THE SOLUTION



SERGE BARIL HEATTRAGING CABLES

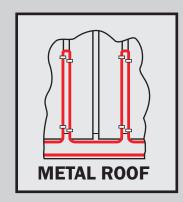


FOR ROOFS - GUTTERS & DRAINS



Serge Baril self-regulating heat tracing systems provide roof & gutter de-icing in a wide range of industrial, commercial and residential applications.







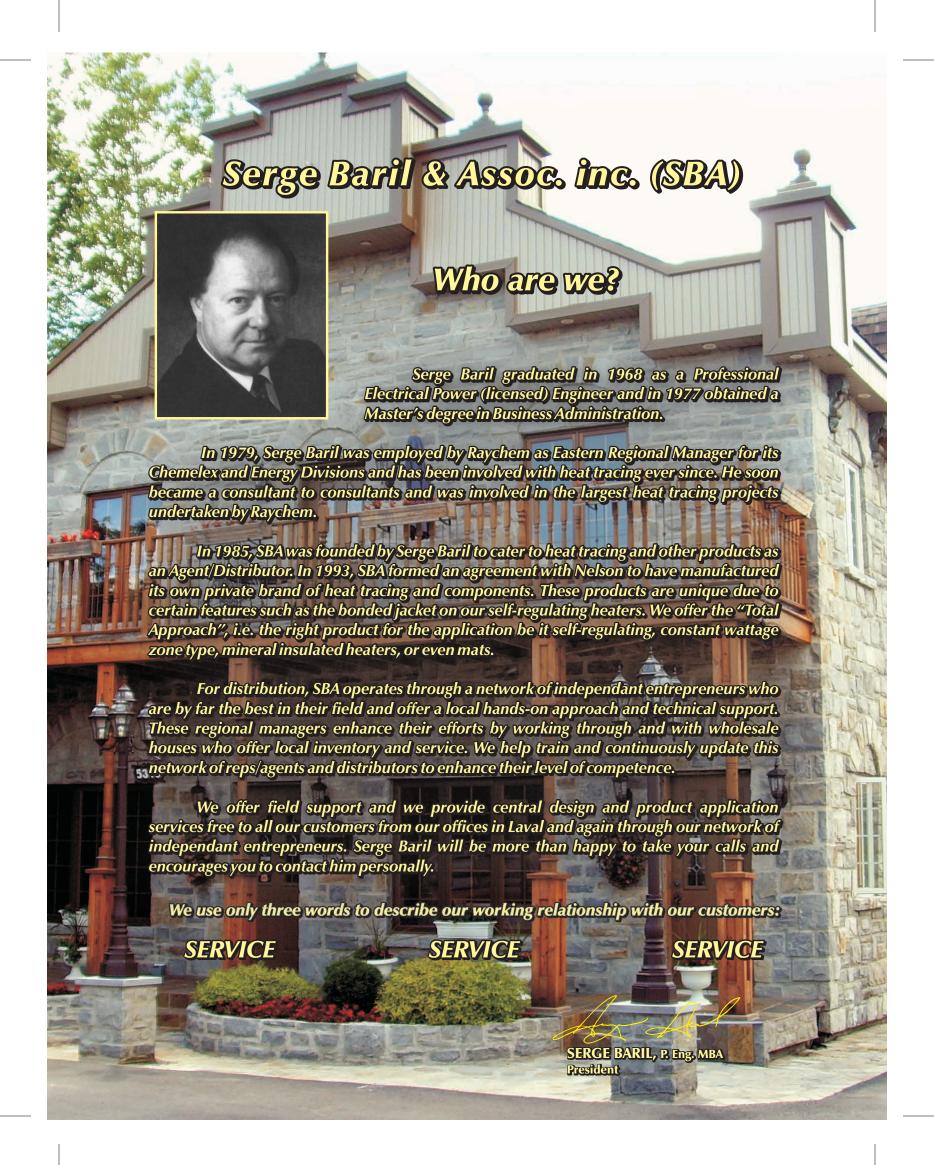


TABLE OF CONTENTS

THE PROBLEM	_ 4
Explanation	_ 4
THE SOLUTION	_ 4
CABLE SELECTION	_ 5
SHINGLE ROOF	_ 6
Components	_ 10
Controls	_ 10
METAL ROOF	_ 12
FLAT ROOF	_ 13
DRAINS	_ 13
INSTALLATION	_ 14
TESTING	_ 15
WARRANTY	16

OTHER TYPICAL APPLICATIONS:

- Pipe & tank freeze protection.
- Maintain temperature in product pipelines.
- Snow melt using high wattage MI cables.

