

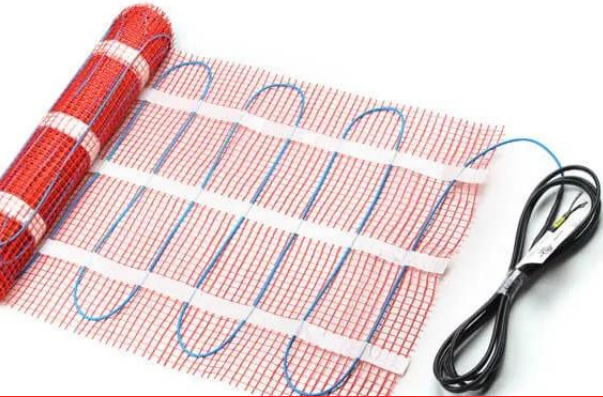


**LIBERTY
ELECTRIC
PRODUCTS**

Electric Snow Melting Systems

**Products, Accessories, Controls, and
Application Knowledge**

06.21.23



Our Agency

- Established in 1987, Liberty Electric Sales is celebrating its 36th year of serving Upstate NY with industry-leading products, designs, and technical expertise in the electrical, HVAC, and industrial industries.
- Our agency started with a focus on electric heat applications and has grown through both sales volume and strategic timing. In the past 5 years, we've bought and integrated 3 other representative agencies. We total around 50 lines.
- Our main offices are located in Syracuse, N.Y., and we're staffed with 5 outside salespeople, and 8 inside sales & support staff.
- We call on a diverse audience, including architects/engineers, electrical/mechanical wholesalers, contractors, industrials, and institutional accounts.

Our Snow Melting Team

- **Rob Zerrillo** has been in the industrial/commercial heating business for more than 16 years, first working with commercial/industrial steam and hot water boilers and mechanical room equipment and then for the last 13 years with Liberty Electric Products focused on electric heating applications. Rob has worked on and developed solutions for more than 1,000 different heat trace applications in Upstate NY. His primary responsibility is being in the field at job sites, working with engineers/architects on new designs, and helping contractors with installations.
- **Tricia Neuburger** has been with Liberty Electric Products for more than 21 years and is currently our Operations Manager, overseeing the inside technical and support staff that ensures customers get quick responses on quotes, orders, and other issues. Her primary responsibility is to be the stationary point of contact for all customers to get them the best solutions for all our products and manufacturers.
- **Ed Jordan** has been with Liberty Electric Products for 5 years and is our resident heat cable resource expert. Ed's background is in mechanical engineering, and he previously worked as an HVAC design engineer. He is also a commercial /private jet pilot. Ed is responsible for heat trace designs, quotes, and technical information.

Agenda

- **Types of Heating Elements**
 - Self-Regulating Cable
 - Constant-Wattage Cable
 - Mineral-Insulated Cable
 - Self-Regulating Polymer Sheets
 - Tinned copper Screen Sheets
 - Snow Melt Channel/Flashing
- **Roof & Gutter De-Icing**
 - Roof & Gutter Controls
- **Sidewalk & Pavement De-Icing**
 - Sidewalk Snow Melt Controls
- **Installation & Best Practices**

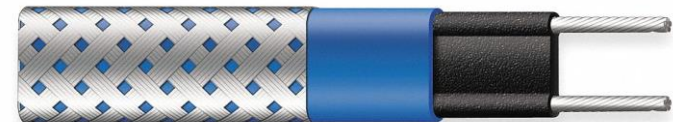
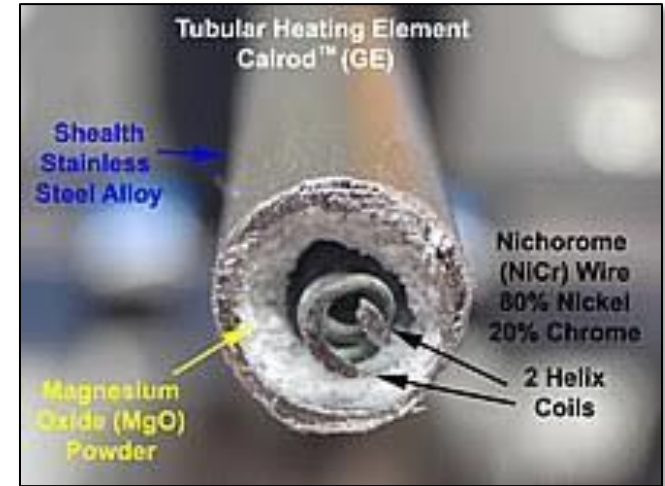




Electric Snow Melting Elements

Electric Snow Melting Elements

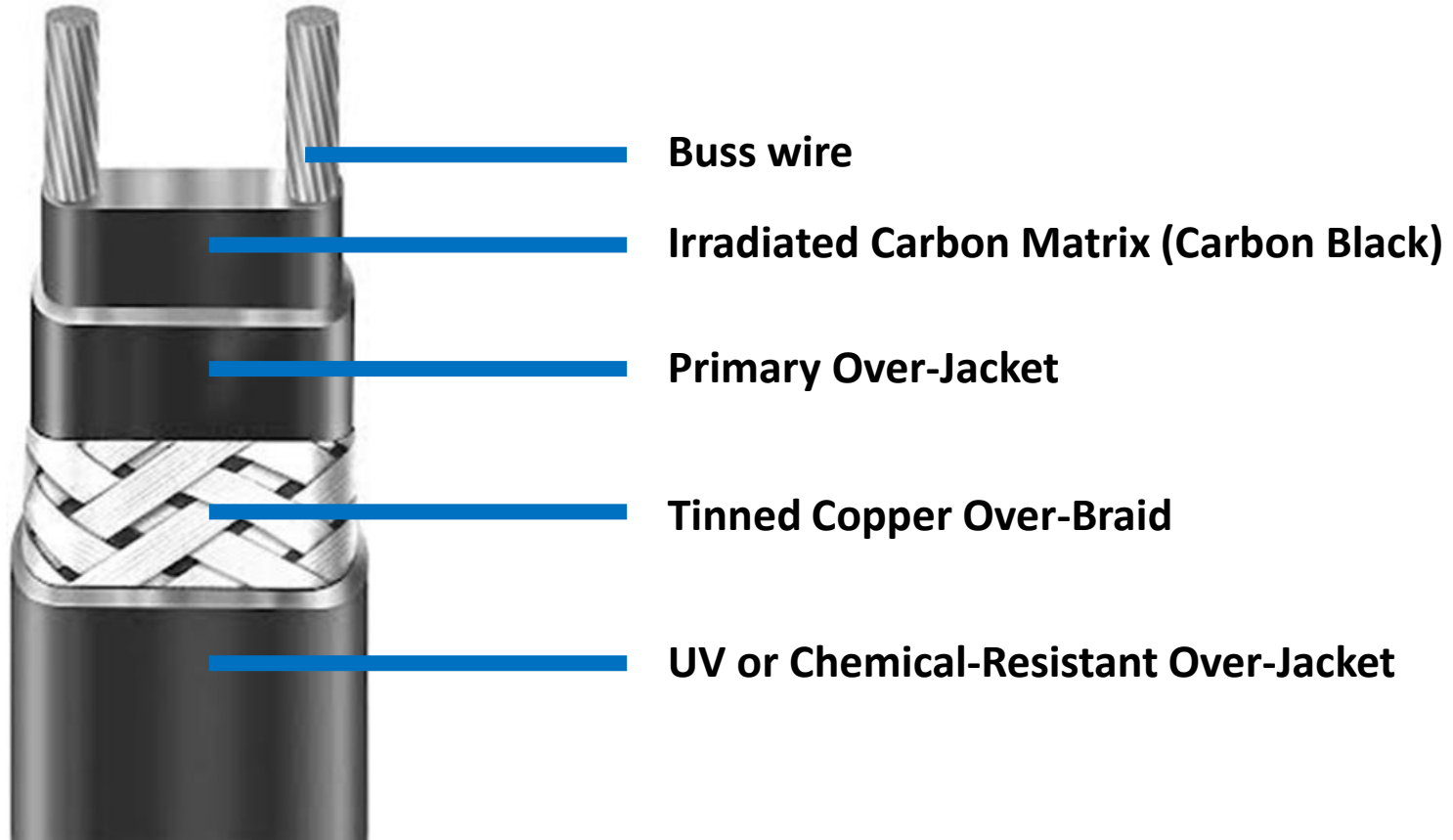
- Electric snow melting elements vary in type and purpose but are similar regarding controls and installation terminations.
- Higher quality manufacturers and commercial grade products can provide decades of service life with little to no maintenance.
- Electric elements can also be repaired or replaced more easily than hydronic-based systems if post-installation damage is incurred.



