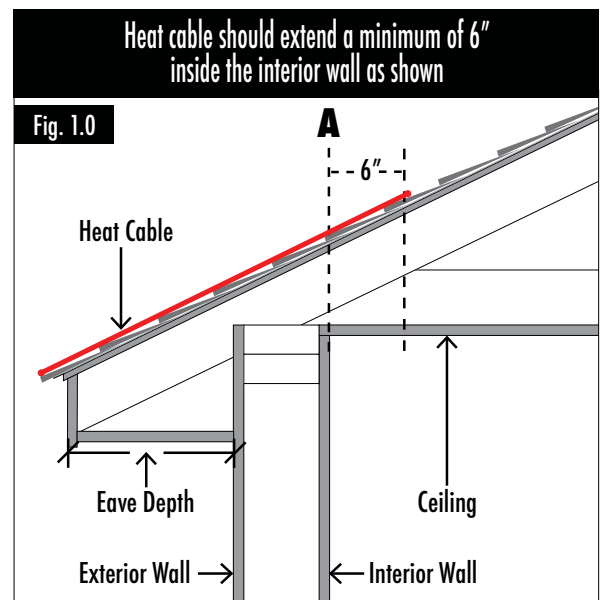
2.2 ROOF & GUTTER DE-ICING SYSTEM INSTALLATION

PREPARE FOR INSTALLATION

1. Verify that the source voltage corresponds to the heating cable rating printed on the cable jacket.
2. Make certain gutters and downspouts are cleared of debris and leaves.
3. Plan your installation and double check your measurements to ensure you have chosen the right cable length for your application. Think through the best path for your cable pattern, factoring in variables such as downspout and power source locations. Some installers use chalk to mark out clip locations prior to clip installation to ensure proper spacing. The cable starting point should not be near any entrance areas, sidewalks, etc. to avoid damage caused by people or equipment. If an electrical outlet already exists in an appropriate location near the eave that is an ideal place to start the cable installation.
4. Check the cable prior to installation for any signs of mechanical damage such as kinks or cuts or gouges through the outer jacketing.
5. Perform a megger test (per section 2.1) to verify proper cable operation **BEFORE YOU BEGIN INSTALLING CABLE**. You will perform another megger test after installation to verify no damage has occurred to the cable during installation. It's imperative to record these megger test results to maintain your warranty. Use the 'Test Record Tables' on page 6 to record your test values.

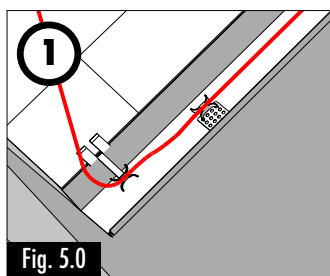
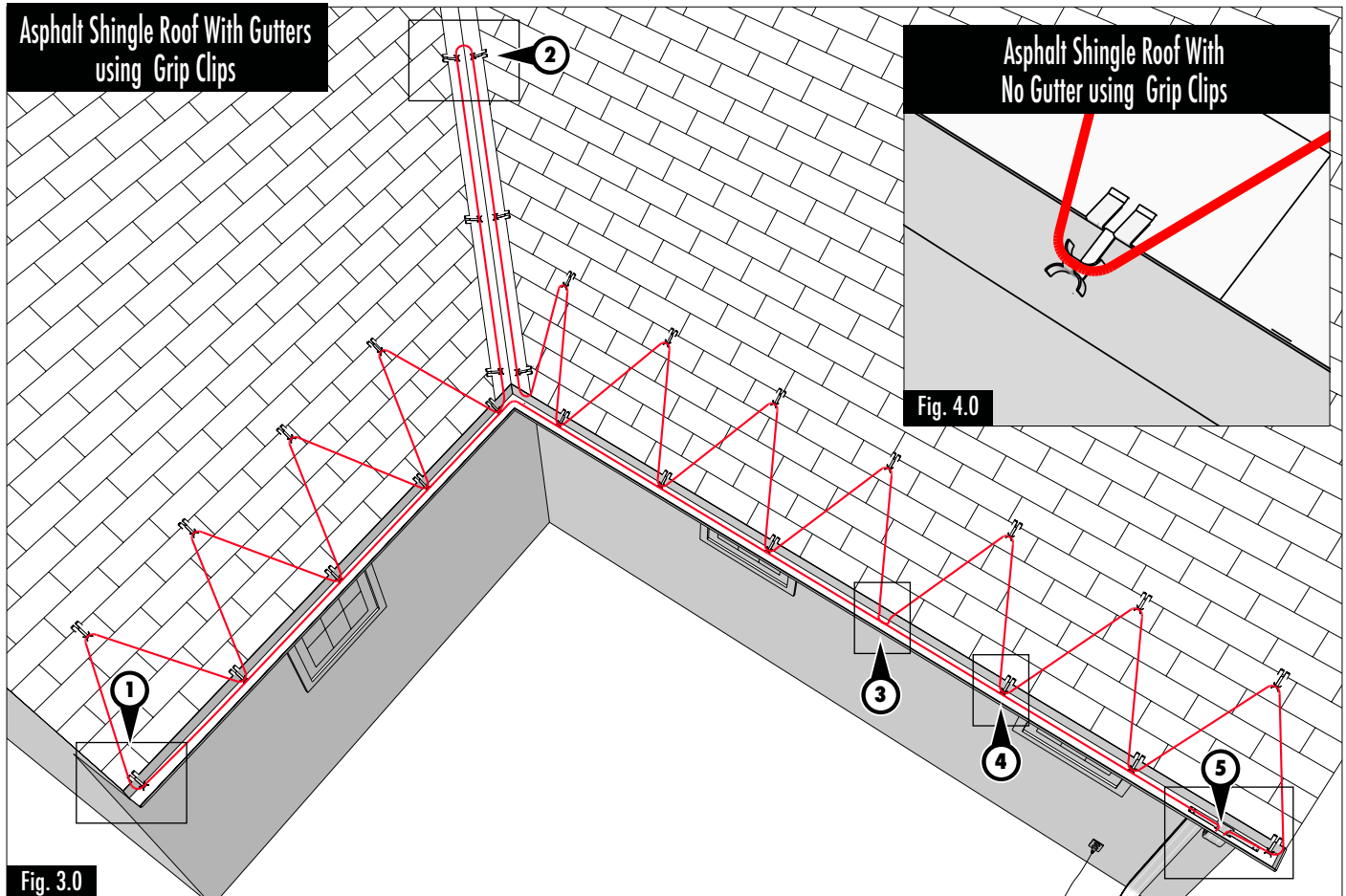
INSTALLING HEATING CABLE ON SLOPED ROOF

