



warmboard®
RADIANT SUBFLOOR

Installation Guide



ATTENTION: Approved tubing list on page 3.
Please review before purchase. For questions call 1-877-338-5493.

Revised August 1, 2010



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12 Important Installation Highlights

1. Review the Warmboard supplied Auto Cad drawings. Check and confirm floor plan dimensions, joist, or Trust Joist International (TJI) layout.
***Note:** Verify that the joist (TJI) direction and location of the pull are correct.
2. Review the Warmboard shop drawings: some of the tubing loops may need to be installed before walls are framed and some after framing. If you are not familiar with the installation timeline of this process, please call us for assistance. After tubing is installed and roof sheeting is framed, we recommend installing temporary masonite or lauan in the high traffic areas of the home. Remove the protection when the finish floors are ready to be installed.
3. When installing panels, gap 1/8" on the 4' butt side. This gapping is not necessary on the tongue and groove side of the panel.
4. Use the Warmboard provided alignment pins when installing panels (see page 6).
5. Use Pex Aluminum Pex tubing only. Use nail plates to hold down tubing on turn panels and remove them before the installation of finish floors (see our approved tubing list on page 3).
6. Do not exceed a 300 foot tubing length when a field revision is required.
7. Custom routes require a 1-1/2 horsepower router minimum. A Porter Cable router will interface with the Warmboard provided template guides. Do not attempt a custom route without the proper template guide attached to the router (see page 7).
8. Our Warmboard system (and the entire radiant industry) requires the surface temperature of the finished floors not to exceed 85° (see pages 29 and 30).
9. Try to avoid exposing the panels to rain or snow, otherwise "edge swelling" may occur. If "edge swelling" does occur, the panels will return close to their original dimensions once the increased moisture content subsides.
10. When Warmboard is being installed over joists, a minimum of R19 insulation is required underneath the panels to prevent downward heat loss.
***Caution:** If installed panels have been exposed to rain, do not install subfloor insulation until panels have returned to a moisture content that is acceptable.
11. Review the installation manual before installing finish floors (see pages 11-24).
12. Call Warmboard at (877) 338-5493



Approved Tubing List

**Warmboard is approved to interface with 1/2" Pex Aluminum Pex Tubing
Also approved Uponor 1/2" hePEX (**manufactured after 3/12/10*) see note below.**

The tubing types/brands listed below are approved for use with Warmboard panels:

Barrier PEX Tubing 1/2" I.D.:

- AIM- Pex Aluminum Pex
- Allied Pipe Systems- Pex Aluminum Pex
- Aqua Therm- Pex Aluminum Pex
- ComfortPro- Pex Aluminum Pex
- EHT (Efficient Heating Technology)- Pex Aluminum Pex
- Excel- Pex Aluminum Pex
- Henco- Pex Aluminum Pex
- Hydro-flex- Pex Aluminum Pex
- HYDRONX- Pex Aluminum Pex
- Inferno- Pex Aluminum Pex
- Infloor Heating Systems- Pex Aluminum Pex
- Mr. Pex- Pex Aluminum Pex
- RHT- Pex Aluminum Pex
- Roth- Pex Aluminum Pex
- Uponor- hePEX
- Uponor- Multi-Layer composite tubing (MLC) Pex Aluminum Pex
- Watts- Pex Aluminum Pex
- Weil-McLain- Pex Aluminum Pex
- Zurn Alumicor- Pex Aluminum Pex

CAUTION!

Viega Fostapex is not approved, the diameter is too large to fit into the Warmboard groove.

Notes about Pex Aluminum Pex:

Other brands of Pex Aluminum Pex may be acceptable. Please check with Warmboard's Technical Department.

Silicone or other types of adhesives are not necessary to use when installing the hePEX or Aluminum Pex Tubing.

Use nail plates to hold down tubing in channels and remove them before the installation of finish floors.