Elements – Self-Regulating Cable

- Self-regulating cable is used primarily for roof and gutter snow melting, and freeze protecting pipes. It has also been used for sidewalk snow-melting applications because it can be customized in the field.
- Industry standards dictate a self-regulating cable's wattage output is determined at 50°F. These cables work off the expansion and contraction of an irradiated carbon core and fluctuate temperatures based on the surface it touches.
- When the cable becomes colder than 50°F, the cable constricts the carbon mastic and creates higher resistance/temperatures. When the cable is placed against warmer surfaces, it expands the carbon layer until it cannot expand further because of the inner jacketing. Typically, an SR cable might go 1-2 watts less than the rated duty at 50°F.

Elements – Self-Regulating Cable



Elements – Self-Regulating Cable

- Self-regulating cable circuits must be sized for the full wattage potential of the cable.
- For example, a 5w/ft. cable has the potential to draw up to a maximum 12w/ft. To avoid nuisance trips, size the circuit draw based on 12w/ft.
- Self-regulating cable is safe to touch against itself.
- At higher voltages, the self-regulating cable's irradiated carbon core will degrade over time, and the wattage output will decrease.
- For roof and gutter applications, 8w/ft. cable is recommended. The only self-regulating cable used for sidewalk snow melting is rated at 37w/ft.
- Low-temp self-regulating cable will operate to a maximum possible temp. output of 150°F and destroy itself at 180°F; it is safe to use on asphalt shingles or EPDM roofs.

Elements – Self-Regulating Cable

Recommended Circuit Lengths *NOT TO EXCEED* for 8w/ft. cable (22 w/ft. max draw)

30A Breaker:

120V – 210ft.

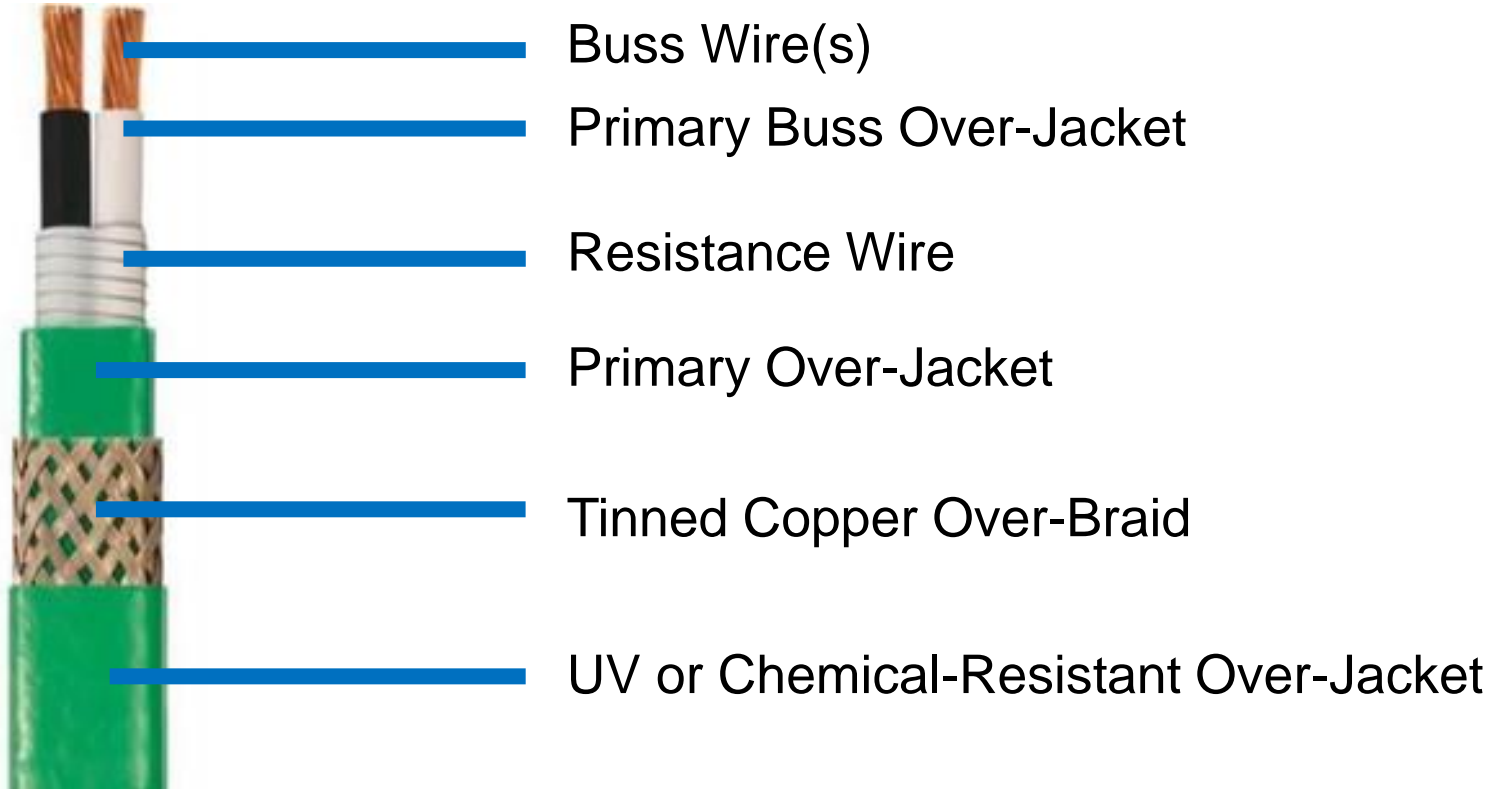
208-277V – 420ft.