- Hot water systems.
- Sprinkler freeze protection.
- Comfort and space heating.
- In-Pipe freeze protection for potable water using our FPS family of heaters.

NOTE: Please consult SBA for the appropriate publication for your application.

THE PROBLEM:



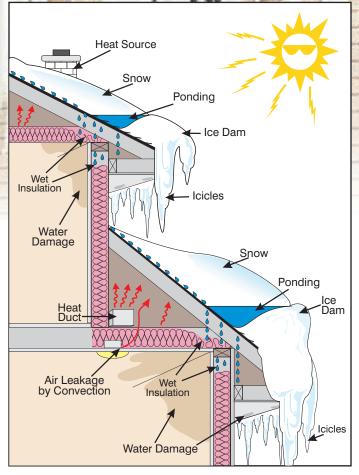
EXPLANATION

In cold weather, heat from the house rises and eventually heats the attic area. Ceiling insulation, while needed to reduce heating requirements in the house, does not prevent but only delays this build-up of heat in the attic. Snow on the roof acts as a good insulator creating a temperature differential between the attic and the outside. The temperature of the attic increases compared to the outside temperature. This allows the underside of the snow on the roof to gradually melt and form water droplets. These will flow down the roof forming ice dams by freezing as they reach the unheated cold roof edge (over the eaves, outside the walls). These water droplets may eventually freeze in the gutters, climb over the ice-filled gutter and form major, dangerous icicles.

ICE FORMATION ON THE EDGE OF THE ROOF

Leading to

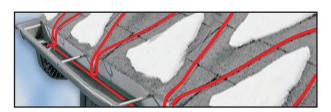
WATER INGRESS IN THE HOUSE



As this ice builds-up, it creates a bigger dam. The ice forms a barrier and melted water accumulates behind this ice dam and may leak inside the wall space, under the shingles and into the building, causing water damage.

"The roof is leaking!" ... not really, what has happened is the ice build-up stopped the flow of water down the roof and allowed it to leak into the house.

THE SOLUTION:



RELATIVELY EASY-

JUST KEEP THE FLOW OF WATER DIRECTED OFF THE ROOF.

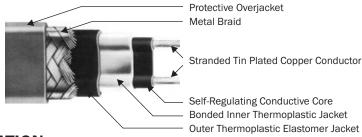
KEEP THE PATH OPEN!

Serge Baril roof & gutter de-icing systems offer the best way to help prevent ice dams and icicles using a self-regulating heating cable that provides a continuous drain path for melted ice and snow from the roof through the gutters and downspouts to the drain.

CABLE SELECTION

Serge Baril CCA or FPS heating cables provide a solution for ice dams that can build up and damage buildings and gutters. The self-regulation feature of the cables provides additional benefits:

- Lower energy consumption the cable reduces its power output as the ice and snow disappear.
- Fail safe temperature limit the cable cannot overheat and melt or damage temperature sensitive roof coatings.



PRINCIPLE OF OPERATION

The parallel bus wires apply voltage along the entire length of the heater cable. The conductive core provides an infinite number of parallel conductive paths permitting the cable to be cut to any length in the field with no dead or cold zones developing. The heater cable derives its self regulating characteristic from the inherent properties of the irradiated cross linked conductive polymer core material. As the core material temperature increases, the number of conductive paths in the core material decreases, automatically decreasing the heat output. As the temperature decreases, the number of conductive paths increases, causing the heat output to increase. As the cable self-regulates its heat output, it provides for the efficient use of electric power, producing more heat when and where it is needed, also limiting the maximum sheath temperature of the cable. Four jackets provide extra dielectric strength, moisture resistance, protection from impact or abrasion damage, and flame retardancy. The inner thermoplastic jacket is extruded over and bonded to the core material to prevent moisture penetration and wicking along the core. A waterproof thermoplastic elastomer outer jacket is then extruded over the inner jacket for dielectric protection and additional moisture resistance. A tinned copper braid is installed over the second jacket providing a continuous ground path and mechanical protection. A flame retardant, UV stabilized polyolefin overjacket on the CCA cables is then extruded over the braid. On the FPS heaters, the outer jacket is a fluoropolymer to provide more corrosion protection.

