CONTRACTOR®
THE NEWSMAGAZINE OF MECHANICAL CONTRACTING
Reprint from October 1995

Install 'dry' radiant heating properly, or don't install it

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THREE BASIC DRY installation techniques commonly used in the industry:

Tubing on top of subfloor with aluminum heat transfer plates.

Tubing below the subfloor with heat transfer plates and.

Tubing below the subfloor without heat transfer plates.

The first method is the most labor intensive, but the best in terms of performance of all dry systems.

In order to apply the tubing on top of the subfloor, you have to cut plywood sleepers to cover the entire subfloor to accommodate the tubing and its aluminum heat transfer sheeting. You're creating a radiant heating underlayment system, ready to receive the finished floors.

The main advantage of this method is that it has the best heat transfer. You reduce the R-value of the floor "sandwich" above the aluminum sheeting to a minimum. The tubing is always fully exposed, which is especially important when nailing hardwood floors over it.

Wall to wall carpeting, in most cases, can be installed directly over the system with an appropriate padding. Linoleum, ceramic tiles and natural stones require a thin concrete board over the tubing sleeper system.

This type of sleeper system has to be either custom-built by a carpenter on the job site (who is usually hired by the general) or you can buy a pre-fabricated underlayment system. By using the pre-fabricated system, the heating contractor can supply the complete modular system himself.

The second method - below the subfloor with heat transfer plates - is primarily a retrofit method where finished floors exist and cannot be disturbed.

The staple-up method totally disregards the basic laws of physics just for the sake of selling cheap systems.

The subfloor must be fully accessible from between the joist structure, i.e., first floors with full basements or accessible crawl spaces.

One negative is the additional R-value of the subfloor, especially in older structures which may have heavy pine board flooring and/or built-up layers of old underlayments. They can severely impede heat transfer, resulting in insufficient Btuh output during design conditions. It is therefore important to accurately calculate the actual existing R-value of the floor sandwich to determine if supplemental heating is necessary.

If you use the below-subfloor method in new construction where hardwood strip flooring is to be installed, always install the tubing after the floor is nailed down or you'll own a sprinkler system.

Always insulate with R-19 minimum between the joists, regardless of whether the tubing is below the subfloor or on top of it. You want to reflect the heat up.

The last installation method, also called the staple-up method, where tubing is stapled directly to the subfloor or, even worse, to the side of the joists without using heat transfer plates, is a truly American phenomena. The staple-up method totally disregards the basic laws of physics just for the sake of selling cheap systems. This is like installing copper fin tube without the fins.

The result is insufficient heating output in cold weather. The system

runs at very high water temperatures, which defeats the principle of radiant heat as a low temperature system and associated system efficiencies. Staple up systems generate expansion and contraction noises, not to mention a large group of dissatisfied customers.

Never install tubing without heat transfer plates and consult your systems manufacturer for proper recommendations.

The purpose of an aluminum heat transfer plate between the tubing and the wood frame structure is different from aluminum fins on copper baseboard. Baseboard fins are designed to promote convection heating. Heat transfer plates are designed to heat the floor structure by conductive heating.

Remember, we want to heat up the floor structure to transfer the heat from tubing to the structure more efficiently. That's why you need the tubing right up against the floor with a heat transfer plate and R-19 insulation behind it.

If you heat an air gap between the subfloor and the insulation you'll never get enough heat transfer to the floor at low system water temperatures to heat the structure. Air is a perfect insulator

It's hard to believe that the staple-up method is a very common installation method, all in the name of cost. You only have one chance to do it right. Please don't use this method. Use the aluminum heat transfer plates that are available.

Do dry radiant systems right or don't do them at all! Floor heating will always be more expensive.

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