Rated @ 50°F in Air			Rated @ 32°F in Snow & Ice		
208V	240V	277V	208V	240V	277V
4.10	5.00	5.60	7.57	8.80	11.50
6.88	8.00	8.96	15.65	18.20	21.90

Elements – Constant-Watt Cable

- Constant-wattage cable is manufactured to deliver a consistent wattage output per foot and does not fluctuate.
- These cables are usually malleable, easy to bend, and can be cut to length in the field.
- **DO NOT** overlap or let these cables touch each other; they will burn through.
- Not recommended for use in roof and gutter applications or inside PVC conduits.
- Typically used for sidewalk/pavement snow melting, frost heave prevention, and pipe tracing.
- Figuring circuit lengths is easy and predictable.

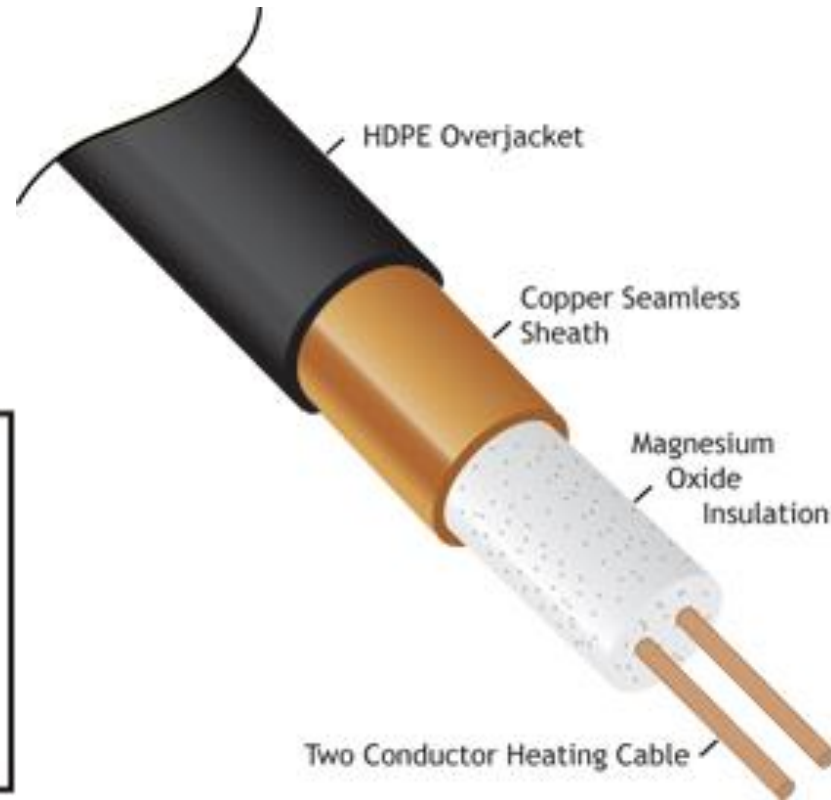
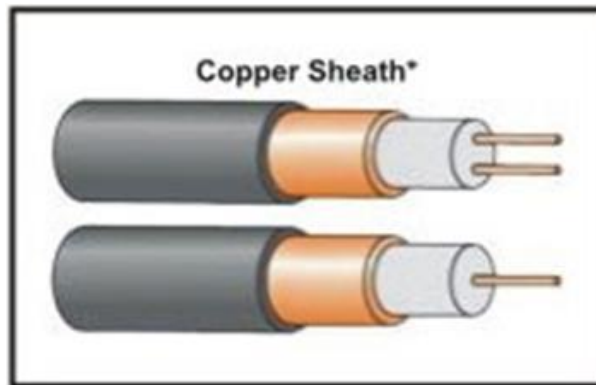
Elements – Constant-Watt Cable Cable



Elements – Mineral-Insulated (Heat) Cable

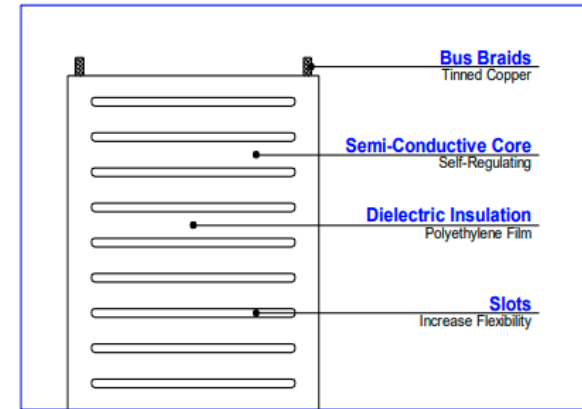
- There are 2 kinds of mineral-insulated cable: power, and heat. The construction is similar, but “heat” MI uses a Ni-Chrome resistance wire wrapped around the conductor to create heat.
- Copper and stainless steel jacketed retains bend memory and is very durable.
- Custom engineered and produced for wattage output, not a “cut to length” or splice-able product.
- Because it’s constant wattage by nature and can run hotter, **DO NOT** let these cables touch against themselves.
- Can be used for roof and gutter, sidewalk snow melting, and frost heave prevention. As the wattage output can be customized, and these cables can last 30+ years in service.

Elements – Mineral-Insulated (Heat) Cable



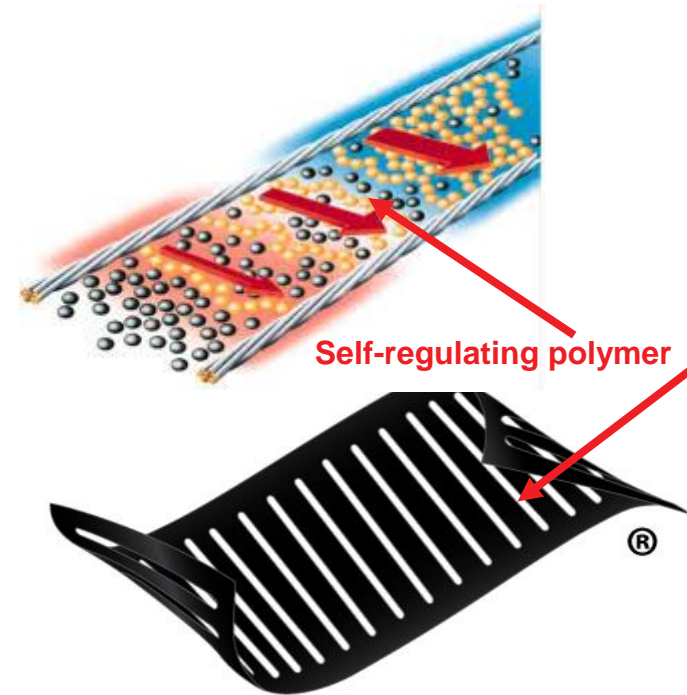
Elements – Self-Regulating Polymer

- Homogenous, semi-conductive polymers are used in low-voltage snow melting systems. They work similarly to self-regulating cables.
- They are thin, flat, flexible, and can be nailed, stapled, or screwed into. **DO NOT DAMAGE** the buss braids bordering 2 long sides of the mat- the only real susceptible component.
- Quality and brand determine longevity, and some manufacturers are LEED certified, produce 100% recyclable, no hazardous off-gassing, and safe-for-the-environment products.