Both 6CCA and 5FPS self-regulating gutter and roof de-icing cables are rugged, industrial grade heaters that have a bonded inner jacket for enhanced moisture and dielectric protection. All heating cable components are UL listed, CSA certified for use as part of the system to provide roof and gutter de-icing.

• For most applications, use:

6CCA-1BA 120 V with polyolefin overjacket.

For highly corrosive or hazardous areas, use:

5FPS-1BT 120 V with fluoropolymer overjacket.

POWER OUTPUT

These self-regulating heating cables will develop a nominal power output of 10 to 12 W/ft (33 to 40 W/m) in snow and ice and 5 W/ft (16 W/m) in open air.

The maximum exposure temperature of all roof, gutter and downspout materials should be verified, especially when dealing with non-metallic materials such as vinyl. The heater selection should be in accordance with these temperatures.

ADVANTAGES

- Cut to length for the project.
- Reduced electrical costs.
- Adjusts its power output where and when it is required.
- Very flexible, therefore easier to install.
- Can be used with or without thermostats.
- Can be installed on any types of roofs.

Serge Baril offers the solution for a wide range of applications such as:

SHINGLE ROOF

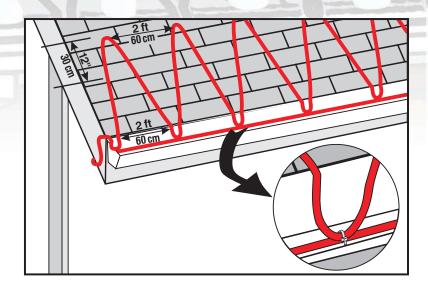


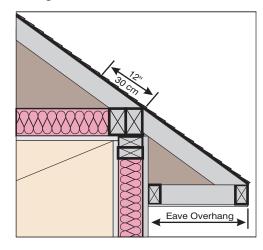
TABLE I: CABLE LENGTH PER FT (M) OF ROOF EDGE Cable spacing is 2 ft (60 cm)

Eave Overhang		Lo Hei		Feet (m) of cable/ Foot (m) of roof
inches	cm	inches	cm	
12	30	24	60	3
24	60	36	90	4
36	90	48	120	5
48	120	60	150	6

STEP 1. HEATER ON ROOF

Install the 6CCA heater (120 or 240 Volts) looped up and down 12" (30 cm) beyond the eave overhang (see sketch) to the edge of the roof and to the bottom of the gutter to prevent ice build-up over the gutter. Cable spacing between the loops is normally 2 ft (60 cm). The amount of cable to be used will be affected by the depth of the eave overhang as shown in **TABLE I** below. This table provides the total number of feet or meters of cable required per foot or meter of roof edge.

The cable must be looped down over the edge of the roof and tied to the cable in the gutter using UV resistant cable ties. This is to help prevent the ice from bridging over the gutter.



STEP 2. HEATER IN GUTTER

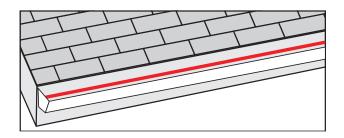
The gutter requires a length of heater along the bottom to keep the flow of water to the drain. For gutters larger than 6" (15 cm), multiple runs of heater cable are recommended. It is preferable to tie the cable down with the use of aluminum tape (AT-150) in order to keep the cable flat and on the bottom of the gutter. This also helps dissipate the heat along the bottom of the gutter providing wider coverage.

NO GUTTERS?

- 1) Install the cable on the roof as shown above leaving loops protruding about 3" (7.5 cm) over the edge of the roof.
- 2) A heat tracing cable can also be installed longitudinally under the drip lip of the roof. This could help prevent the built-up of ice and icicles along the edge of the roof.

TRACING GUTTERS ONLY?

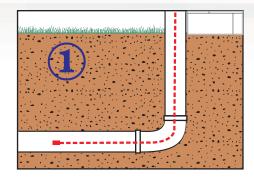
This may well be adequate and could prove to be a good first step if there are no obvious ice dams forming on the roof. If this does not suffice, the roof can be heat traced following the above procedure at a later date.



