

Tile and natural stone provides the coldest sensation out of any of the common finished floor materials. By incorporating a radiant heat system under the tile, a luxuriously warm finished floor that will greatly enhance the comfort and value of your home will be the end result.

The following information provides a basic overview of the design and installation needs and concepts for STEP Warmfloor™ systems installed in tile or natural stone floors.

Element Spacing

Due to the high thermal conductivity of tile, the STEP Warmfloor™ heating elements should be installed with a maximum 3-inch spacing between the elements. Tile conducts the heat vertically from the elements so fast that the heat does not transfer very far laterally within the floor. An element spacing that is larger than 3-inches will have a cold stripe down the center of that spacing. This will result in undesirable performance for the customer. A spacing tighter than 3-inches, even down to 1-inch, is used to provide a very even floor surface temperature and to increase the floor response time to temperature changes in the room.

Thermal Insulation

The high rate at which tile transfers heat makes thermal insulation selection very important to ensure proper performance. Without the use of insulation, cold stripes may be evident even with tight element spacings.

Please note that the incorporation of insulation into the layers of a finished tile floor is difficult at best. Issues such as insulation

compressibility that will result in the eventual failure of the tile floor are a concern. The location of thermal insulation is usually underneath a plywood subfloor or around the perimeter of a concrete slab. As a minimum, you need more R-value below the elements than above.

Refer to the STEP Warmfloor™ Design Note on thermal insulation for additional information.

Membranes

Many types of membranes are used with tile and natural stone installations. Vapor, cleavage, isolation and waterproof membranes are some basic examples. Do not use an asphalt or butyl rubber based membrane in conjunction with the heating elements. Those types of membranes can be chemically aggressive and can cause failure of the heating elements. The use of polyethylene sheeting is recommended.

In addition, metal sheets or pans are occasionally used as a membrane or structural layer in showers. The STEP Warmfloor™ installation instructions specifically states to “not place the heating element in direct contact with any conductive material or in indirect contact through metal fasteners.” If metal sheets or pans are to be used, ensure that the heating elements are electrically insulated from the metal with the use of thick polyethylene sheeting and that non-metallic fasteners are used to attach the heating elements.

Floor Layering Options

The four most common installation methods we see are:

- Cement backer boards

- Self-leveling compounds
- Double mortar beds
- Thick-set mortar beds

Each method has its own benefits for various installations. The installation of a tile floor has many considerations that have to be taken into account to ensure a long life for the finished floor. These considerations involve the finished floor materials and the load rating for the finished floor more than with the incorporation of a STEP Warmfloor™ product into that floor.

Make sure that all manufacturer's instructions and requirements are followed for all products used in the finished floor, especially any curing times required before energizing the heating elements.

Cement Backer Board Method

This method entails installing the STEP Warmfloor™ heating elements directly onto the subfloor. Attach the elements to the subfloor and install the extension wires per the manufacturer's installation instructions. To provide a flat and level surface for affixing the tile, install cement backer boards over the heating elements and extension wires. To create a solid homogeneous layer between the subfloor and cement backer boards, install a layer of thinset over the heating elements before screwing down the cement backer boards. When screwing down the backer boards, make sure you do not penetrate the bus wires embedded along the edge of the heating elements or the extension wires. Using a chalk line, mark the bus wire and extension wire locations on top of the cement backer boards and screw everywhere but there. The tile is

then installed on top using a latex-modified thinset.

Self Leveling Compound Method

This method entails installing the STEP Warmfloor™ heating elements directly onto the subfloor. Attach the element to the subfloor and install the extension wires per the manufacturer's installation instructions. To provide a flat and level surface for affixing the tile, pour a self-leveling compound over the heating elements and extension wires. Once this compound has cured, the tile can be installed on top using a latex-modified thinset.

Double Mortar Method

Layout the STEP Warmfloor™ heating elements on the subfloor. Make all the electrical connections to the extension wires and attach the wires to the floor per the manufacturer's installation instructions. Leave the heating elements un-attached to the subfloor. Roll the elements up towards the element end that has the electrical connections to expose the subfloor for mortar placement. Trowel a layer of mortar directly onto a small section of the subfloor. Roll the element back into place into the mortar. Trowel another layer of mortar directly over the heating element. Install the tile into the top layer of mortar. Repeat this process as you progress across the floor. Do not

let the bottom layer of mortar set up before you install the heating elements and top layer of mortar.

Thick-Set Mortar Bed Method

This method can also be known as a thick-bed or mud-bed installation. This method may either be "bonded" by setting it directly on the subfloor, or "floating" by using a cleavage membrane directly on top of the subfloor. The use of a lathe or mesh material is required for the structural integrity of the mortar bed. The end result is a 1-1/4 inch to 2-inch thick mortar bed as the final surface for the tile placement.

This method offers the most challenges for the installation of an electric floor radiant heat system. The lathe or mesh to be used in the floor must be non-metallic if it will contact the heating elements. Also, the mounting location of the elements must not interfere with the proper function of the cleavage membrane.

We are aware of two basic methods that have been employed. The first method involves the placement of the heating elements and extension wires on top of the cleavage membrane. The lathe or mesh is installed over the heating elements and the full thickness of mortar is packed into the lathe / mesh. The second method also involves the

placement of the heating elements and extension wires on top of the cleavage membrane. An approximately 3/4 inch layer of mortar is placed on top and allowed to partially or completely set up. Lathe or mesh is then installed over the first mortar bed and an additional layer of mortar is added on top to reach the desired overall thickness of the mortar bed. In the second method, metal lathe or mesh could be used as long as the heating elements are completely covered by the first layer of mortar. Upon completion of the mortar bed, the tile can be installed on top using a latex-modified thinset.

Resources

Various resources are available to guide you, your architect, and your builder in selecting the correct tile installation method for your system. The STEP Warmfloor™ Handbook has some basic guidelines and suggestions. Your STEP Warmfloor™ or tile distributor/retailer may be able to offer assistance. The Tile Council of America (www.tileusa.com) publishes a Handbook for Ceramic Tile Installation that details various installation methods and options. Also refer to your local codes as they may have requirements that specify acceptable tile installation methods.

WARNING:

As new products continuously enter the market, it is very important to identify the composition, chemical behavior and compatibility of all ingredients and building materials used in an installation. STEP Warmfloor™ must not be in direct contact with any conductive material or installed with aggressive solvents, acids or adhesives.



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