Elements – Self-Regulating Polymer

- These come in width ranges that typically run from 3” wide for interior floor warming applications, to 12” wide for sidewalk snow melting. They can be cut to conform to any shape needed but need proportionate buss braids to allow power into the polymer.
- Used for sidewalk, paver, helicopter pad snow melting, and as a heated roofing underlayment for any kind of roofing material. It is also used for interior floor warming, and residential snow melting, as the power required is 1/3 to 2/3 less than conventional constant wattage systems.



Elements – Brass/Tin Conductive Mesh

- Metallic conductive mesh fabric is similar to the homogenous semi-conductive polymers in application, durability, and forgiving install; you can nail, screw or staple through the conductor itself without damage (through non-conductive materials).
- Metal conductive woven mesh works between 5-12 watts/ft. output and comes in 9 or 12” widths. **MUST use edge repair kits if you cut through this product; threads and strands can get RED HOT and present a potential fire hazard.**
- Metallic woven conductive material is LEED certified, 100% recyclable, no hazardous off-gassing, and considered a safe environment product.
- Power is delivered via conductive connection plates having direct contact with conductive mesh border plates.

Elements – Brass/Tin Conductive Mesh

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Transition plate w/ power

Conductive metal mesh





Roof, Gutter, and Downspout De-Icing

Roof & Gutter De-Icing

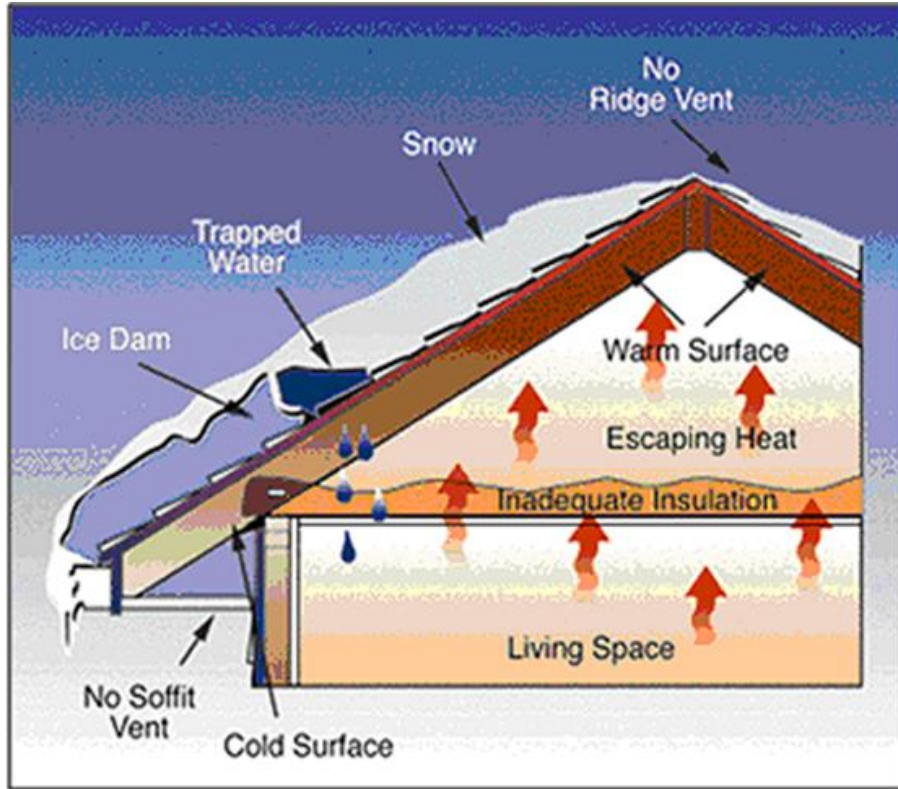
- Roof and gutter de-icing is a safe, and reliable way to help prevent leaks and water ingress and preserve roof/related roof materials over time.
- Residential grade products are typically 5-6w/ft. constant wattage cables. Life expectancy is 3-15 years, depending on quality/brand.
- **DO NOT USE FOR COMMERCIAL APPLICATIONS.**



Roof & Gutter De-Icing

- Commercial-grade self-regulating cables are the most commonly used for this application, and a 5-8w/ft. range is typical. Self-regulating cable is also a great choice because it's able to touch against itself without damage, and it's easy to work with in the field (cut and terminate). Self-regulating cables are also used with aluminum and copper channel melt systems.
- Mineral-insulated cable is also commonly used with slate roofs and copper flashings/gutters. This cable can be engineered for 7-9w/ft. output, has a bare copper jacketing that verigates to match the roof copper. This cable is **VERY DURABLE** and very long-lasting. However, it cannot be allowed to touch itself.
- Semi-conductive polymers and metallic conductive mesh are installed below the roof's surface. These systems are very effective at linear edge melting, conforming to odd shapes and surfaces. They also cover larger areas with less labor and larger width melt paths.

Roof & Gutter De-Icing



If you're using cables, the melted water uses the cable as a path to reach the gutters & downspouts, therefore, how/where you run it counts.