1. The top of the serpentine installation pattern (the 'peaks' of the cable pattern) should extend at least 6" beyond the intersection of the exterior wall below (Area 'A' in Figure 1.0, right)
2. Work your way across the eave by weaving the heat cable between your roof clips, which are installed roughly 24" apart from peak to peak ('D' in Figure 2.0, right). You may elect to compress that spacing under certain circumstances but keep in mind you will need more cable length to accommodate that change.
3. **Valleys:** Run the cable approximately 6 feet up valleys. You may elect to run the cable up further on lower sloped valleys. Remember, the NRCA currently dictates that no fasteners should be driven through the valley flashing within 6" of the centerline. See 'E' in Figure 2.0, right.
4. On areas without gutters, use Grip Clips to create a drip loop (Figure '4.0, page 8). On areas with gutters, you may install a single Grip Clip, point 'F' in Figure 2.0 or you may use no roof clips on the bottom of the pattern and use a heavy-duty UV resistant cable tie to loosely connect the bottom loop of the cable to the heat cable running along the bottom of the gutter (Figure 7.0, page 8).
5. Radiant Solutions Company offers a wide variety of clips for securing heat cable to just about any surface. Please consult our list of accessories on page 16 .
6. **Gutters:** Use a single run of heat cable in gutters that are 5" wide (or smaller) and two runs of cable in gutters 6" or larger. Use either downspout hanger brackets or a CableGuard where heat cables drop into downspouts to protect the cable from cuts and abrasions from sharp gutter edges and screws at that location (Figure 8.0, page 8). Use UV resistant cable ties to secure cable to downspout hangers. If a downspout is in the middle of a gutter, loop the cable down and back up. Use CableGuard to protect any areas of exposed heat cable where it exits the downspout. Where the cable enters a buried drain from the gutter system, install the cable along the entire length of the drain you wish to keep flowing in freezing conditions.

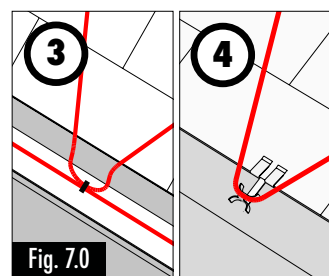


2.3 INSTALLING SELF-REGULATING HEAT CABLE WITH GRIP CLIPS™

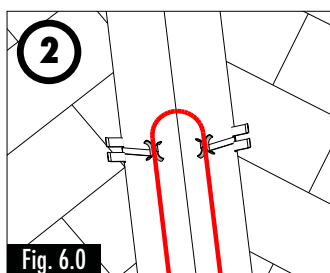
Grip Clips are suitable for use with HTP Self Regulating Heating Cable. They allow for the installation of heat cable on shingled roof systems without the use of tools or nails driven through the roof. The installation time is approximately four times faster than traditional nail-on clips. Grip Clips allow the installation of heat cable near the center of the valley, which is difficult or impossible with traditional roof clips as they require nails be driven through the valley flashing (NCRA recommends nails not be driven within 6" of the centerline of the valley). Grip Clips can be removed without damaging the roofing materials using a putty knife to bend up the top arms of the clip.



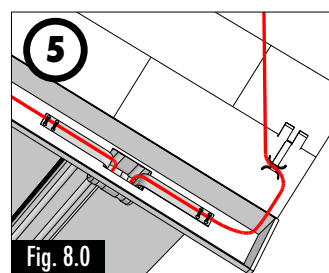
Use a Grip Clip off the end of the last course of shingles to place the heating cable into the trough of the gutter. You may also use a traditional roof clip glued to the bottom of the gutter as shown here to secure the cable to the gutter.



An alternate method to using Grip Clips on the bottom edge of the shingle is to bend the cable down into the gutter and join it with a UV resistant cable tie to the heat cable running in the gutter.

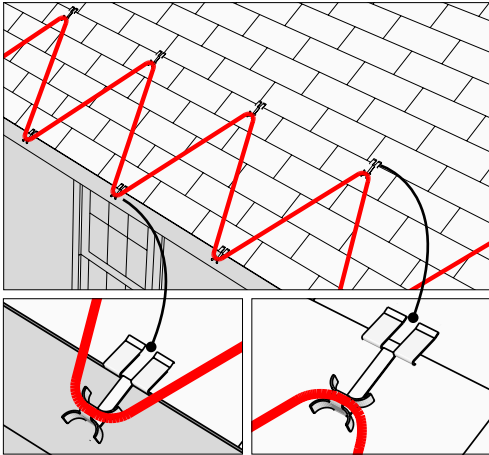


Grip Clips allow for the installation of heat cable near the center of the valley flashing because no nails are required for installation. Nails should never be driven within 6" of the center of the valley under any condition.



Grip Clips can be used creatively to secure cable to the roof in any location. They can also be pushed onto the side of a shingle to run heat cable horizontally.

2.4 INSTALLING GRIP CLIPS ON ROOFS



Grip Clips are the preferred heat cable clip for installations on shingle roofs. Installations require NO tools and NO nails need to be driven into the roof. This greatly decreases installation time while also reducing the potential liability associated with using traditional nail-on clips. Grip Clips allow heat cables to be placed near the center of the valley which is impossible with nail-on roof clips due to nailing requirements. Additionally, Grip Clips can be easily repositioned or removed without damaging the roofing materials by simply bending up the top arms of the clip.

Uses:

The Grip Clip 325 can be used to install both self-regulating and constant wattage heat cable on asphalt shingle roofs on areas both with and without gutters. Use Grip Clip Models 625 and 875 for roofing materials between 3/8" and 3/4" thickness.

Grip Clip Installation Tips

1. To establish your Grip Clip locations, determine the best path for your cable pattern, factoring in variables such as downspout and power source locations. Some installers use chalk to mark clip locations prior to installation to ensure proper spacing.
2. Grip Clips can usually be installed by simply pushing the clip up onto the end of the asphalt shingle as shown* in Drawings A and B, right. If the glue strip between the asphalt shingles is quite bonded, use a putty knife as shown in Photo D to break the glue strip bond where you intend to insert your Grip Clip.
3. After the Grip Clip is pushed into position and is engaged into the asphalt shingle, lay the heat cable into the cradle area of the clip, as shown in Drawing C, and use your fingers to pinch the top half of the cradle down onto the cable.

* We recommend installing the Grip Clip on the double-thickness areas of the shingles.

Considerations

There are four robust aluminium barbs on the bottom of each Grip Clip body. Those barbs embed, or 'bite', into the asphalt shingle creating a semi-permanent anchor that can be used for many years (Figure 9.0, Below). Installing the Grip Clip on cold roofing can prevent barb engagement. Therefore, we recommend performing the installation before the roofing material becomes cold and hard. If cool weather installations are necessary, barb engagement can be promoted by quickly warming the shingle with a heat gun in the clip location. Another technique is to simply wiggle the Grip Clip back and forth after it has been pushed up into position to encourage the barbs to sink into the asphalt shingle.

