

FROM THE FIELD

The cold, hard truth about snowmelt systems: what they didn't tell you in class

BY DAN FOLEY CONTRIBUTING WRITER

Washington, D.C., is not exactly the Arctic Circle, but we have installed a surprising number of snowmelt systems over the years, everything from walkways and front steps to a 28,000-sq.-ft. driveway and parking pad. I have approximately 40 systems installed over the past 20 years.

We typically get three or four snowstorms a year and a good ice storm every couple of years. Two years ago, we had the epic two- and three-foot dumps one week apart that practically shut down the city. While hardly a necessity, these systems do come in handy several times a year.

Our clients choose snowmelt systems for several reasons. Steep driveways are one. Another client had a heart condition that did not allow him to exert himself shoveling snow. We had a doctor that had to be able to get out of his driveway in any weather condition. Most often, we install it under driveways that would be difficult

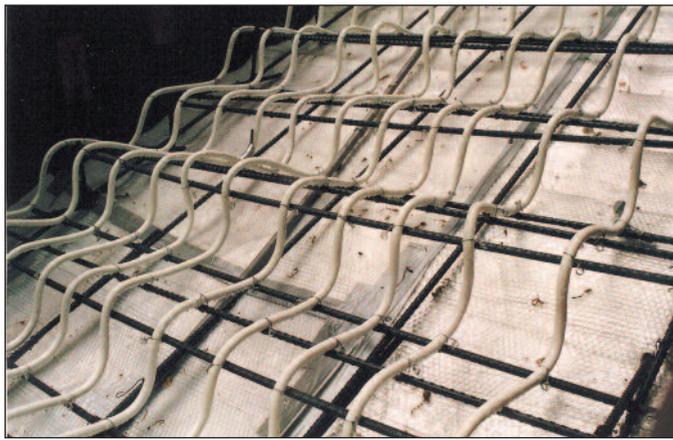


Photo 1: This snowmelt innovation runs Multi-Cor PEX vertically down the steps and forms the bends such that the entire step is covered. **Photo Credit: John Abularrage.**

to plow or shovel; cobblestone, brushed aggregate, stamped concrete and limestone drives are among several that come to mind.

Mostly, we install these for clients because they want them and have the means to pay for them. No question, it is (for the most part) a luxury that the majority cannot afford. There are exceptions to this, such as commercial jobs, but most of our jobs fall into the luxury category. They are expensive to install and consume huge amounts of Btu. There is nothing "green" about a snowmelt system. Even on our largest residential projects, the snowmelt boiler or boilers dwarf those that heat the home.

I have made every mistake you can make designing and installing these systems and have learned from these mistakes. Hell hath no fury like a homeowner who just paid big bucks for a snowmelt system and finds that it doesn't work when it finally snows. The conversation goes something like this: "Hey Dan, get your butt over here

and fix your snowmelt system that does not work. And bring your snow shovel!"

Then you spend a couple of hours driving 20 miles an hour through blinding snow to fix the problem. If you are lucky, the equipment is installed in a garage or basement, out of the snow, where you can at least warm up and think straight. If not, you are outside, trying to remember where you installed the snow sensor or lying in the snow, digging down to the cover of manifold boxes or trying to figure out why the boiler is not lighting.

Here is what I have learned from 20 years of installing snowmelt. Insulate the slab. Response time is critical. When snow or ice covers the driveway, you want it gone as quickly as possible. You can debate Class I vs. Class II vs. Class III systems and response time with your client as his driveway resembles the Verizon Center hockey rink. Let me know if your conversation went any better than mine did.

You want the energy of the system directed upward to melt the snow. You do not want to spend the precious Btu heating crushed rock, gravel and earth below the slab, where it does no good. We always specify 2" extruded polystyrene insulation (Dow Blue and Styrofoam Pink are two products we use). Bubble wrap and reflective foil are a waste; use these products at your own peril. You need the R-Value of a good insulation product in this application.

Short loops, large diameter. We typically use 3/4" PEX at 9" centers on our driveways. We keep loop lengths at 300'. Ice cold glycol is difficult to pump. I use 5/8" PEX for applications that require 6" o.c. spacing but use shorter 250' loops. I only use 1/2" PEX on steps, where it is very difficult to get the larger PEX to bend tightly and keep the loops short, 200' or less. These are just guidelines. Each job is different, so doing an accurate design is a requirement. I use three software programs: Wrightsoft Right-Suite Universal, Uponsor ADS and LoopCAD. If you are uncomfortable using the software products available, all the tubing manufacturers will assist with design.

To keep loop lengths short, we try to mount the manifolds remotely as close to the driveway as possible. This minimizes the "wasted" tubing leaders to/from the drive. After experimenting with plastic irrigation boxes with mixed results, we have shifted to the concrete vaults used by utilities. Quazite is a good one that we have used for the last few years. Yes, they are heavy and more expensive than the plastic boxes, but they hold up better to the jobsite abuse they will see from the final grading, landscaping and maintenance.