STEP 3. **DOWNSPOUTS**

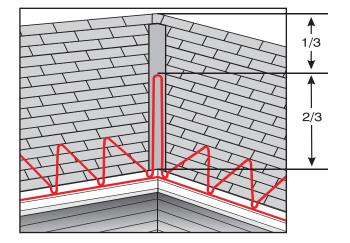
The downspouts which serve to lead the water to the ground or drain must also be heat traced. The cable is looped down and back, unless the downspout is on the end of circuit with the cable terminating at the bottom.

If the cable is terminated at the bottom, the end should protrude some distance into the ground drainage under the frost line (see sketch 1) to prevent freezing or tied to the exterior of the downspout (see sketch 2).

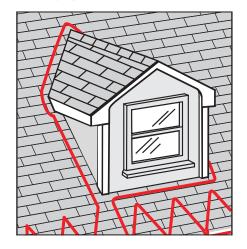


STEP 4. ROOF VALLEYS

Install the cable up to two thirds the height of the valley and back down.



STEP 5. DORMERS OR SKYLIGHTS Install the cable all around the perimeter of the dormer or skylight.



STEP 6. **CABLE LENGTH CALCULATION**

TABLE II: TOTAL CABLE REQUIRMENTS: SLOPED SHINGLE ROOF

Roof		X		=	
	Roof length		Cable multiplier (from Table I)		
Dormers		Χ		=	
	Quantity		Perimeter		
Valleys		X		=	
-	Quantity		2/3 up and 2/3 down		
Gutters		X		=	
	Length		1 pass / 6" (15 cm) width		
Downspouts		X		=	
	Quantity		Length x 2 (or 1 if end of circuit)		
Connections		X	2 ft (60 cm)	=	
	Quantity				
			Cable length	=	
			Cable length x 5%	=	
			Total cable length	_	

CIRCUIT BREAKER SELECTION

Caution: Both the National and Canadian Electrical Codes require the use of a ground fault protection device (GFPD) at all times in conjunction with the installation of all heat tracers.

The circuit breaker is selected on the basis of the maximum length (ft or m) that can be connected at a specific start-up temperature. More than one segment can be connected to a single breaker as long as the maximum heater length per breaker size is not exceeded.

HEATER LENGTH IN FT. OR M / BREAKER AMPS

TABLE III:

Catalog	Maximum heater length / Breaker amps							
Number	Start temp. °F / °C	15 A	20 A	30 A	40 A			
6CCA-1BA	20 / -7	102 / 31	136*/ 41*	203* / 62*	272* / 83*			
120 V	0 / -18	90 / 27	120 / 37	180* / 55*	240* / 73*			
Max. segment length 120 ft / 37 m	-20 / -29	80 / 24	105 / 32	156* / 47*	210* / 64*			
	-40 / -40	70 / 21	90 / 27	140* / 43*	185* / 56*			
6CCA-2BA	20 / -7	203 / 62	266 / 81	404*/ 123*	536* / 163*			
240 V Max. segment length 290 ft / 88 m	0 / -18	180 / 55	240 / 73	355*/ 108*	275* / 145*			
	-20 / -29	155 / 47	210 / 64	310* / 95*	415* / 127*			
	-40 / -40	140 / 43	185 / 56	275* / 84*	370* / 113*			

FOR HIGHLY CORROSIVE OR HAZARDOUS AREA

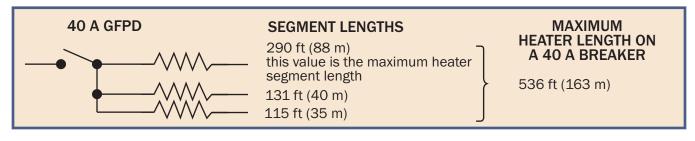
Catalog	Maximum heater length / Breaker amps							
Number	Start temp. °F / °C	15 A	20 A	30 A	40 A			
5FPS-1BT	20 / -7	123 / 37	164*/ 50*	246* / 75*	328*/ 100*			
120 V	0 / -18	110 / 34	147 / 45	220* / 67*	294* / 90*			
Max. segment length	-20 / -29	100 / 30	133 / 41	200* / 61*	267* / 81*			
147 ft / 45 m	-40 / -40	91 / 28	122 / 37	183* / 56*	244* / 74*			
5FPS-2BT	20 / -7	246 / 75	328 / 100	492* / 150*	656* / 200*			
240 V Max. segment length 330 ft / 100 m	0 / -18	220 / 67	294 / 90	441* / 134*	588* / 179*			
	-20 / -29	200 / 61	267 / 81	400* / 122*	533* / 161*			
	-40 / -40	183 / 56	244 / 74	366* / 111*	488* / 149*			

^{*}These lengths exceed the maximum segment length and require more than one segment per breaker.