**To confirm that the hePEX tubing is manufactured after 3/12/10, find the "NOT FOR POTABLE WATER" labeled on the tubing. Check the number that begins with two letters (example UB13100330). The last six digits of this number should be 100312 or greater.*

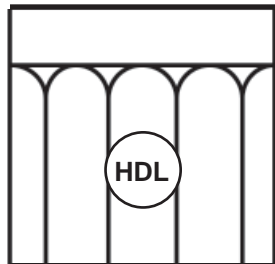
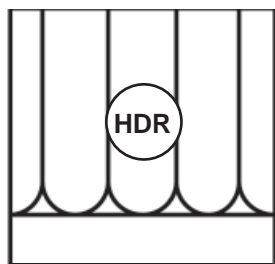
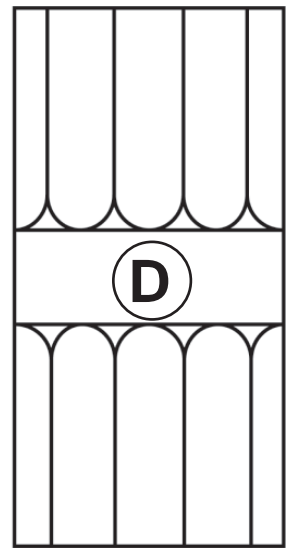
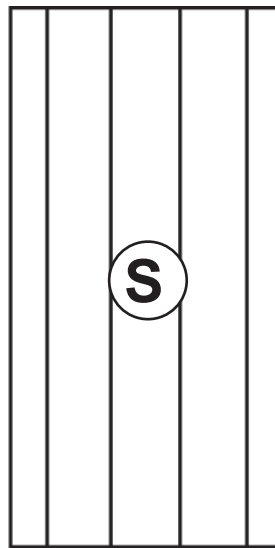
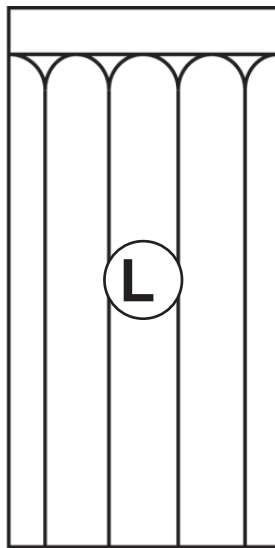
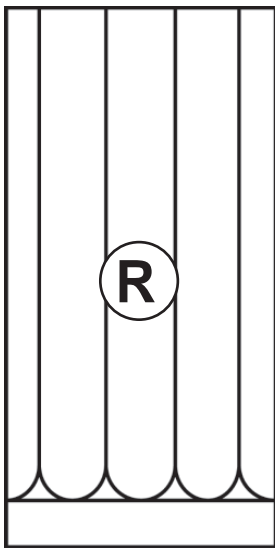


Panel Types

Read all instructions thoroughly before beginning installation.

Review Warmboard supplied working drawings including floor plan dimensions, joists or TJI layout.

The following are six panel types used on a Warmboard installation:



Warmboard Panel Types	
S	- Straight
R	- Right
L	- Left
D	- Double
HDL	- Half double left*
HDR	- Half double right *
* Created by cutting a standard double panel in half.	



Tools Needed



Warmboard Installation Kit contains:

- 3 - Custom routing templates/guides (wood)
- 1 - 5/8" router bit
- 2 - Alignment pins (metal)
- 1 - Porter Cable template guide
- 1 - Porter Cable guide lock nut

Other materials and tools needed on site:

- Porter Cable router, 1-1/2 horsepower minimum required
- Electrician nailing plates
- Heavy roller (typically a linoleum roller)
- Warmboard approved Pex Aluminum Pex
- Shop vacuum
- Drill motor with a 1 1/4" drill bit
- Pex tubing cutter
- Felt tip marking pen
- Warmboard Panel and Tubing Plans
- Tubing un-coiler
- 4" grinder or dremel



Fastening Warmboard to the Joists / Tubing Preparation

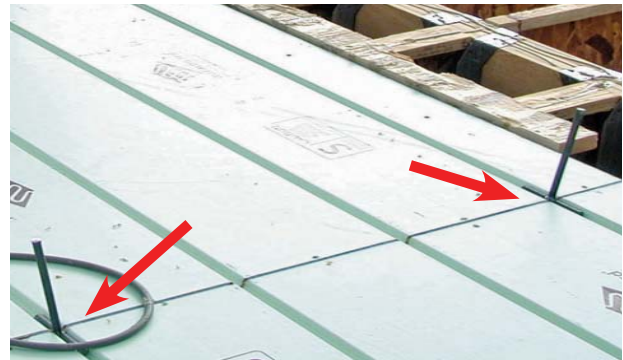
Customary subfloor installation practice is generally followed. For traditional joist application, fasten with panel adhesive and 2-3/4" screws, ring shank nails, or 10 D common nails. Please apply common sense when sizing fasteners for TJI's or Truss systems. When sizing a nail or a screw for a TJI or Truss system size the fastener in order to grab as much flange as possible. Do not size a nail or screw that will penetrate the bottom side of the flange. **Always refer to architectural specifications on the nailing pattern. If not specified, APA (American Panel Association) recommends a 12" inside, 6" edges pattern.**



