

Shakeout Time

By John Siegenthaler, P.E.

The winter of 2004 was one of the coldest on record in much of the Midwest and Northeastern United States. I can remember feeling upbeat during one January arctic intrusion in upstate New York when the high temperature for the day made it above 0 degrees F. The day before it never made it above minus 4 degrees F with lows in the range of minus 30 degrees F, and that's without wind chill. Yeah, I know you guys up in Fairbanks had it worse, but these temperatures really sting in locations where ASHRAE outdoor design temperatures range from 5 degrees F to maybe minus 5 degrees F.

I don't think it's possible to be in the heating business and not lay awake on bitterly cold nights thinking of what the following morning will bring. For many heating contractors this past winter, those mornings brought nonstop service calls, a small percentage of which were actually profitable (fixing someone else's mistakes). For too many, these mornings brought an onslaught of expensive callbacks associated with inadequate heat delivery. Without a doubt, the winter of 2004 shook out lots of marginally performing heating systems that might have limped along through more typical winter weather.

This Has To Stop!

Most of the SOS calls I received this winter involved under-performing radiant floor heating systems, the vast majority of which used "plateless staple-up" tubing installation such as shown in Figure 1.

I discussed and visited several jobs with tubing stapled to the bottom of the subfloor, sides of the floor joist, and flanges of the I-joist framing. Many of these jobs also lacked adequate underside insulation.

At one point I almost wanted to play a game called "Let me guess how your radiant heating system is installed" when a new call came in. Tubing stapled to floor framing — you don't say. No aluminum "reflector" plates over the tubing — just a lucky guess. Your basement is really warm, but the upstairs won't climb over 55 degrees F — what a coincidence.

I admit to enjoying the technical aspects of forensic engineering on hydronic systems. Listening to the symptoms, examining the schematics, feeling the pipes, following the heat, it's as close as I'll ever get to being Sherlock Holmes.

On most jobs the major problems reveal themselves quickly, as do ways of correcting them. After this, it's time to communicate the findings to the building owner, and that's something I definitely don't enjoy.

Who would enjoy telling the thoroughly frustrated and shivering owner who spent \$25,000 on a supposedly "fully engineered" hydronic radiant heating system that the corrections may cost another \$10,000 and require major disruption of the building? Who can't imagine the sinking feeling in their stomachs when they hear this? Who wants to be present when their justifiable anger at those who designed or installed such a system kicks in? Especially when the designer/installer simply breaks off communication with the owner — as happened in one of the projects I heard of this year.

Can you really blame an owner for seeking legal redress in such a situation? Can you really sympathize when 1-800-LEGALEAGLES successfully prosecutes the responsible parties? Can those who choose to do radiant heating correctly assume such a problem will correct itself before individual litigation gives way to class action lawsuits?

More Venting

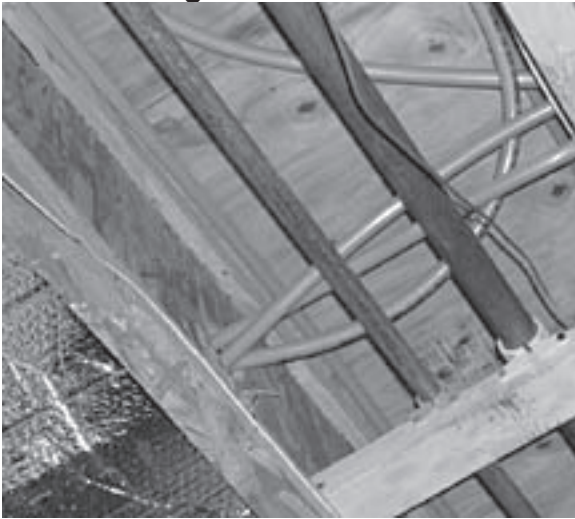


Figure 1

Back in July 2002, I vented my feelings on plateless staple-up systems in a PM column titled “Plateless In Radiantville.” I wrote about it then because I was concerned that inappropriate use of plateless staple-up was setting up individuals, as well as the radiant heating industry, for major problems. Based on what I experienced this past winter, I don’t think the people who needed to hear this message were listening.