Grip Clips can be removed by simply prying up on the upper, exposed arms until the pinching grip has been released from the shingle. The Grip Clip can then be safely slid off the shingle.

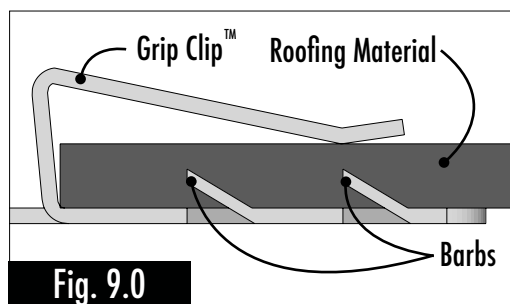
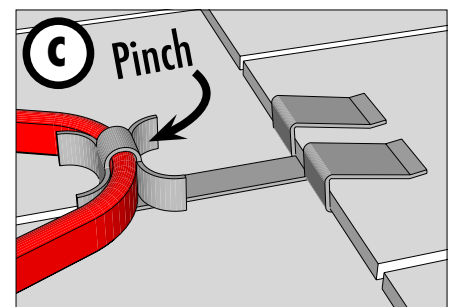
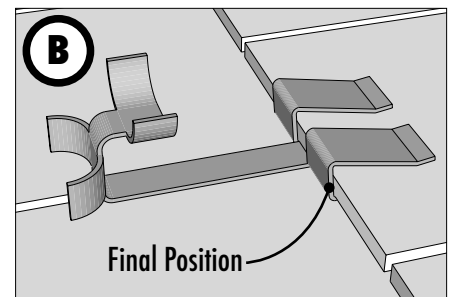
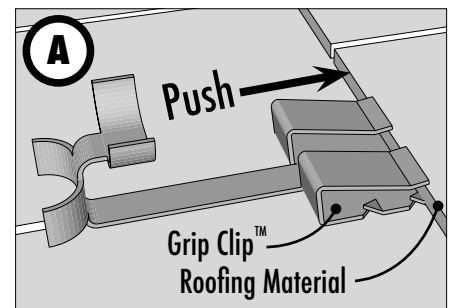


Fig. 9.0



PIPE HEATING SYSTEM DESIGN & INSTALLATION

2.5 GENERAL INSTALLATION GUIDELINES & WARNINGS

- It is imperative to conduct the series of Megger Tests (Insulation resistance tests) for pipe heat tracing installations detailed in section 2.1.
- HTP heating cable may be used on metal and plastic water pipes but not on flexible vinyl tubing, such as garden hoses, and is not intended for use inside any pressurized pipes or for use in classified hazardous locations. It may be used inside open ended water drain pipes.
- Keep all end seals, splices and other connections out of areas subjected to long-term submersion.
- Install heat cable with a minimum of 1/2" fire-resistant, waterproof thermal insulation on all pipe freeze applications.
- Never use on any pipes that may exceed 185°F (85°C).
- All actual lengths installed should be recorded.
- For the installation of this heating system use only components (wire, connectors, etc.) Manufactured by Radiant Solutions Company and/or listed for the U.S and certified for Canada that have suitable ratings for the application.

ADDITIONAL WARNINGS:

- Install HTP heating cables only in accessible locations; do not install behind walls, ceilings, or floors.
- The presence of the heating cables shall be made evident by the posting of caution labels. "Caution Electrical Heat" labels shall be posted at appropriate locations and/or at frequent intervals along the circuit. One label for every 10 feet (3 m) of pipe, alternating on either side of the pipe should be attached to the outside of the thermal insulation. Labels are provided in all required Radiant Solutions connection kits.
- Be sure all piping and equipment to be heat traced have been completely installed and pressure-tested.
- Ensure that all surface areas where the trace heater is to be installed are reasonably clean. Remove any dirt, rust, and scale with a wire brush.
- Remove oil and grease films with a suitable solvent.
- Inspect pipes for burrs, rough surfaces, or sharp edges before installation work begins. Remove if necessary.
- De-energize power sources before installation.
- Keep ends of heat cable and all kit components dry before and during the installation.
- It is important to check whether the marking on the heating cable and components complies with the project planning documents.

2.6 GENERAL REQUIREMENTS FOR FINISHING HEAT CABLE INSTALLATIONS

The following requirements apply to both roof and gutter de-icing and pipe freeze heat trace projects. Follow these guidelines:

Voltage Rating: Verify that the source voltage corresponds to the heating cable rating printed on the cable jacket and specified by the design.

Electrical Loading: Overcurrent devices should be selected according to the heating cable type, source voltage and circuit length to allow start-up at the designed ambient temperatures. The design specifies the size and type of overcurrent device.

Ground-Fault Protection:

1. Ground fault equipment protection is required for each circuit.
2. For typical installations (with TT and TN grounding systems), the means of protection must include a residual current protective device for each branch circuit.
3. For fixed-level earth/ground-fault circuit interrupters, a minimum 30 mA trip level is recommended. The preferred trip level for adjustable devices is 30 mA above any inherent capacitive leakage characteristic of the heater.
4. **WARNING:** To minimize the danger of fire from sustained electrical arcing if the heating cable is damaged or improperly installed, and to comply with RADIANT SOLUTIONS COMPANY requirements, 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 breakers.
5. Two copies of a caution notice indicating the presence of electric de-icing and snow-melting equipment on the premises are packed with this unit. On roof and gutter de-icing projects, one notice must be posted at the fuse or circuit-breaker panel and the other on or next to the on/off control for the cable unit. Both notices must be clearly visible. For pipe freeze prevention projects, the presence of trace heaters shall be made evident by posting of caution signs or markings at appropriate locations and/or at frequent intervals along the circuit. Apply warning labels along the pipe on the outermost surface of the thermal insulation.

2.7 INDUSTRIAL & COMMERCIAL PIPE HEAT TRACE CABLE LENGTH ACCORDING TO BREAKER SIZE

HTP self-regulating heat cables are UL Listed for Industrial and Commercial (Category KQXR) and Residential (Category KQYI) applications from voltages including 120v, 208v, 240v and 277v for ordinary locations.