As sheets are placed, alignment pins are tapped into place on the two outer most channels, across the seam between the adjacent panels, to ensure proper channel alignment (see photo). Pay close attention to the panel layout plan as the work proceeds. Per APA guidelines all subfloor panels, including Warmboard, should be gapped 1/8" on the 4' side.

Panel preparation prior to installing the tubing:

Using a felt tip marker, and as per the tubing plan, mark the bury points where each loop starts and stops, the location of any manifolds, and the paths of any supply/return leaders from a given loop to a manifold or the boiler panel. Mark locations of any custom channels, which may be required due to unusual architectural features or where plumbing interferes with the regular Warmboard tube patterns. At each bury point drill a shallow 30° angle 1-1/4" hole in the channel in the appropriate direction so that the leader can pass from the channel to the under floor area, in the correct direction to lead to the appropriate manifold location.



Cleanliness of channels:

Inspect the channels at the joints between panels for any excess of panel adhesive which may have squeezed up between sheets at the channels. Use the 4" grinder to remove any excess. Using a leaf blower, shop vac or room (leaf blowers are the quickest and easiest way to clean the channels) clean off any debris or dust from the subfloor surface and the channels. Cleanliness is important for easy tubing installation, so take care with this step.

Exposure to Weather:

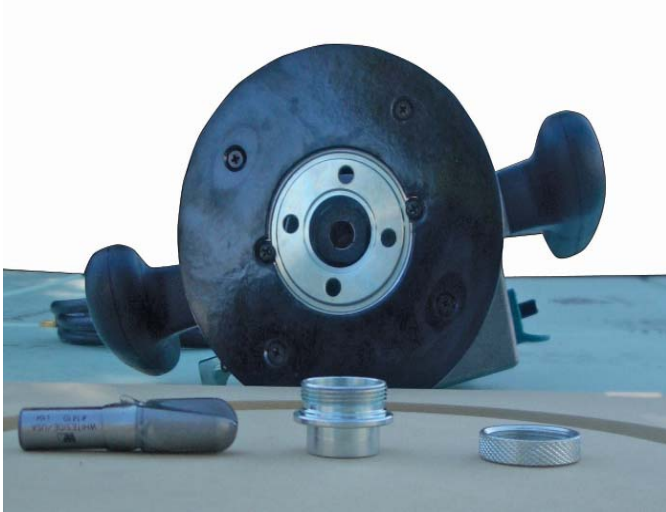
Warmboard panels are rated Exposure 1. Technically, they can be exposed to the elements for 1 year and still serve as structural subfloor. That said, Warmboard panels will still respond to moisture like any plywood product. This means swelling. Whenever possible, it is advantageous to avoid exposing the panels to rain or snow. If Warmboard panels are exposed to weather, since they are protected on the top side by the aluminum skin, a common reaction is "edge swelling." This means the edges swell up with moisture creating an uneven surface.

The panels will return close to their original shape when the moisture leaves the panels. If the panels have already been installed, one way to speed up this process is to install the tubing and get the system running. The heat will speed up the evaporation process. If the panels are installed over a crawlspace, it is essential that the crawlspace is completely dry and well ventilated. If the panels are installed over a slab, the slab must be completely dry with no water intrusion.

For technical assistance call Warmboard toll-free 1-877-338-5493



Custom Routing



5/8" Router Bit

Template Guide

GuideLock Nut

- Review all tubing layout plans. Using felt tip marker and wood templates (included in installation kit) mark all areas on Warmboard that will require custom routing.
- Prepare router with router bit, template guide and template guide lock nut.