Whoever is promoting the concept of simply tacking tubing to the side of floor joists in a wide variety of situations is causing serious and irreparable harm to the radiant heating industry. I for one am tired of uninformed or apathetic tubing suppliers promoting this method of installation, especially to untrained novices that accept it on good faith.

I’m weary of hearing laments such as “Joe at the supply house said this would work,” or “The other guys all do it this way — how else can I compete?” or (one from this last winter) “I’ve done it this way on a hundred jobs and it’s always worked.” If only that last fellow hadn’t pushed it to job No. 101 where the laws of physics apparently came back into play.

There is nothing magical about PEX, PEX-AL-PEX, copper or rubber tubing that lets them sidestep the laws of physics. A tube tacked to wooden framing does not constitute conditions favorable to heat transfer. Think of it as thermal constipation. The heat is in the tube, but has a very hard time leaving.

This situation is only exacerbated by low flow rates (such as when eight zone circulators and eight manifold stations are supplied through a single 3/4-inch three-way thermostatic valve — true story). Mix in very poor underside insulation (such as 3/8-inch beadboard tacked to the bottom of the joists — another true story) and you might as well start handing out the earmuffs.

Every time one of these jobs comes to my attention, I ask myself the same question: Why do those who make the recommendations on tubing installation condone this method of installation? Do they plan to sell a few containers of tubing and then “get out of Dodge” before next winter? Do they only care about today’s sale rather than carving out a reputation for quality and enjoying the repeat business this always brings? Do they even understand basic heat transfer?

Questions For The Experts

If you’re involved with the design or installation of hydronic radiant heating, I recommend asking the following questions of your tubing supplier:

1. If you, as a tubing supplier, advocate plateless staple-up installation, will you back up the stated performance financially if it doesn't perform as you've indicated verbally or through computer printouts?
2. Will you sell tubing to an installer who indicates it will be used in a plateless staple-up job?
3. Can you show me documented third-party testing or accurate thermal modeling that demonstrates the claimed heat output of the plateless staple-up configuration you are advocating? The performance of hydronic baseboard is verified on a periodic basis by impartial testing; why shouldn't radiant circuit performance have similar impartial ratings?
4. Can you explain what the aluminum "reflector plates" that some installers use in staple-up applications are for? Why aren't they needed in plateless staple-up jobs?
5. Why do I even need underside insulation since everyone knows that "heat rises?"
6. Does it make a difference if the tubing is stapled to the sides of the floor joist vs. the underside of the subfloor? If so, what is the difference?
7. Would you install the tubing in your own house using the plateless staple-up approach?

Draw your own conclusions based on the answers you receive. As you do, remember that you're not just deciding where to buy tubing, you're selecting a business partner that should have the same goal of supplying your customer with a quality heating system. Most manufacturers and suppliers are glad to be your partner at the time of sale. Will they remain your partner if their recommended approach comes up a bit short on one of those cold nights?

Does Plateless Have Any Place?

In the interest of fairness, yes it does. Tubing stapled at 8-inch centers directly to the bottom of a wood subfloor can provide limited heat output sufficient for floor warming, with the balance of the load handled by properly sized supplemental heating.

I suggest limiting what you expect from such an installation to no more than 15 Btu/hr./sq. ft. with total floor resistances not exceeding 2.0 degrees F•hr.•sq. ft./Btu (including the subfloor). This limited output might be sufficient for a well-insulated home in a mild winter climate, but it's not going to cut it for a ski chalet with 25-foot-high ceilings and a gable full of glass in Vermont.

My candid advice to newbies in hydronic radiant heating is to avoid plateless staple-up installations altogether. The possibilities for underperformance and the ensuing costly corrections are just not worth it.

My candid advice to those who aren't willing to learn how to do radiant heating correctly is to not do it at all. Leave the market intact for those who choose to do it properly.

There's more to radiant heating than a coil of tubing and a staple gun. When done correctly, it provides tremendous satisfaction to those who live with it as well as those who install it. When radiant design and installation is based on "black magic" rather than solid physics, there's often a (really) high price to be paid. Do you want referrals to future customers, or will you need referrals to local defense attorneys? At least for the time being, it's still your industry and your choice.

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