MAXIMUM CABLE LENGTH ACCORDING TO CIRCUIT BREAKER SELECTION

Model Number	Start-Up Temp	120V				240V			
		15A	20A	30A	40A	15A	20A	30A	40A
3HTP	50°F (10°C)	327'	377'	377'	377'	654'	732'	732'	732'
	32°F (0°C)	262'	350'	377'	377'	525'	700'	732'	732'
	14°F (-10°C)	235'	313'	377'	377'	470'	627'	732'	732'
	0°F (-18°C)	200'	266'	377'	377'	400'	533'	732'	732'
	-20°F (-29°C)	173'	231'	346'	377'	346'	461'	692'	732'
5HTP	50°F (10°C)	200'	267'	302'	302'	400'	533'	604'	604'
	32°F (0°C)	166'	222'	302'	302'	333'	444'	604'	604'
	14°F (-10°C)	149'	198'	280'	302'	298'	397'	560'	604'
	0°F (-18°C)	126'	168'	252'	302'	252'	336'	504'	604'
	-20°F (-29°C)	110'	146'	220'	293'	220'	293'	439'	586'
6HTP	50°F (10°C)	175'	233'	279'	279'	349'	465'	561'	561'
	32°F (0°C)	150'	197'	279'	279'	295'	394'	561'	561'
	14°F (-10°C)	134'	177'	256'	279'	265'	353'	513'	561'
	0°F (-18°C)	113'	150'	226'	279'	226'	301'	451'	561'
	-20°F (-29°C)	99'	132'	198'	264'	198'	264'	395'	527'
8HTP	50°F (10°C)	154'	205'	243'	243'	307'	409'	482'	482'
	32°F (0°C)	131'	175'	243'	243'	262'	350'	482'	482'
	14°F (-10°C)	119'	159'	227'	243'	238'	318'	453'	482'
	0°F (-18°C)	104'	138'	207'	243'	207'	276'	415'	482'
	-20°F (-29°C)	92'	122'	184'	243'	184'	245'	367'	482'
10HTP	50°F (10°C)	125'	167'	207'	207'	250'	334'	410'	410'
	32°F (0°C)	110'	146'	207'	207'	220'	293'	410'	410'
	14°F (-10°C)	101'	134'	195'	207'	202'	269'	388'	410'
	0°F (-18°C)	90'	120'	179'	207'	179'	239'	359'	410'
	-20°F (-29°C)	81'	107'	161'	207'	161'	215'	322'	410'

2.8 ADDITIONAL ITEMS REQUIRED BUT NOT SUPPLIED FOR PIPE APPLICATIONS

- Ground-fault protected outlet (GFCI)
- Waterproof thermal insulation
- Fiberglass tape or aluminium tape

2.9 RESIDENTIAL PIPE HEAT TRACE CABLE LENGTH ACCORDING TO BREAKER SIZE

MAXIMUM CABLE LENGTH ACCORDING TO CIRCUIT BREAKER SELECTION

Model Number	Start-Up Temp	120V		240V	
		15A	20A	15A	20A
3HTP	50°F (10°C)	327'	377'	654'	732'
	32°F (0°C)	262'	350'	525'	700'
	0°F (-18°C)	200'	266'	400'	533'
	-20°F (-29°C)	173'	231'	346'	461'
	-40°F (-40°C)	152'	203'	305'	406'
5HTP	50°F (10°C)	200'	267'	400'	533'
	32°F (0°C)	166'	222'	333'	444'
	0°F (-18°C)	126'	168'	252'	336'
	-20°F (-29°C)	110'	146'	220'	293'
	-40°F (-40°C)	97'	130'	195'	259'
6HTP	50°F (10°C)	175'	233'	349'	465'
	32°F (0°C)	150'	197'	295'	395'
	0°F (-18°C)	113'	150'	226'	301'
	-20°F (-29°C)	99'	132'	198'	264'
	-40°F (-40°C)	88'	117'	176'	235'

* Per UL2049, Section 5.1, constructions without a cord and plug are not permitted for residential pipe applications. The flexible cord shall not be more than 6 feet in length and shall be terminated by a grounding type attachment plug.

* Per National Electrical Code (NEC), Clause 427.55 (B), cord and plug construction products are limited to 20A circuit breaker maximum.

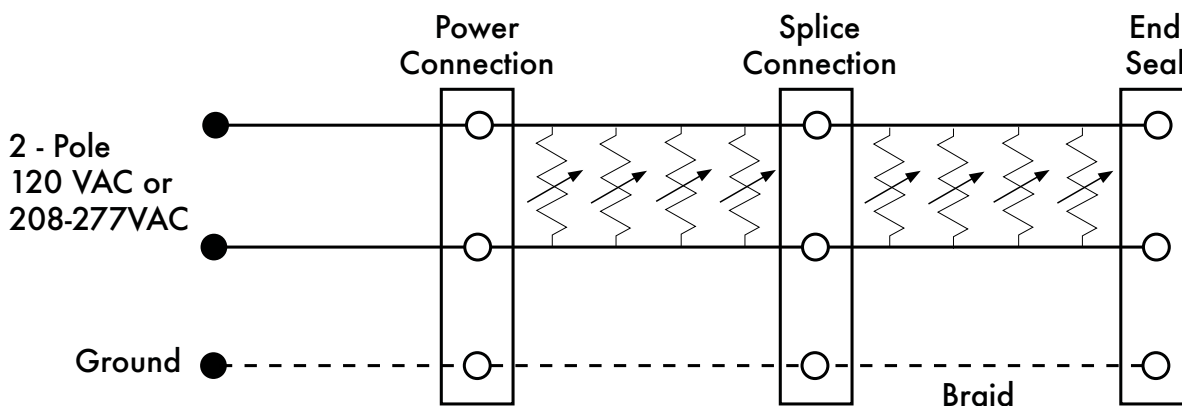
* PPK-319 plug-in power connection kit with equipment ground fault protection device is limited to 15A circuit breaker maximum and therefore shall not exceed maximum circuit length values given under 15A circuit breaker size in the chart above.

3.0 RESIDENTIAL PIPE TRACE APPLICATIONS: CIRCUIT LENGTH ADJUSTMENT FACTOR

CIRCUIT LENGTH ADJUSTMENT FACTOR

	3HTP-2	5HTP-2	6HTP-2	8HTP-2	10HTP-2
208V	0.969	0.957	0.942	0.925	0.920
240V	1.000	1.000	1.000	1.000	1.000
277V	1.054	1.065	1.076	1.088	1.120

3.1 EQUIPMENT DIAGRAM



Minimum square meters of Lead wire: 1.5 sq for less than 2,000W, 2.5 sq for More than 2,000W

3.2 HEATING CABLE SELECTION HELP

This chart is designed to speed selection of the appropriate wattage of cable when used for freeze protection. Find the diameter of pipe below and cross reference with the expected minimum ambient temperature for the recommended cable. For cables with rated output higher than 6W/ft, please contact Radiant Solutions Company.

CHART CONSIDERATIONS

- This chart is based on straight runs of cable on pipe. Spiral applications are approved but not suggested.
- Heat loss is based on 40°F maintenance temperature and insulation of k=0.25 at 50°F
- Non-metallic pipe heat losses are based on using aluminium foil tape for improving heat transfer.
- For larger pipe sizes, consult Radiant Solutions Company design advice.