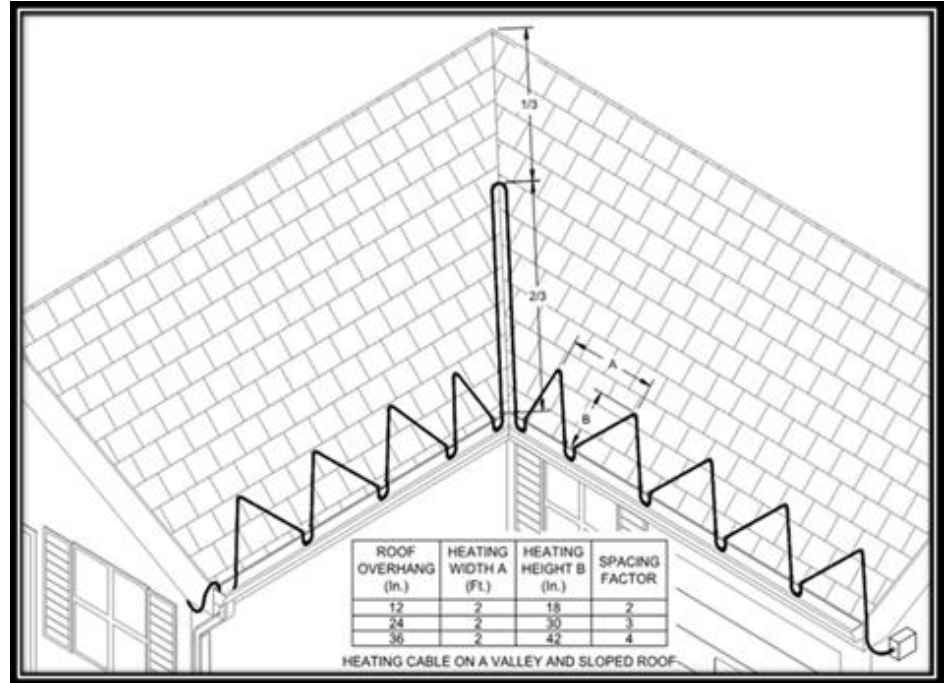
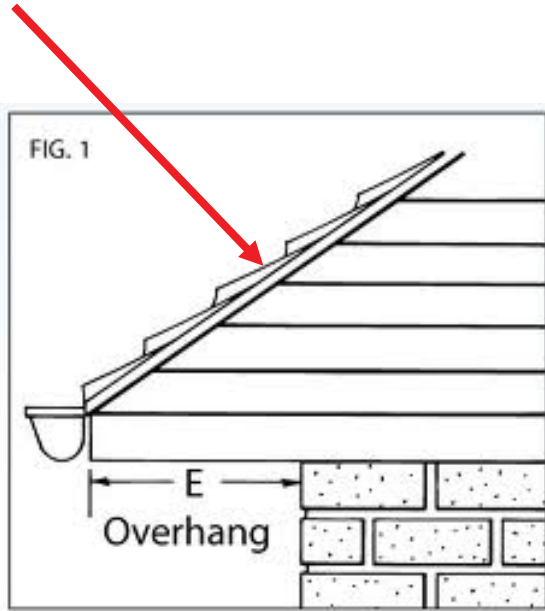
Low-voltage systems melt larger areas and keep them warm enough to path water to the gutters across its entire heat path.

Roof & Gutter De-Icing

- The greatest point of heat loss comes where the outer wall and overhang meet.
- We typically recommend extending (sawtoothing) cable at least 1 foot past this point to keep ice dams from forming. The sawtooth width is 2' between the bottom points.
- Natural light windows, and gable or dormer borders with old/poor insulation are also locations with potentially higher heat losses, or if you want to channel melted water around them.
- Metal roofs run sawtooth between ribs.
- In most cases, continuing the circuit down and up the downspout is less expensive than splicing. Adhere roof clips with epoxy cement to avoid roof penetrations.

Roof & Gutter De-Icing

Major Point of Heat Loss/Re-freeze



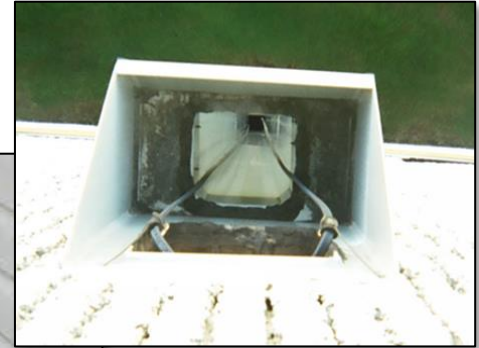
Gutters & Downspouts

- Typical 4" wide gutters would normally require 1 run of heat cable down the middle to keep water flowing. If over 4", its recommended to add another cable run/ every 4" of width.
- Cable doesn't have to be fastened down in the gutters, per se, but it does add to a more accurate,better-performing system by keeping the heat cable flat against the bottom of the gutter for best heat transfer. Use epoxy and many fasteners can work, just nothing that will damage the cable.



Gutters & Downspouts

- Downspouts are similar. One pass CAN work for a 4" dia. gutter, but oftentimes, it actually saves more time and money to go "down & back up" gutters with cable instead of cutting and making a 100% accurate splice. Over 4" diameter, make 2 passes.
- Downspouts can also either drain underground (catch basin) or to surface. If draining to surface, make sure the cable gets all the way to the bottom opening, and form a drip loop with the cable. On catch basins, always make sure the cable comes back up and is not left underground where the end seal can become saturated or left in standing water for long periods of time.



Low-Voltage Gutters & Downspouts

- Low-voltage systems, whether semi-conductive polymers or conductive metallic mesh, can be cut to the desired shape of the area to be melted.
- Semi-conductive polymers seem to require less labor to cut and conform to unusual shapes and do not have to be examined closely for loose threads that can get incredibly hot if not addressed.



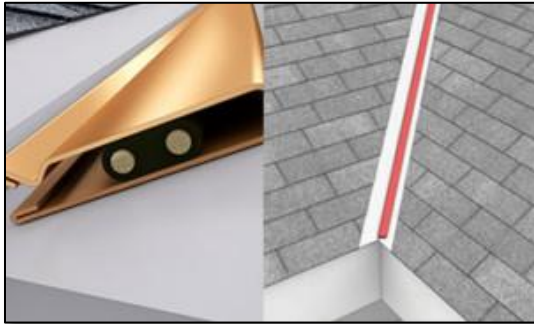
Low Voltage Gutters & Downspouts

- Also, semi-conductive polymers are produced in more widths/sizes to help with specific requirements like mounting in gutters (3" wide) or conforming to drip edges.
- **NOTE:** Both products **MUST** be covered for proper heat transfer and cannot be left to "open air". UV light will degrade semi-conductive polymers.



Snow Melt Channels & Trim

- Snow melt channel trim is another creative (but expensive) way to hide heating cables, but the trade-off is superior heat transfer.
- Self-regulating cables are the most popular in this application; most channel systems are designed for it.
- Great for edges and valley tracing.