Steps are always a challenge. It is difficult to get the



| FROM THE FIELD | CONTINUED FROM PAGE 64

tubing in place, especially when it is cold out and the tubing is stiff. We try to get a loop (two passes) in the tread and a pass of tubing in the vertical riser. It is hard to get tubing close to the leading edge of the step where ice will accumulate. My friend and fellow columnist, John Abullarrage came up with a brilliant innovation where he ran Multi-Cor PEX vertically down the steps and formed the bends such that the entire step was covered (See photo 1).

Boilers. If at all possible, find an indoor location to mount the boiler(s) and pumps. I realize that mechanical space is at a premium. Three of my snowmelt projects have outdoor boilers. I was out on one last year during blizzard conditions. It was dark, cold and snowing sideways. I was lying in a snowbank with a mini Mag-Lite clenched in my teeth trying to read a wiring diagram. This is no way to work on a boiler. We have one current



project in progress with an outdoor boiler, but this will be our last. I'm getting too old for this!

In all but the smallest jobs, we have a dedicated snowmelt boiler or boilers. Except for the outdoor boilers, we only use condensing boilers for snowmelt. This eliminates the thermal shock and condensing issues that have to be addressed with non-condensing equipment. Condensing boilers thrive on the low return water temperatures and will operate at peak efficiency in snowmelt applications.

This leads to the issue of "thermally shocking" a snowmelt slab. I imagine that in certain commercial applications, with industrial horsepower boilers and pumps, it is possible. In a residential application with a properly sized boiler, it is all but impossible. It just is not possible to raise the slab temperature fast enough to thermally shock it. The system quickly establishes equilibrium and the temperature rises very slowly.

For example, last winter we installed a system in a 1,400-sq.-ft. residential driveway. The 3/4" tubing was installed in a 4" base slab of concrete on 9" centers. Granite cobblestones were then laid into a mortar setting bed. The entire structure was about 10" to 12" thick. I roughly calculated the entire mass at over 100 tons. This mass is a black hole to Btu. With a properly sized boiler and pump, it just is not possible to change the temperature quickly enough to cause thermal shock.

On this job, we installed a 250,000 Btu Triangle Tube condensing boiler. It was piped through a hydraulic separator with a separate boiler and system pump. As an

experiment, I turned the system pump off until the boiler cycled off on limit, 155 F in this case. I then turned on the system pump to see what would happen. Within seconds, the boiler temperature dropped enough to kick on the burner. In less than a minute, the boiler temperature was the same as the initial start-up temperature, with no temperature change in the slab.

I can sum up my experience thusly: I want as much heat as possible to flow into the slab as quickly as possible. I have no interest in maximizing efficiency or "saving" energy (there is nothing to "save"). My only goal is to make the snow or ice disappear as fast as possible. With dedicated condensing equipment, it makes no sense to try to temper the supply water temperature.

Controls. Almost all of our systems have a snow/ice sensor tied to an operating control. This will automatically activate the system when snow or ice is present. It will also have a slab sensor to turn off the system when the slab is up to temperature, typically 38-40 F. We also incorporate a "manual on" switch to manually activate the system in the event of a sensor failure or to preheat the slab in advance of an oncoming storm. We use a 12-hour spring wound timer switch to avoid the astronomical fuel bills caused by a system that was accidentally left on (Yes, this has happened to me). I also incorporate a "manual off" or disable switch to kill the entire system if the owner does not want it to operate. A simple three-way toggle switch with "off-auto-on" points would serve the same purpose.

The snow/ice sensors have proven to be the Achilles heel of these control systems. We have seen an unacceptable failure rate of these sensors. One manufacturer had the audacity to inform me that the failure was caused by water getting into the sensor. Really? Memo to manufacturer: these sensors are installed OUTSIDE! We finally found a sensor that would hold up to the elements, made by Caleffi, only to find out it was discontinued. Just my luck. I would be curious to hear what my fellow contractors are using.

We recently completed a system with a networked control system (Uponor CCN). I call these control systems DDC-Lite. It gives you most of the functionality of a commercial DDC system at a fraction of the price. These controls allow remote access, activation and monitoring of the snowmelt system from your office or anywhere with Internet access. I can remotely activate the system in advance of a storm, monitor it to see if it is functioning properly and locate failure points before leaving the shop. A scaled-down version of this system designed specifically for snowmelt systems is on my wish list.

If you are in the snow belt, snow/ice melt systems can be a profitable niche. Design and install them right or you will regret ever taking the job. Done right, and priced accordingly, there is nothing more satisfying than driving by one of your snowmelt projects and seeing a clear, dry driveway, while the neighbors are breaking their backs shoveling their drives. ●

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