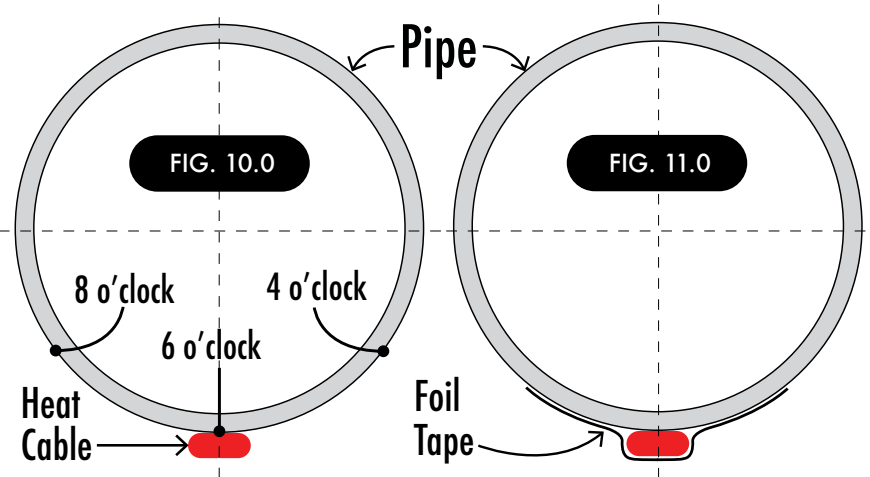
Metal Pipe				
Insulation Thickness	Pipe Diameter	Minimum Ambient Temperature		
		0°F (-18°C)	-22°F (-30°C)	-40°F (-40°C)
1/2"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
1"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
1 1/2"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
2"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				

Non-Metallic Pipe				
Insulation Thickness	Pipe Diameter	Minimum Ambient Temperature		
		0°F (-18°C)	-22°F (-30°C)	-40°F (-40°C)
1/2"	1/2"	3HTP/6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 2*6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
1"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
1 1/2"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				
2"	1/2"	3HTP or 6HTP		
	3/4"			
	1"			
	1 1/2"	2*3HTP or 6HTP		
	2"			
	2 1/2"			
	3"	3*3HTP or 2*6HTP (and/or thicker insulation)		
	4"			
6"				

Factor the following additions to cable length calculations: Valves or spigots, add 1 foot, Pipe supports & flanges, add 2 feet, PPK-319 Power Connection Kit, add 1 foot, TSK-723 Tee & Splice Kit, add 2 feet for splice connection and 3 feet for tee connection.

3.3 PIPE HEAT TRACE CABLE INSTALLATION

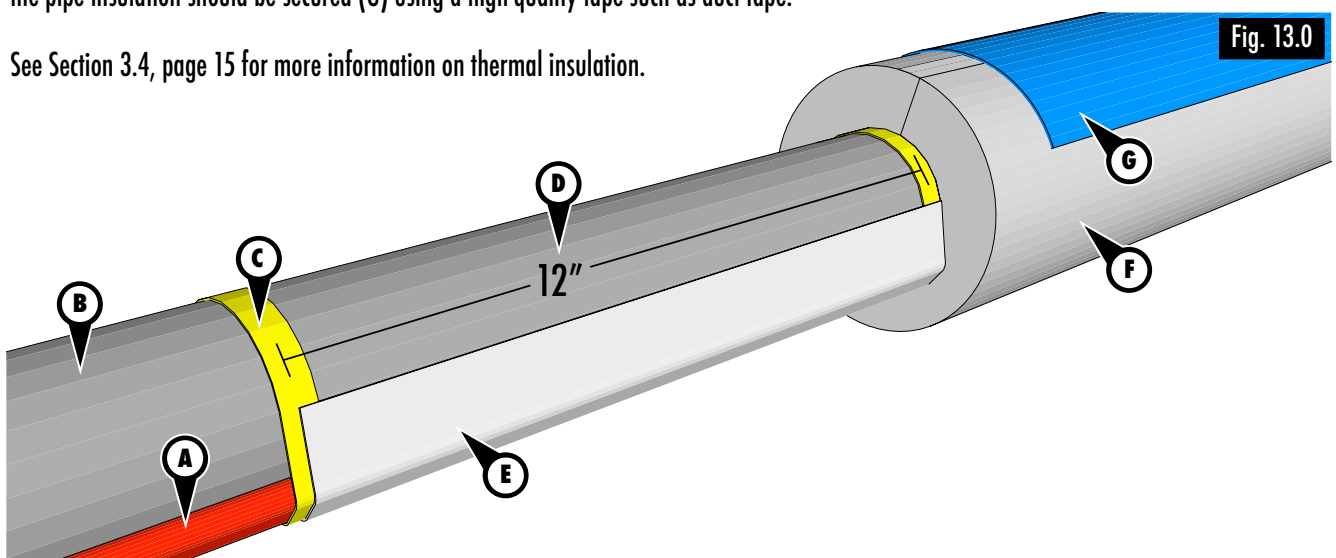
- Make sure all piping to be traced is dry.
- Install cable straight or spiral pattern and on all valves, flanges, etc., as shown in Figure 14.0, page 15.
- There is not an exact pattern that must be followed for valves, spigots or tees. Simply wrap the cable in a way that provides adequate coverage to prevent freezing.
- For straight tracing, install single runs of heating cable on a lower half of the pipe at the 6 o'clock position as in Figure 11.0.
- For double runs install the cable at the 4 o'clock and 8 o'clock positions, as in Figure 10.0.
- Minimum cable to cable on center spacing for spiral wraps is 6" (15 cm) at 5°F (-15°C)
- Fasten heating cable to the pipe at 1-foot intervals using fiberglass tape (RSC-420). Do not use vinyl electrical tape, duct tape, metal bands, or wire. The cable should be in direct contact with the pipe to promote efficient conductive heat transfer from the cable to the pipe.
- If excess cable remains at the end of the pipe, double it back along the pipe.
- For additional thermal performance you may elect to install cable using aluminium foil tape along the entire length of the cable installation (diagram 11.0, above). This helps maintain cable-to-pipe contact and reflect heat back into the pipe. This is particularly helpful on plastic pipes because they are not as thermally conductive. Be sure to keep the cable flat as you bend it during the application.
- Install drip loops in all cables and power cords running into outlets or junction boxes to prevent water from running directly into the boxes.



SUMMARY OF INSTALLATION

Here is a close-up of an ideal installation. Note that for the purpose of illustration we have shown one cable on a pipe of approximately 1" diameter, located on the 4 o'clock position. The cable in this illustration should be located at the 6 o'clock. The heat cable (A) is secured to the pipe (B) with glass cloth tape (C) approximately every 12" (D). There is a continuous strip of aluminium foil tape installed (E) over that assembly. While foil tape is not required, it is a good idea for reasons previously mentioned. Once the cable(s) is secured to the pipe you must install a layer of 1/2" standard pipe insulation minimum (F). You may install thicker insulation if you like to increase energy efficiency. Finally, the pipe insulation should be secured (G) using a high-quality tape such as duct tape.