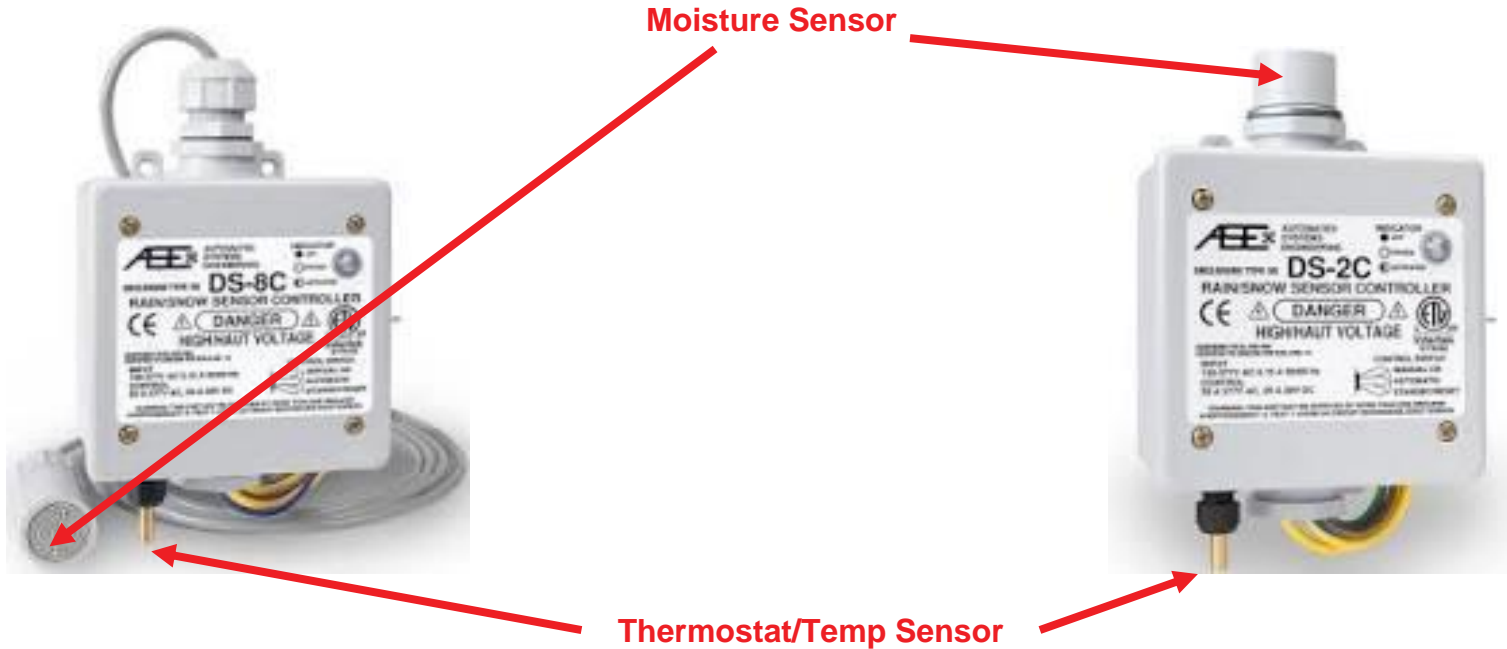


Roof & Gutter Controls

- Controls for roof and gutter applications can range from single-circuit to multi-circuit breaker integrated panels. All of these systems share in common a sensor that sends a signal to allow power to pass to the melting system.
- **Single Circuit Controls**
 - These are the least expensive and simplest technology for turning systems on/off.
 - Sensors are also integrated into these controls. Some are GFI rated to handle code requirements.
 - Most of these controls are capable of handling 30-40A and are line voltage 120-277V.
 - You can wire power directly into them, and come out with heat cable, or power to another J-box.



Roof & Gutter Controls



Roof & Gutter Controls

- **Contactor Relay Panels, Snow Melt Controllers, and Sensors**
 - Contactor relay panels are a simple, affordable, and effective way to turn on multiple snow melt circuits at one time.
 - Each circuit is fed from a distribution panel, typically with 30A breakers. GFI code requirements can be handled with breakers, or C-R panel based.
 - Snow controllers are wired to the C-R panel and operate based on feedback from remote sensors mounted on rooftops, or in gutters.



Roof & Gutter Controls


- **Breaker Integrated Panels & Remote Sensors**
 - Breaker-integrated panels are the most expensive option for snow melt control but are also the biggest labor saver for multiple circuit systems.
 - These panels just require a feed from the supply entrance/distribution panel: 100A, 200A, 400A, etc. They can handle up to 72 circuits and accept extension panels of 36 circuits in addition to.
 - Field sensors are (typically) low-voltage and can be run hundreds of feet out to the sensor location and are connected directly to the panel.
 - These panels also have options for HMIs, BMS plugins, alarms, power monitoring, GFEP, etc. Many options are available.



Roof & Gutter Controls – Low-Voltage Systems

- Low-voltage systems use isolation power supply transformers rated with ratings from 25A @ 30V, to 6kVA.
- Each transformer can support “X” square feet of heating element per. They are daisy-chained together to continue the system expansion.
- There is variance between manufacturers and transformer design to support differences in low-voltage elements and system design criteria.
- Noise levels can become an issue if the system is large and requires many of them.
- A simple contactor sized for the system with a low-voltage coil for a proprietary thermostat. Small, single point of control on the wall.

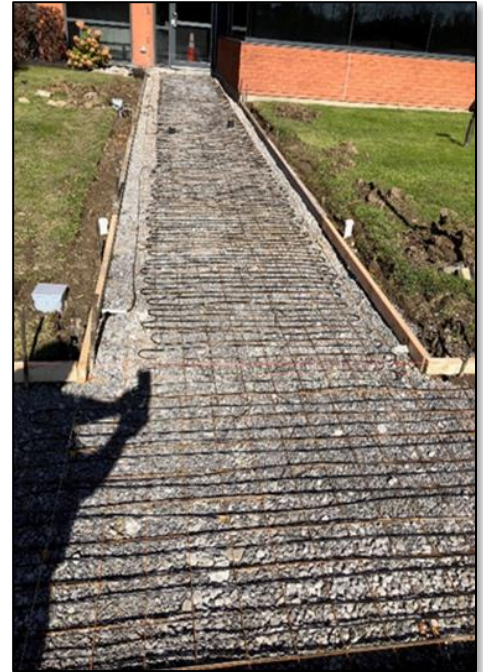




Sidewalk, Pavement, & Paver Snow Melting

Sidewalk Snow Melting

- Automatic snow-melting systems for walkways and pavement are a great way to save medium to long-range costs, preserve concrete and pavers longer, prevent slip hazards, keep salt and corrosives from being tracked into the building, and creating further damage.
- The 2 most popular systems are hydronic and electric. Low-voltage systems are also becoming more popular because of energy savings. Despite the bad reputation electric systems have historically been tagged with, they operate more efficiently, with less maintenance at a competitive, if not less expensive initial cost of materials and installation.
- Electric melts more consistently and operates around 4X fewer hours vs. hydronic systems. No moving parts and almost zero maintenance.
- Predictable energy costs.



