

THE MANY WAYS TO MELT SNOW

By Lawrence Drake, Executive Director for the Radiant Panel Association

The act of melting snow is a fairly simple thing. Raise the temperature of the snow above 32°F and it turns to water. It is the mechanism of getting that snow above freezing that seems to hold a lot of mystery for many in the mechanical trades. Whether your heater of choice is hot water tubing or electrical elements, there are some basic details that are common to all successful snow melting systems.

First and foremost is determining the customer's expectations. Does the customer expect the surface to always be clear of snow, or will they allow for a couple of hours of melting after a large snowfall? Typically, snow melting system expectations can be defined in Classes.

Class 1 systems allow a layer of snow to accumulate during a heavy snowfall and then melt the snow over a several hour interval after the snowfall stops or slows down. These systems typically deliver 80 to 125 Btuh/sq ft (23 to 36 watts/sq ft) depending on the location.

Class 2 systems are more typically utilized in commercial areas that must be kept clear of accumulating snow, but the pavement may remain wet. To meet the expectations of Class 2, heat delivery is generally in the 125 to 250 Btuh/sq ft (36 to 73 watts/ sq ft) range.

If your customer wants the snow to melt as fast as it falls and quickly evaporate so that the surface is dry, you may have to deliver heat from 250 to 450 Btuh/sq ft (73 to 132 watts/sq ft). **Class 3** systems are often used for helicopter pads, ramps to hospital emergency rooms, sloped pavement in parking areas, and other areas where traction is critical.

The actual heat requirements in each Class are determined by the rate of snowfall, dry bulb air temperature, humidity, wind speed and apparent sky temperature. Since these things can only be based on local or regional weather data that is often difficult to come by, much of the time this information is estimated. There are statistics available from the National Climate Data Center, which is the world's largest active archive of weather data, or publications like the ASHRAE Applications Handbook.

Once you have determined how much heat it is going to take to meet your customer's expectations, you will need to select a heat delivery system that will provide the needed heat. In the case of electric systems, manufacturers typically rate their products by watts per foot or watt per sq ft. This makes matching the electric element to the task a fairly straightforward process.

Sizing a hot water system is a bit more complex, but no more difficult than sizing a radiant system. As long as you can provide enough hot water at an acceptable flow rate in a reasonable concentration, melting will occur. The RPA Guidelines recommend that system flow rates should be based on a 25°F temperature drop from supply to return utilizing tubing that creates a flow velocity between 2 and 5 ft/sec. Tube spacing will depend on tube diameter and anticipated heat output. Class 1 system tube spacing utilizing 1/2" tube typically ranges from 9" to 12" on center. 6" to 9" is most often used in Class 2 systems, while 4" on center will most likely be required for Class 3 systems. Larger systems utilizing 3/4" tubing may be spaced slightly wider.

One other thing that is specific to hydronic systems is the use of freeze protection. Closed loop snow melting systems should contain sufficient inhibited antifreeze to maintain the solution in a pumpable fluid state at least 5°F below the lowest anticipated ambient air temperature. A non-toxic antifreeze such as propylene glycol is recommended.

The purpose of these systems is to melt snow, not heat the ground. Insulation is mandatory for a properly operating system. Losses to the ground can be up to 50%. A loss of 25% to the ground is fairly common where no insulation is used. Two inches of closed cell polystyrene foam board insulation is typically used beneath the slab. Insulation the edge of the slab is also a good idea.

In some cases where the system is designed to “idle” just above freezing, it may be desirable to use the earth beneath the slab as a heat sink. In that case, insulation can be installed vertically at the edge of the slab down to at least frost level.

Bubble foil or reflective insulations provide little insulation value under a slab, whether is a snow melting system or a radiant floor. Once the reflective surface comes in contact with the ground or the slab, it becomes a conductor rather than a reflector. Inches of encapsulated air are what insulate under a slab. At this time, polystyrene is the material of choice as long as the manufacturer recommends it for the application.

Controls can be simple or complex. Again, owner expectations are critical in choosing the proper control. If the owner is OK with a Class 1 system and wants to have full control over the system, then a simple on/off switch may be the answer. They must understand that there is a definite lag time between throwing the switch and melting snow.

Other controls include temperature, humidity and moisture sensing. They can anticipate snowfall, or “see” snow on the ground. The spectrum of control sensitivity to the environment is broad. Evaluate your customer’s expectations and then read up on the capabilities of the controls available through your chosen manufacturer.

One last thing, figure out where all that melted snow is going to end up. As long as it is liquid, it will flow until it freezes again. Does your customer want a snow free driveway with an ice skating pond at the end? Drainage can be as important as melting. Remember, once the melted snow leaves the warmer surface, it doesn’t take long for it to become hard and slippery.

Many of the tubing and electric element manufacturers offer instructions on sizing and installing snow melting systems. The RPA’s Standard Guidelines for the Design and Installation of Radiant Panel Heating and Snow/Ice Melt Systems contains much of the basic information you will need. It can be ordered through the RPA’s online store or by calling the office. For those who really want to get into the nitty-gritty of snow melting, get hold of the ASHRAE HVAC Applications Handbook and check out Chapter 50.

Do your homework before tackling a snow melting system. We get too many calls at the RPA office from homeowners and mechanical contractors alike, wondering why their snow melting system isn’t working. The answers run the gamut from no insulation to burying the tube a foot down in sand. We even hear of systems that are trying to melt a driveway with an electric water heater. Be a professional and get educated before you install a system.