See Section 3.4, page 15 for more information on thermal insulation.



NOW THAT THE CABLE IS INSTALLED ON THE PIPE, PERFORM THE SECOND MEGGER TEST AS OUTLINED IN SECTION 2.1. THIS TEST SHOULD BE PERFORMED BEFORE THE INSULATION IS INSTALLED AND THE VALUES SHOULD BE RECORDED IN THE TEST RECORDS TABLES, PAGE 6 .

3.4 THERMAL INSULATION INSTALLATION

BEFORE INSTALLING INSULATION

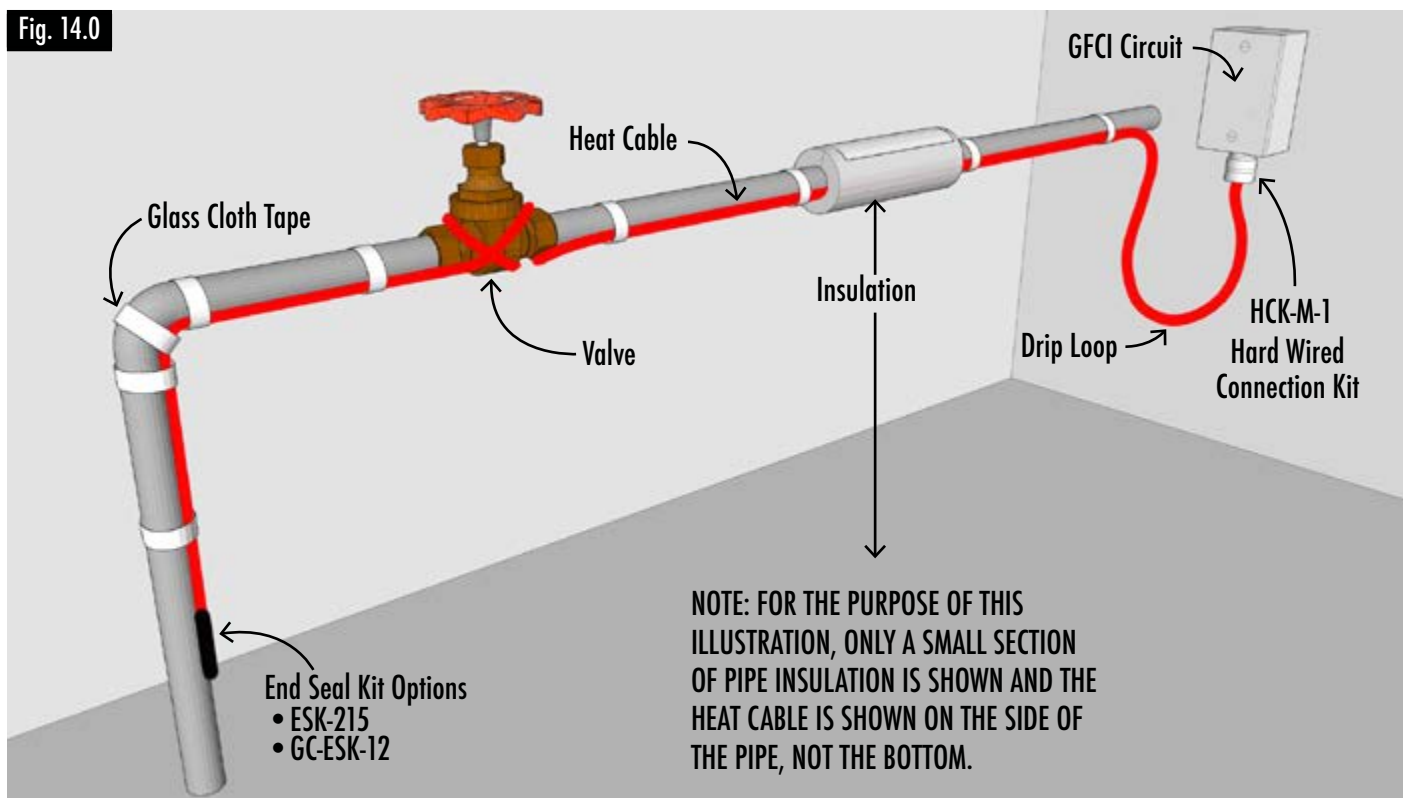
- Before installing thermal insulation be sure the heating cable is free of mechanical damage. Damaged cable must be replaced.
- Visually inspect the heating cable and components for correct installation.
- Perform IR testing (refer to Section 2.1), prior to covering the pipe with thermal insulation.
- Properly installed and well-maintained thermal insulation is critical to the performance of the trace heating system. Without proper insulation, heat losses are generally too high to be offset by a conventional heat tracing system and pipes may freeze.
- Properly insulate all heat sinks, including pipe supports, hangers, flanges, and in most cases, valve bonnets.
- Install the insulation on the piping as soon as possible to minimize the potential for mechanical damage after installation.

INSTALLING INSULATION

- Install 1/2" thick (minimum) foam pipe insulation. Do not use fiberglass insulation as this does not have enough R-value and is not well suited for pipe freeze applications. You may use 1" thick insulation to achieve freeze protection down to -40°F. Do not leave any areas of heat cable exposed (without insulation). Cable should be in direct contact with the pipe along the entire length of the installation.
- The presence of trace heaters shall be made evident by posting of caution signs or markings at appropriate locations and/or at frequent intervals along the circuit. Apply the provided Warning labels along the pipe on the outermost surface of the thermal insulation.
- Perform IR testing (refer to Section 2.1), prior to covering the pipe with thermal insulation.
- Figure 14.0 shows partially insulated pipe to visually show how the heating cable is installed. You must fully insulate all traced areas of pipe.



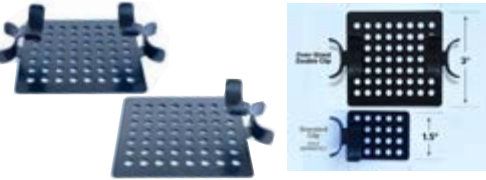






NOW THAT THE INSULATION IS INSTALLED OVER THE CABLE ON THE PIPE, PERFORM THE THIRD MEGGER TEST AS OUTLINED IN SECTION 2.1. RECORD ALL TEST VALUES IN THE TEST RECORD TABLES ON PAGE 6.

3.5 PIPE HEAT TRACE DIAGRAM



3.6 ROOF AND GUTTER DE-ICING INSTALLATION ACCESSORIES

The following accessories are suitable for use with HeatTapePro™ heating cables. Use this guide to determine the most appropriate accessories for your installation. Additional installation accessories and detailed installation instructions are available at www.radiantsolutionscompany.com.