NOTE: For 208, 220, 277 Volt applications, please contact SBA.

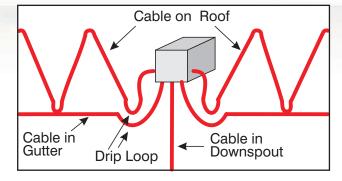
SEGMENT LENGTH = Length of the heater cable from a power connection point to the end seal.

Example: From **TABLE III** the maximum heater length of the 6CCA-2BA on a 40 A breaker, at a start-up temperature of 20°F (-7 °C) is 536 ft (163 m). *A typical installation to meet this number is as follows:*



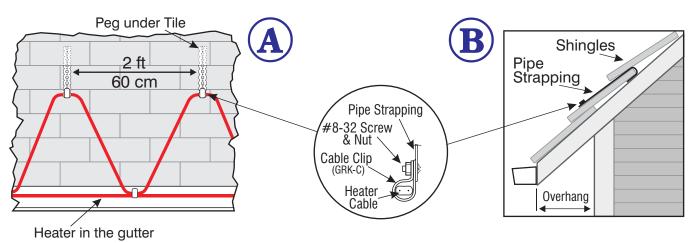
SCRAP PREVENTION

If possible, position the main connection box to allow the use of smaller lengths of cables, thus reducing scrap and preventing unnecessary splices as shown.

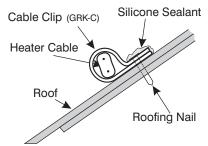


ROOF ATTACHMENT

GRK-C roof clips can be used in conjunction with pipe strapping nailed directly into the shingles of a new roof (see sketch A). For existing structures, bend the top edge of the pipe strapping before slipping it under the tile or shingle. Push up and pull back down to have the bent edge hook onto the top of the tile (see sketch B).



GRK-C roof clips may have to be surface mounted as shown. Please assure a complete seal by using silicone or other appropriate sealing agent.



An alternative solution: A bead of adhesive (not furnished) should run along the pipe strapping for a length of 3" (76 mm) prior to slipping the strapping up under the tile. **Do not use an excessive amount so as to leave a visible blob of adhesive on the outer edge of the tile.** The adhesive bead should be large enough to deform and smear along the surface of the tile underneath. Allow the adhesive to cure to full bonding strength before attempting to install the cable and clips.

COMPONENTS

All heating cable components are UL listed, CSA certified for use as part of the system to provide roof and gutter de-icing. Component enclosures (not supplied) should meet CEMA 4X requirements to prevent water ingress and corrosion.

GRK-P POWER ENTRY SEAL (includes GRK-E end seal) provides a watertight entry seal into a junction box. It is recommended that a CEMA 4 or 4X box be used and that it be mounted under an eave or other protected area. Each kit contains one power entry seal and one end seal.

GRK-E END SEAL provides a moisture seal at the end of each heater cable circuit. It is included with the GRK-P kit but can be bought separately in a package of 5 (GRK-E-5) or by one (GRK-E-1).

GRK-S SPLICE KIT is used to splice two pieces of cable together. This could occur when a longer circuit is needed or a damaged spot must be cut out or repaired. The splice should not lie in water at the bottom of the gutter.

GRK-DH DOWNSPOUT HANGERS are used to support the cable where it enters or exits a downspout drain. One hanger is required for each downspout. If the downspout is in the middle of a circuit, then loop the cable down to the bottom of the drain and back up, clamping it into the downspout hanger to prevent the cable from being pulled tight against the drain/gutter edge.

GRK-C UNIVERSAL ROOF MOUNTING CLIPS are used for all types of installations. Clips come 25 per bag. Order one bag per 8 ft (2.4 m) of eave or one bag for every 100 ft (30 m) of cable installed on flat roofs.

AT-150 ALUMINUM FOIL TAPE may be used to secure the heater cable to the bottom of the gutter. Each roll of tape will accommodate 150 ft (46 m) of gutter. The gutter must be clean for the foil tape to adhere properly.