National Fuel Headquarters parking lot entrance (Williamsville, NY)

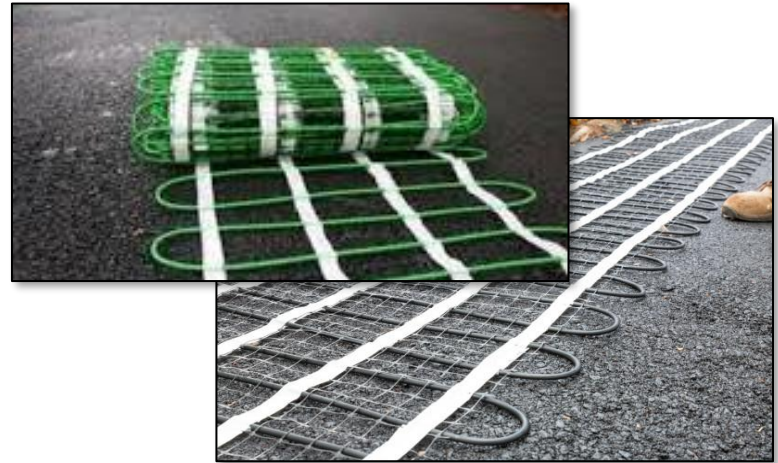
Sidewalk Snow Melting

- When using constant watt snow-melt mats, or mineral-insulated cable, we recommend heat output around 45-50 watts/sq ft. to melt snow at 2" per hour falling in Upstate NY. Both products are able to reduce wattage output; mineral-insulated cable is customizable for heat output per ft. and turn on a 6" radius. Mats are also available in 36-38w output.
- Per NEC code, mineral-insulated cable or mats must be at least 2" below the surface of the concrete. The system is then controlled by a combination moisture/temp sensor embedded in the concrete or can be used with surface/aerial mounted sensors. Do not cross expansion joints; decorative scores are OK.



Constant-Wattage Mats

- An economical and effective snow melt product, this is a constant wattage cable typically 9 or 12w/ft, taped or woven into a plastic mesh roll.
- These install very quickly and can be fastened down using zip ties. Standard mat sizes include widths in 12", 18", 24", 36", and lengths in 5, 10, 15, 20'. Great with 2-part pour scenarios.
- Constant wattage mats can achieve very long service lives, 20+ years easily if properly installed. Again, manufacturers differ in quality, warranty, and application expertise.



Mineral-Insulated Cable

- Mineral-insulated cable is a great product for sidewalk snow melting. It has customizable wattage output, can be built to specific lengths for better fit, and conforms to radius bends and odd shapes well.
- Mineral-insulated cable has a service life of 30+ years. Despite the cost difference (more expensive by \$3-6/ft.), 2-conductor cable is much easier to install in less time. Copper sheath is easier to bend but requires an HDPE jacket for chemical resistance during installation. Stainless mineral-insulated is much stiffer to bend but doesn't need the HDPE jacketing.



Low-Voltage Melting Systems

- Low-voltage systems are classified by rate of melt (1, 2, or 3). At its lowest wattage output, which will keep up with mild snowfalls, these systems will consume about 60-65% less wattage than a conventional snow mat or mineral-insulated cable install. Can accept DC power from photovoltaics directly to low-voltage transformers.
- At melt level 2, or enough to keep up with ½-1” per hour falling, you’re using about 30-35% less wattage than conventional systems. Melt level 3 puts you on melting pace with MI or CW.
- Some semi-conductive polymers use a 12-mil thick chemically inert and dielectric insulation to protect against potential for alkalis and salts to come in contact. These elements also come in 9 or 12” widths, up to a maximum of 60’ long.



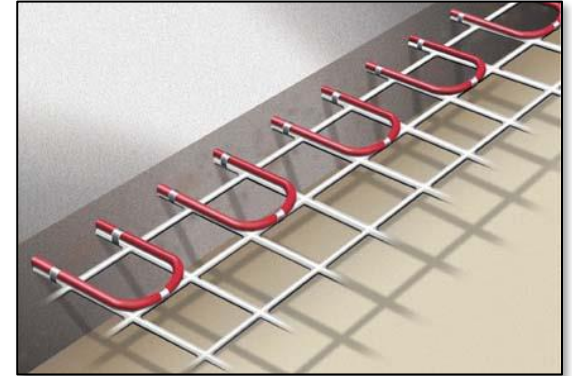
Surface/Portable Snow-Melt Mats

- Portable snow-melt mats are a great alternative for an existing sidewalk.
- 120/240V with standard sizes in 5', 10', 15', 20'L X 2' and 3' wide. Customs available; stair kits/treads also available.
- Auto-resetting GFI plug-in cord set.
- Non-slip surface, resists tearing, but punctures can take out areas, not the whole mat.

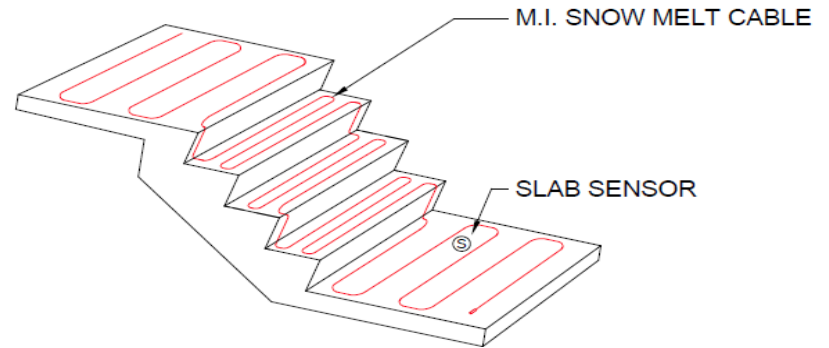
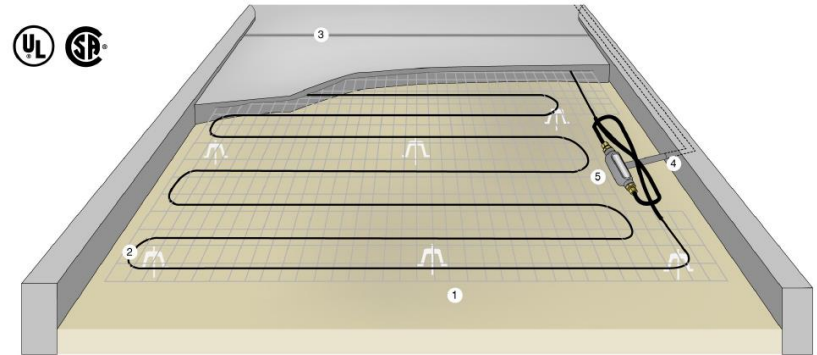
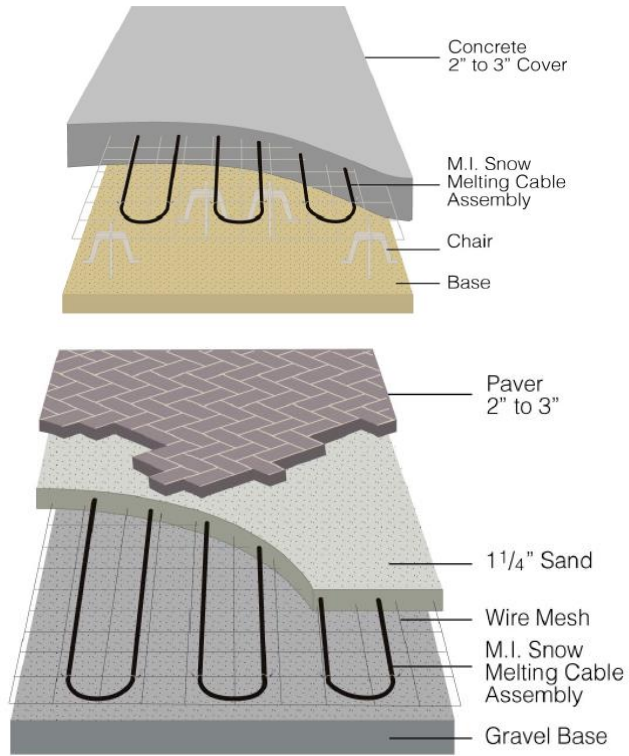