Accessories	For Use On:	Photos
Grip Clip: IDP-325, 625 & 875 Grip Clips work with a huge variety of roofing materials including asphalt shingles, wood shakes/shingles and synthetic tile/shakes. The Patented Grip Clip is designed to install in about 5 seconds, withstand 40lbs of pull force and never threaten roof warranties. Sold in boxes of 25 in three sizes. <small>PATENTED</small>	<ul style="list-style-type: none"> Asphalt shingles of all varieties Wood shakes from .25" to .75" thick Synthetic shakes from .25" to .75" thick Certain panel metal roof systems 	
Corrugated Roof Clip: JS-222 The body of the JS-222 is shaped to accommodate the vast majority of standard North American panel metal roof profiles. Use the JS-222 roof clip to install heat cable on a variety of standard metal roofs including both corrugated and trapezoidal panels. The included butyl pads (MKS-1022-1) seal around the mounting screws to significantly reduce the likelihood of water ingress. Sold in boxes of 10. <small>PATENT PENDING</small>	<ul style="list-style-type: none"> Trapezoidal metal panel roof systems Corrugated metal panel roof systems 	
Jumbo Glue-Down/Nail-Down Clips: DDK-719 The DDK-719 Heat Cable Roof Clip can be used to secure self-regulating heat cable on a variety of roofing materials. With 200% more active surface area than traditional roof clips, the 3"x3" DDK series offers twice the holding power in adhesive-based applications and is ideal for situations where high bond strength is desired. The DDK-719-1 has one cradle and the DDK-719-2 has two cradles. Sold in boxes of 10. <small>PATENT PENDING</small>	<ul style="list-style-type: none"> Rubber membrane TPO and PVC membranes Metal roofs Asphalt shingles of all varieties Wood shakes/shingles Synthetic shakes/shingles 	
Standing Seam Saddle Clips: GVG Series The GVG clip comes in three sizes and is designed to provide a strong attachment point for the installation of heat cable on most common standing seam metal roofs. The GVG series will fit standing seams between 1/8" to 5/8" and when coupled with the optional MKS-1022-2 butyl pads provide an economical method of heat cable installation when compared with alternatives on the market. Model numbers: GVG-325-10 (3/8" ID), GVG-50-10 (1/2" ID) and GVG-625-10 (5/8" ID). GVG clips are sold in boxes of 10. <small>PATENT PENDING</small>	<ul style="list-style-type: none"> Standing seam metal roofs 	
StickyClips: LEO-215 The revolutionary StickyClip® is used for installing heat cable on smooth surfaces including membranes, metal roof systems, gutters, skylights, solar panels and more. The StickyClip® requires no fasteners, installs in seconds and can be removed in the future without leaving damage behind. Two standard sizes, LEO-215-1 (1.75"x1.75") and LEO-215-2 (1.75"x3.25"). Sold in boxes of 10. <small>PATENTED</small>	<ul style="list-style-type: none"> Rubber membrane TPO and PVC membranes Metal roofs 	
Multi-Purpose Clips: MPC-325 The MPC-325 uses the patented body of the revolutionary Grip Clip™ in combination with a slotted loop and provided UV-resistant zip tie to allow for unlimited cable orientations on a variety of materials including asphalt shingles and metal flashings. This clip is a true problem solver. Sold in boxes of 10 clips with 10 zip ties. As with the standard Grip Clip™, the MPC-325 installs in seconds and requires no penetrations into the roofing system. <small>PATENT PENDING</small>	<ul style="list-style-type: none"> Asphalt shingles up to 3/8" thick Metal flashings 	
Cable Guard: CG-24 The CG-24 Cable Guard is designed to provide protection against a variety of common threats to heat cable installations including sharp metal edges, screws, abrasion and more. CG-24 is sold in 24" sections and works on cables from 8-13mm wide x 5-7mm thick. Use anywhere heat cable is exposed to potential damage to prevent premature system failure. CG-24 is frequently used in place of standard aluminium downspout hangers due to ease of installation.	<ul style="list-style-type: none"> Self-regulating heat cable 8-13mm wide x 5-7mm thick 	
Sized Butyl Pads: MKS-1022 Our MKS Series butyl pads are sized specifically to accommodate the footprints of our nail-down/screw-down clips including the GVG Standing Seam Saddle Clips, the DDK Jumbo Clips and the classic Nail-down Clip. The MKS-1022-1 is 1.5"x2" and the MKS-1022-2 is 3"x3", both come in boxes of 10 and are about 1/8" thick.	<ul style="list-style-type: none"> Roofs of any material All gutters and downspouts 	
Downspout Hanger: IDP-115 Shield your cable from the sharp-edged transition from gutter to downspout and hold your heat cable in place for maximum effectiveness in maintaining a melted pathway. The IDP-115 is made of non-corrosive aluminium and comes with 4 UV resistant cable ties. Approximate dimensions: 1" x 12".	<ul style="list-style-type: none"> Gutters and other areas 	

3.7 VISUAL ACCESSORY INSTALLATION INDEX

Here are some common roofing systems with compatible clip recommendations. Numbers on the roof material photos indicate the common clips and supplies used for heat cable installation. Note that butyl pads and sealants, such as the ones included in this section, can be used on every roof system shown here.

STANDING SEAM		12 14 16 10	13 15 7 5	
BATTEN SEAM			7 8 10 5	
CORRUGATED		11 9		
R-PANEL			11 9	
FLAT SEAM		7 8 10 5		
ASPHALT SHINGLE			1 2 17 10	7 8 9 6
CEDAR ROOF		2 3 18		
SLATE				18 7 8
SYNTHETIC ROOF		2 3 18		
FLAT ROOFS				7 8 10 5



Consult the installation manuals and other available RSC technical documents to help you decide of the right choice for your project

CLIP & ACCESSORY INDEX

1. GripClip™ .325"
2. GripClip™ .625"
3. GripClip™ .875"
4. Cable Separator Clip
5. StickyClip™
6. Multi-Purpose Clip .325"
7. Jumbo Glue Down - Double Cradle
8. Jumbo Glue Down - Single Cradle
9. Small Butyl Pad 1.5"x 2"
10. Large Butyl Pad 3"x 3"
11. Corrugated Roof Clip
12. SR-S5 Clip
13. S5 Clamp
14. Saddle Clip .325"
15. Saddle Clip .50"
16. Saddle Clip .625"
17. Nail-On Roof Clip 1.5"x 2"
18. Slate Roof Clip 2"x 16"

The most common problem in a heat tracing system is a circuit breaker tripping. This type of fault can occur in two ways: The circuit trips instantaneously upon power-up, or the circuit trips after a few seconds of operation. It is critical to observe the trip time, as this clue helps to inform the troubleshooting process. See our TroubleShooting Guide for additional solutions to common issues.