CONTROLS

OPTION 1: MANUAL SWITCH

The system can be controlled by a manual switch either directly or through an appropriate contactor or an OPEN/CLOSE breaker at the beginning/end of season. This is by far the simplest, but can allow the heater to operate when not needed.

OPTION 2: THERMOSTATIC CONTROL (TLE4X40)

The system can be controlled by an ambient sensing thermostat fixed at $40^{\circ}F$ ($5^{\circ}C$) in a CEMA 4X enclosure either directly or through an appropriate contactor. This saves energy when the ambient temperature is $40^{\circ}F$ ($5^{\circ}C$). Make sure the probe at the end of the 30" (76 cm) capillary is positioned to measure the lowest temperature the cable will sense and it is not sitting comfortably in the sunshine.

OPTION 3: AUTOMATIC SNOW CONTROLLER

The system can be controlled by one or more SMGS-1 gutter-mounted sensors along with a SMAS-1 aerial-mounted sensor in combination with an SMMC-3 control panel through an appropriate contactor. This is by far the best system and should be considered for larger commercial or industrial applications. The SMMC-3 controller can control up to 3 zones through appropriately sized contactors (see description next page). The sensors will start the system automatically in the presence of water and low temperature which signals the possibility of ice blockage and pursuant problems. The description of each of these control components follows:

SMMC-3 MULTI SENSOR SNOW/ICE MELTING CONTROLLER

The SMMC-3 can monitor snow and ice accumulation in three separate zones. The SMMC-3 programming allows each zone to be controlled independently or on a priority mode basis. NEMA 12 enclosure, LCD display, 120 V, 450 VA.

The control signal relays operate external contactors.

SMTS-1 Temperature sensor

- Included with every SMMC-3 controller.
- Measures outdoor temperature conditions.

SMAS-1 Aerial sensor

 Detects falling or blowing snow, then sends a signal to the SMMC-3 (includes 10 ft (3 m) of wire for the connection back to the SMMC-3). The SMAS-1 is well suited for mast mounting and custom positioning.

SMGS-1 Gutter sensor

• Detects moisture on roofs and in gutters, then sends a signal to the SMMC-3. The housing of the SMGS-1 sits directly in the gutter and the sensor wire is secured to the roof (includes 10 ft (3 m) of wire for connection to the SMMC-3).

SS-01 AUTOMATIC SNOW/ICE CONTROL

- Uses microprocessor technology to reduce energy consumption by energizing the heating cable only when the right conditions of temperature and snowfall occur.
- C/W a LED indicator light. This light switches on and turns red if the snow sensor is dirty and needs to be cleaned.
- Power supply 120 V.
- Output type 16 A Relay.
- The cable remains energized for 2 3/4 hours after the snow stops.





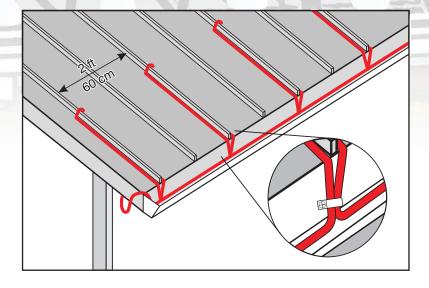
LCD-1 SNOW SWITCH

- Reliable automatic control.
- Sensing moisture and temperature, saves substantial energy compared to other control techniques.
- Continues heater operation for several hours after snow stops.
- Operates from 120 VAC 50/60 Hz. Provides internal relays rated for 120/240 VAC, 16 A

GIT-3A GUTTER ICE MELTING CONTROLLER

- Detects precipitation and low temperatures.
- C/W a ground-fault sensor and gutter-mounted computerized sensor in a CEMA 3R enclosure SPST, 26 A contactor.
- Operates from all common distribution voltages.
- Continues heater operation until icing conditions are no longer present and for the hold-on time of one hour thereafter.

METAL ROOF



Using the same logic as above, we basically have to guide a water droplet down the roof. The droplet should therefore meet a cable as it comes down. As such, we have to trace each second rib as shown on the drawing but not more than 2 ft (60 cm) between traces.

CABLE REQUIREMENTS ON ROOF

The cable requirements for the loop on the roof are calculated as follows: the eave overhang plus $1\frac{1}{2}$ ft (45 cm) which allows for extra cable to cover the portion of roof inside wall space plus the loop down to the gutter multiplied by the number of ribs (2 traces on every second rib is equivalent to one trace per rib) plus the length of roof. See formula below.