Layout Tips

- Layering the snow melting elements in the pour/pavers/etc. varies depending on the application, but the design fundamentals are the same.
 - Must be at least 2" below the surface, ideally 2.5" depth.
 - Keep cables 2-3" from edges.
 - Paver melting; ensure heat cables are buried/compacted in sand layer.
 - Using insulation board will help the overall efficiency of the system. It keeps the heat from progressing downward.
- **DO NOT CROSS EXPANSION JOINTS**
- **DO NOT LET CABLES TOUCH EACH OTHER**

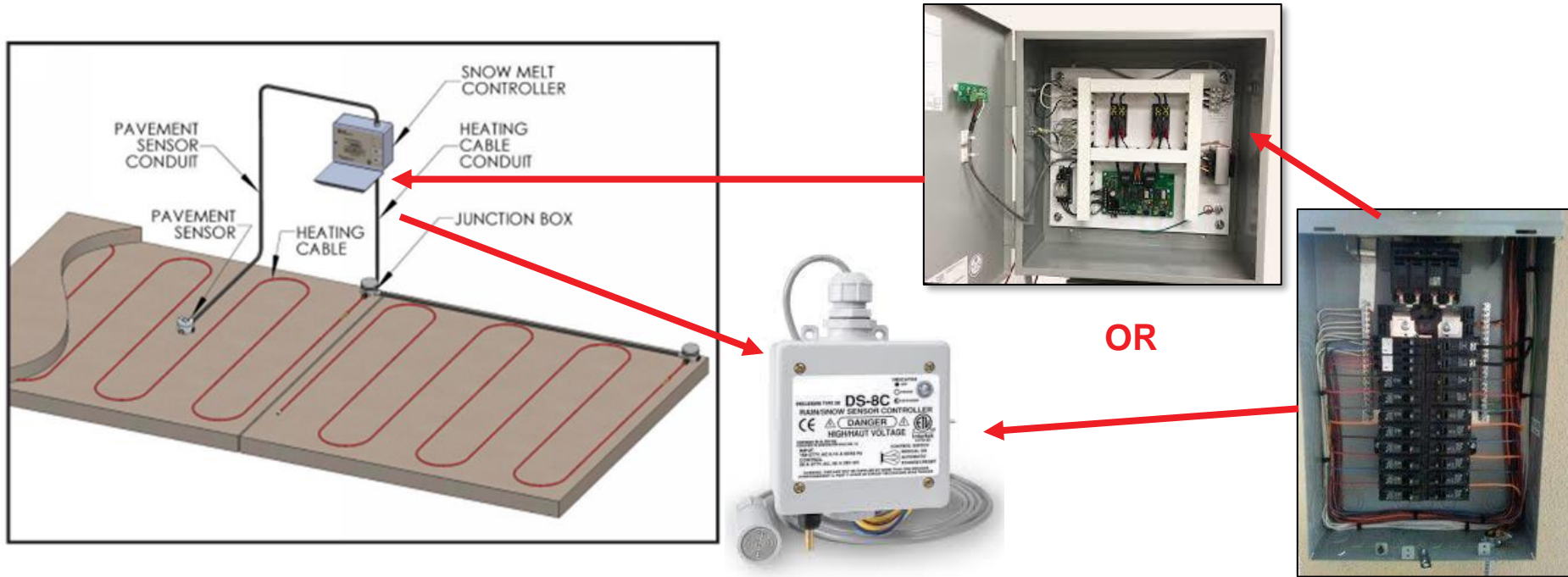


Layout Tips



Layout Tips

- System components are basic and easy to implement.



Controls

- Controls used for sidewalk and pavement melt systems are literally almost identical to roof and gutter snow melt controls. Both applications can employ:
 - Single-circuit controls for smaller areas, as long as amp load maximum isn't exceeded. **120-277V**
 - C-R panels w/controller and sensors, instead of gutter sensors, there are pavement sensors that install flush with the sidewalk and detect moisture and temp. **120-480V**
 - Breaker integrated panels, these are simply a main feed into, run low-voltage sensors into, and have alarm and BMS options. **120-480V, 600+ custom.**



A photograph of a hallway with a blue overlay containing the title 'Installation and Best Practices'. The hallway has a patterned carpet and a white door on the left. The blue overlay is semi-transparent and covers the lower half of the image.

Installation and Best Practices

Installation Tips

- Be specific when you need to on the drawing! If you leave discretion to the installer, any number of outcomes can happen.
- Usually, the greatest challenge for the installer is; **DON'T DAMAGE THE CABLE** before, during, or after.
- Get other related parties involved; masons, insulators, steamfitters, etc. Ask them to help “police” the job and help ensure the heating cables aren’t damaged.
- Installers should be reviewing the plans for installation the week prior to the work (at least) and ensure all materials are ready to go, or on-site.



Installation Tips

- Installers should be reviewing the plans for installation the week prior to the work (at least) and ensure all materials are on ready to go, or on site.
- It is a very good idea to specify that heat cable systems **MUST have meg-ohm and resistance readings recorded and submitted to GC or customer after installation** - this ensures the products were not damaged at the time of install.
- Factory, or rep start-ups are also a good idea to ensure the checklist is being followed and the job is 'blessed' by the product manufacturer.
- We all run parallel roads. Engineers, reps, logistics, and contractors all working together to do the job right and keep the customer happy!



Summary

- In summary, Electric Snow Melting systems on the roof offer building owners a kind of insurance policy against premature roof/gutter damage and mitigating dangerous hanging icicles. Roofs are a very expensive install and fix- and effectively pathing melt water off helps prolong their life expectancies and performance. The entire roof doesn't have to be done- specifically targeted areas with limited sunlight exposure are good places to start.
- Electric Pavement Melting systems are typically more cost effective and outperform hydronic systems with faster and more consistent melting. Figuring out cost per hour is easy, and there is very little maintenance. The only real downside however is how much available service/power there is in the building. By using an automatic melting system, the building owner separates away from damaging salt that destroys a lot more than just the sidewalks, and still offers a granular slip hazard.

Thank You

Check out our website at www.libertyelectricproducts.com.
For more information email sales@libertyelectricproducts.com.