Circuit trips UPON power-up:

Circuit trips upon power-up are usually caused by a short circuit to ground somewhere in the system. The problem may be with the cable itself, the power connection, or the power wiring.

Step 1. Ensure that the cable's conductive core material and wires is not in contact with the metal grounding braid or other metal parts of the junction box. Check all power connections, splices, tee boxes, and end seals to ensure that the conductive core material is isolated from all metal parts, including the grounding braid. If the conductive core contacts metal, make the necessary repairs and run megger checks until the insulation resistance is above the manufacturer's minimum requirement. While checking junction boxes and end seals, be sure that all connections are dry, because wet junction boxes or end seals can cause megger tests to fail.

Step 2. If no metal parts or braiding are found to be in contact with the conductive core and the insulation resistance is still too low, isolate each piece of heating cable on the circuit and run a megger check on each independently. This can help to identify an area of physical damage to the heating cable that is causing the conductive core to short to the metal grounding braid on the pipe. Inspect the cable system and look for obvious signs of damage on the sections that test low. If there are no obvious signs of damage, it may be best to remove and replace the section of cable that is testing low. Longer sections can be segmented and tested separately to isolate the fault. Once the fault is isolated, remove the offending section of cable and replace it with new cable. Conduct a megger test on the new installation to verify that the cable is good.

Step 3. If the heating cable sections test okay, run another megger check on the power wiring that runs from the cable junction box back to the heat tracing panel. If the power wiring has a short, remove it and replace it with new wire.

Circuit trips AFTER power-up:

Circuit trips after a few seconds of operation usually indicate a problem with the start-up current generated by the self-regulating heating cables. Possible causes may be:

- ① The start-up temperature is lower than the designed start-up temperature
- ② The installed circuit length is too long for the size of the breaker
- ③ The ground fault current trip level may be set too low (if it is adjustable).

Check the circuit breaker rating and our maximum circuit length recommendations for your start-up temperature vs. the installed length. In many cases, the cable circuits are to be started at a set temperature for freeze protection. If, for example, the cable is run to the maximum circuit length for a start-up temperature of 40°F but the ambient temperature is actually lower, the breaker will experience a nuisance trip until the cable's conductive core is warm enough to draw acceptable current to the breaker. This can be solved temporarily by flipping the circuit breaker on and off until the cable warms up. In rare circumstances this can damage the circuit breaker so use this technique at your own risk. If the circuit length is in excess of the maximum length for the manufacturer's start temperature and breaker size recommendation, then the circuit length must be reduced. Dividing the cable section into two or more circuits that fall within the HTP recommended lengths can solve this problem.

If the breaker sizing and start-up temperatures conform to our specifications, check that the installed cable length is within the maximum circuit length limits. If a circuit is too long, divide it into multiple shorter circuits that satisfy the run length, breaker size, and start-up temperature specifications.

Cable Temperature is Low

If the heating cable temperature is low, the most common culprits are:

- ① A thermostat is not wired correctly or set correctly
- ② The cable is not connected to power
- ③ The cable is connected to the wrong voltage

When checking the voltage, compare the measured values to the cable specifications. For example, a 240v cable powered at 120v will not maintain the correct temperature. Make adjustments as necessary to correct any voltage issues.

HeatTape^{PRO} TROUBLESHOOTING GUIDE

Here are some handy tips for diagnosing common problems along with the suggested solutions. Please run through this guide before calling for technical support. HeatTapePro™ is a heavy-duty product designed to last many years under demanding conditions and 95% of the calls we receive about 'failed cables' relate to either: 1) Issues involving the power supply, and 2) Damage to the heating cable. Manufacturing defects in HeatTapePro™ are exceedingly rare.

Issue	Possible Causes	Remedies
Part of cable not heating	1. Unheated area is damaged Cut in jacket is letting water into cable, cable is kinked, cable is crushed	A. Perform continuity test: Call Radiant Solutions for guidance B. Replace cable
Entire cable not generating heat	1. No or low power supply voltage	A. Check for tripped or damaged circuit breaker B. Check for damaged or faulty outlet
	2. Cable is damaged Cut in jacket is letting water into cable, cable is kinked, cable is crushed	A. Find damaged section of the heating cable and repair (if possible) B. Perform insulation resistance test with 1000vDC megometer C. Replace cable
Circuit breaker tripping	1. Circuit is overloaded	A. Remove other devices from circuit (don't have cable on a shared circuit) B. Too much cable footage on the circuit. Reduce footage of cable on circuit C. Power up cable when temperatures are above freezing D. Replace breaker if existing is undersized E. Replace circuit breakers and feed wiring per Electrical Code to accommodate heating cable footage
	2. Short circuit/damaged cable	A. Check entire cable for damage; Repair or replace cable B. Check circuit for damage; Repair as needed C. Perform insulation resistance test with 1000vDC megometer per Radiant Solutions Company recommendations D. Visually inspect entire length of heating cable for damage, which is often caused by animals or at locations such as downspout openings
	3. Defective circuit breaker	A. Replace circuit breaker
Frozen pipe	1. Cable not energizing	A. See causes and remedies above
	2. Thermal insulation issue	A. Check for damaged or wet thermal insulation - pipe must be 100% covered B. Replace or augment insulation to boost R-value
	3. Inadequate cable coverage	A. Add more heat cable: Certain circumstances, such as pipes larger than 1" in diameter, pipes with low heat conductivity (plastic) or extreme environments may require the addition of a second line of cable to provide protection against freezing
Low insulation resistance test results	1. Damaged cable or connections	A. Replace damaged heating cable. Do not try to repair a damaged area of heating cable.
Snow is covering the heat cable	1. Excessive snowfall in a short period of time	A. This is referred to as 'iglooming' and it is NOT an indication of a problem. The purpose of the heating cable is to create melted pathways through snow and ice. If the cable has even a very small margin of melted pathway through the surrounding snow and ice, the cable is operating properly
GlowCap on the end of cable not lighting up but cable is warm	1. Defective LED	A. The LED is a convenience feature and is not required in order for the cable to operate properly. If the cable is melting pathways through snow and ice there is no corrective action to take
Cable is damaged	If your cable has sustained brand new damage and you are certain no water has gotten into the cable, you can purchase our Tee & Splice kit (TSK-723) to repair the area. If the damaged area has been exposed to any moisture, a repair will not be effective and you will have to replace your heat cable.	
Cable is not HOT	HeatTapePro™ will never get hot to the touch. It is meant only to get warm. If the cable feels warm it is working!	

HeatTape^{PRO}

ICE DAM PREVENTION SYSTEM

R **RADIANT**
SOLUTIONS COMPANY

1515 5th Street South, Hopkins, MN 55343

Phone: 877-387-4218 radiantsolutionscompany.com