FORMULA: (Eave overhang + 1 ½ ft (45 cm)) x number of ribs + length of roof.

Other cable requirements are as per Table II on page 7.

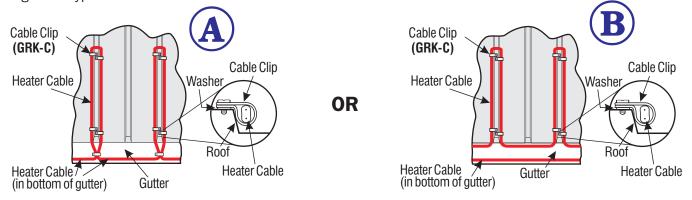
SAVING: Because the loops at the edges of the roof have to be brought down to the bottom of the gutter, we can thus save the cable in the bottom of the gutter by attaching the loops together using UV protected Ty-raps and tie the cable down with the use of the aluminum tape (AT-150) in order to keep the cable flat in the bottom of the gutter. This also helps to dissipate the heat along the bottom of the gutter (see sketch A).

NOTES:

- 1) Every second rib is to be traced but not beyond a spacing of 2 ft (60 cm).
- 2) All the rest of applications such as dormers, gutters, downspouts are as per requirements for a shingle roof above.

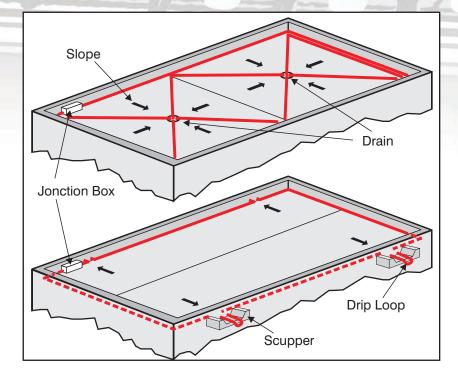
ROOF ATTACHMENT

Use GRK-C clips making sure to use self-sealing screws or other appropriate sealing mechanism to prevent water ingress. A typical rib cross-over is shown below.



Fasten with sheet metal screw using neoprene sealing washer. If washers are not available, coat screw and upslope edge of clip with silicone sealant. Exact cable spacing may vary depending on the rib design of the roof. Typically trace every other rib.

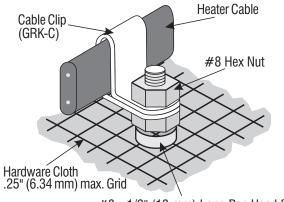
FLAT ROOF



The principle is to keep a pathway open for the flow of water to the drain. There is generally a slope towards a central drain or towards an edge. Run the heat tracing cables from all corners to the drain making sure that the loops are bent into the drain. It is good practice to have one cable go down into the drain to prevent freezing. Lay heat tracers all along the perimeter.

ROOF ATTACHMENT

Use fibreglass or other appropriate sheet material to glue to the roof while having the GRK-C clips attached underneath this sheet as shown.

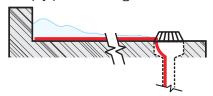


#8 x 1/2" (13 mm) Long Pan Head Screw

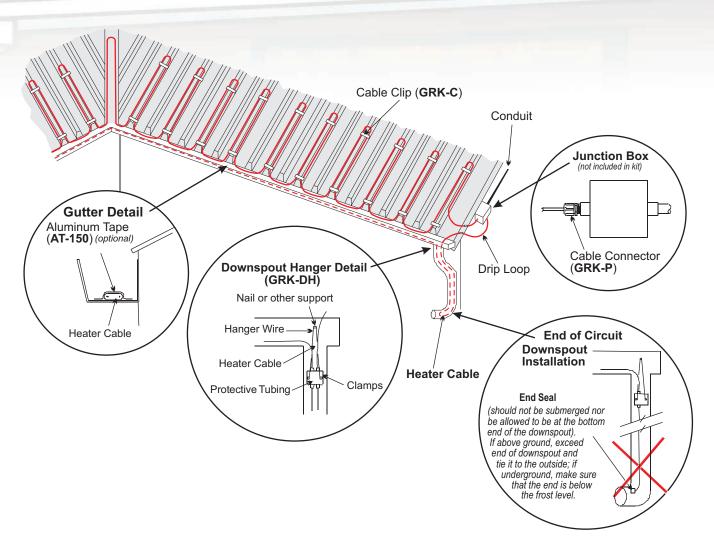
Adhesive (not furnished) should be used to bond clips studs to the flat surface. The roof surface should be clean at the bonding locations. **Do not penetrate flat roofs with screws or nails as leaks may develop.** Allow the adhesive to cure to full bonding strength before attempting to install the cable and clips.

