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Snowmelting systems... something to consider

"Snowmelting systems have been used for many years in commercial installations such as store front walks, parking garage ramps, loading docks, etc. In these installations, the protection against slippery pavement is complimented by the elimination of tiresome and messy jobs of snow shoveling or plowing. The benefits of snowmelting systems

can carry over into the residential field quite easily. The necessary equipment for a well engineered Snowmelting system is easily adaptable to any standard hot water boiler. Two of the major limitations to wider acceptance and use of Snowmelting systems are cost and lack of proper design information. These two characteristics go hand in hand."

-1966 Bell & Gossett Snowmelting System Design Manual

Snowmelting a driveway or walkway for residences has always been considered a luxury. The perception has been that it is too expensive to install and operate. However, over the past few years, I have seen the number of snowmelt systems installed in large residential homes increase quite a bit. The scenario may be a large renovation to an existing home and they decide to replace or upgrade their driveway. On the other hand, it may be a newly constructed home and snowmelting the driveway is part of the design. Regardless of the situation, it has become increasingly common to install a snowmelt system. Unlike other traditional heating systems, with snowmelt systems, once the tubing is installed and piped, it is fairly difficult to fix a design flaw. This is why the B&G quote is as relevant today as it was 50 years ago.

Snowmelting does have some design issues as well as operating issues that both you and your customer need to discuss. First, once you get past the installation cost, the next question that is always asked is, "how much does it cost to operate?" Of course, that answer depends on a lot of issues; how much snow needs to be melted, how quickly does it need to be melted, are you "idling" the driveway at some minimum temperature, how cold is it outside? Based upon some standard conditions here in the New England area, here is an example of what it may cost to operate your snowmelt system during a snowstorm. If you have a driveway that is approximately 1,000 square feet in size and you designed your snowmelt system to provide 200 British thermal units (BTUs)/h per square foot surface area, you would need a boiler capable of providing at least 200,000 BTU/h. In our example, to melt the driveway, the snowmelt system ran for 10 hours so you burned 20 therms of gas or about 16 gallons of oil. Based on the cost of either a therm of natural gas or a gallon of #2 fuel oil, you could calculate the cost to melt the snow during that single event.

How the snowmelt is controlled plays an important part in the cost of operating the system. There are many ways of operating a snowmelt system. They can be turned on and off manually, automatically and somewhere in

between. From an economic standpoint, you want the system to start as soon as it detects snowfall and turn off as soon as the snow is melted off the driveway. This is probably the least expensive way to operate and still maintain all the benefits of a snowmelting system.

You want to have a conversation with your customer regarding expectations and perceptions on what their snowmelt system can (and can't) do. Some people think that when it starts snowing, they can invite their friends over for a snowmelt party. You want to make sure they understand there is a "time-lag". It takes time for the snowmelt system to heat up the slab and bring it up to the set melting temperature. Once it reaches the melting temperature, the system will continue to run until the automatic snow/ice sensor senses that it is dry and shuts the system off until the next snow fall. This operation may last 4-5 hours and quite possibly longer depending upon the amount of snowfall and the outdoor temperature. You want your customer to understand this up front before the first snowfall.

Sometimes, in some applications (usually commercial and industrial) they can't wait that long for the snowmelting system to activate. Instead, they operate the system in what's known as an "idling" condition. Most snowmelt controls have a feature where you can set the snow/ice sensor to maintain the slab at some minimum temperature, typically 28-30°F. This gives the snowmelt system a running start so that when the snow begins to fall, the slab does not have to be heated from a cold starting point. This of course costs money, which makes sense when you think about it. You are heating a slab all the time, so regardless of outdoor temperatures and wind speeds, you are "pumping" BTUs into the ground. This is another thing your customer needs to know when discussing their expectations of the system. In a residential application, a snowmelt system is a convenience item. You don't have to wait for the plow guy to show up, you don't have to shovel the driveway, you don't have to salt your driveway and walkway and the system can start and stop automatically. However, it does take some time to get up and going before the melting starts.

From a design standpoint, you can use any of the reputable radiant tubing manufacturers or their representatives to help you in designing and laying out the system. They will be able to help you in calculating the actual load, selecting the right size and amount of tubing, the best way to layout the tubing, what the design water temperatures should be as well as a control and piping strategy to operate the system.

In general, there are a few design issues you want to be concerned with. The first issue is whether you are going to use the existing boiler to melt the snow. Does it have the capacity to handle this extra load? If not (more than likely the case in most systems), are you going to dedicate a boiler to just snowmelt? This does happen often, but I think a better design is to add the additional boiler to the existing boiler, piped as a multiple boiler plant. Then by adding a small plate & frame heat exchanger, which is dedicated to the snowmelt system, you can have back-up capabilities, rotation and all the other features that come with a multiple boiler system.

When the snowmelt system first turns on, it is very important that the slab/driveway does not get “shocked” with hot water. The control system has to monitor the heat

input to the slab in a controlled manner to protect the slab. If not, the driveway will possibly experience cracking. The same issues exist in the boiler room. It is important to prevent large slugs of extremely cold water from entering the boiler(s). This could cause thermal stressing and eventual cracking of boiler sections. If standard, non-condensing boilers are used, the control system has to prevent flue-gas condensation from occurring for extended periods of time. If not, the system will “rot” out the flue piping and eventually the cast-iron sections. All of these issues can be handled easily with proper piping and a proper control strategy. Again, something that the radiant tubing manufacturers deal with in every system they design.

If you have any questions or comments, e-mail gcarey@fiainc.com, call 1-800-423-7187 or follow me on Twitter at [@Ask_Gcarey](https://twitter.com/Ask_Gcarey).

PS: I want to wish a Merry Christmas and a Healthy and Happy New Year to all of our *ICM* subscribers. May the heating season be healthy and prosperous for every one of you! **ICM**

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