DRAINS

Simply put one length of cable into the full length of the drain to be freeze protected.



INSTALLATION INSTRUCTIONS



- 1. Before installing the cable, allow it to warm up to room temperature. Keep grommets and shrink tubes warm until used (keep inside of jacket pocket, etc.)
- 2. Clear all gutters and downspouts of debris (protect hands with gloves).
- 3. Remove any sharp edges that could damage the heater cable.
- 4. Mount the weatherproof junction box in a sheltered area. The junction box may be positioned to install the cables in different directions and thus reduce scrap.
- 5. Start the cable installation at the junction box, thus leaving a drip loop where the cable exits the junction box.
- 6. The circuit breaker can be used to turn the heater off and on. Optionally, an automatic system using thermostat or snow or ice detector may be used to switch the cable. In all cases, the circuit breaker must be of the ground leakage protection type.
- 7. Splices should be avoided where possible.

TESTING

Electrical tests are recommended at specific points in the receipt and installation of the heater cable. This periodic testing is designed to prevent the expenditure of wasted labour in the event of damage to the product. Installation costs of the cable are much greater than the heater cable. Quick identification of any heater cable damage is the most economic approach to an installation.

It is recommended that the cable be Megger tested between the bus wires and ground braid before and after installation. The heater cable should have a minimum insulation resistance of 20 megohms when tested with a 500 VDC (minimum) Megger.

Tests should be carried out at the following points of the installation process:

Upon receipt of the heater cable

Before installation

■ Immediately after installation

As part of a Periodic Maintenance Program

WARNING

- To minimize the danger of fire if the heater cable is damaged or mis-installed, the use of a ground fault protection circuit breaker is mandatory and required both by the NEC and CEC (National and Canadian Electrical Codes). On circuits in excess of 100 ft (30 m), it is recommended that a 30 mA trip device be used to prevent nuisance tripping. The braided shield on the cable must be connected to the electrical ground for proper protection through the circuit breakers.
- Electrical connections must be made by a licensed electrician.
- Do not twist bus wires together this will result in a short circuit and damage the heater cable.
- Moisture must be kept away from the live electrical parts of the heater cable or electrical faults will develop.
- Damaged heater cable must be repaired or replaced.
- Avoid laying ladders against the heater cable.

TEN YEAR EXTENDED WARRANTY SELF REGULATING HEATER CABLE

SCOPE:

Serge Baril offers an extension of our regular 1 year warranty on all self-regulating heating cables for a period of up to 10 years from the date of manufacture.

This extended warranty includes all terms, conditions and limitations of the basic warranty with the following additions:

- 1. Heating Cable Extended Warranty Acceptance form has been signed and returned to Serge Baril for registration.
- 2. Heating cable failure is defined as having a 20% loss in power output.
- **3.** Warranty is void if product is installed on or with materials containing plasticizers, such as commonly used in vinyl tapes or vinyl insulations. The cables must have been installed according to the manufacturer's installation instructions by an approved installer.

PROCEDURE:

- 1. In the event of a claim, a "claim information sheet" must be completed and returned with all cable that has been removed.
- 2. Serge Baril will provide replacement cable at normal price levels for the initial replacement.
- **3.** Upon examination of the returned cable and the determination that the cable is defective, Serge Baril will issue a credit for the defective cable.

APPROVALS:









GENERAL NOTE:

The above are general suggestions for applications of our cables and are not meant to replace the normal requirements of local, construction, electrical, or other codes. The installer must verify the conformity to all applicable codes or standards.

We are pleased to offer suggestions on the use of our various products, nevertheless, there are no warranties given except such expressed warranties offered in connection with the sale of a particular product. There are no implied warranties of merchantability or of fitness for a particular purpose given in connection with the sale of any goods. In no event shall Serge Baril be liable for consequential, incidental or special damages. The buyer's sole and exclusive remedy and the limit of Serge Baril's liability for any loss whatsoever shall not exceed the original purchase price paid to SBA for the product or products for which a claim is made.

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