**Note - Porter Cable router is not provided
A 1-1/2 minimum horsepower is required.**

Procedure:

- Place the appropriate Warmboard custom routing template over the area to be routed.
- Fasten with 3 screws to securely hold the wooden template in position.
- Proceed with router (ensure that router bit and metal template guide are properly installed).
- When route is complete, remove wooden template guide and use 4" grinder to remove aluminum burrs (ensure that entire area is smooth in preparation for tubing installation).





Choosing the Correct Router for Warmboard Custom Routing

IMPORTANT: Not all Porter Cable subbases will interface with Warmboard supplied Porter Cable metal template guides.



- The Porter Cable router shown on left has the correct subbase to interface with the Warmboard supplied metal template guide.

- Photo on right is an example of a Porter Cable router with the correct subbase and the Warmboard supplied metal template guide installed.



- **CAUTION:** Photo on the left is an example of a Porter Cable router that has a subbase that **WILL NOT INTERFACE** with the Warmboard supplied metal template guide.

- This interface problem can be corrected with the purchase of a Porter Cable subbase shown at left. This accessory only fits on some Porter Cable routers.

- Notes:**
- A 1-1/2 minimum horsepower router is required.
 - Size of supplied metal template guide is 1" OD, designed for Porter Cable routers and accessories only.



Tubing Installation

Using Pex Aluminum Pex:

Warmboard requires the use of Pex Aluminum Pex tubing. Pex Aluminum Pex does not require the use of silicon for installation into the Warmboard groove. You will find that Pex Aluminum Pex is easy to manipulate into the grooves because it holds its shape well. **It is important to use electrician nailing plates** on the turns to help hold the tube in while it establishes its memory. Once you are ready to begin finish floor installation, simply remove the plates and the Pex Aluminum Pex will stay in the groove.

As with all tubing installation, cleanliness of the grooves is very important. Please take extra care to make certain that the grooves are thoroughly cleaned prior to tubing installation.

Tubing should be installed as soon as possible after the subfloor is fastened in place. Mount a coil of Warmboard-approved Pex Aluminum Pex tubing on the tubing un-coiler. Begin the first loop by measuring the length of leader necessary to reach from the bury point to the manifold, plus a few extra feet for margin of error. Mark the bury point on this leader. Mark its loop number and whether it is the supply or return. Tape the end of the tube to keep debris out of it. Guide the tube into the channels following the course indicated on the tubing plan. Roll the tubing into the channel with the weighted roller pressing it firmly into the channel, flush with the top surface.

As you roll the tubing in, check from time to time to ensure that the tubing is flush with the top surface. If it is flush you will barely be able to notice it as you walk on it. If it is not flush, you will notice it easily. If it is not flush there are usually two causes including:

- Excess panel adhesive squeezed up and remains at a seam between panels.
- Debris in the channel.

Both of these possibilities are unlikely if you have followed the steps above regarding channel preparation and cleanliness.

When you come to the end of the loop, measure out a similar amount of tubing for the other leader back to the manifold or boiler panel. Tape the end of the tube and mark it as a supply or return, then mark the leader with its loop number. Insert this leader into the bury hole. You may find that at the bury points there are slight bumps above flush as the supply and return leaders tend to spring up at those points. Use electrician cover plates to temporarily hold the leader flush.

(Note: if tubing damage occurs please see tubing repair page 28)





Tubing Installation (con't)

A final and important step is to pressurize the loops. This will be helpful in the event that during subsequent construction, a tube is inadvertently damaged. If the tubes are left under pressure, any damage will be noticed quickly. If freezing is unlikely this can be done by attaching a temporary manifold to the loops and applying street water pressure to the system. If freezing is expected, then air pressure will accomplish the same purpose. Once this is done, carpenters can return to the site and begin framing walls and otherwise proceed with construction in the typical manner.



Job site considerations:

PEX tubing is especially tough once embedded in its channel. Normal construction activity will not damage it. Of course, care must be taken to avoid nailing a tube or using a sharp cutting tool directly on top of a tube. All tradespeople working on a Warmboard site must take note of the easily visible tubes and must exercise reasonable care to avoid puncturing a tube.

Weather is always a factor in construction. There are certain times of the year when it is difficult to install a Warmboard system. Good construction planning can avoid these problems to a great degree.

For the following reasons, it is best to plan a Warmboard installation for a dry day when the temperature will be above 40°F.

1. Pex-al-pex tubing becomes quite stiff and difficult to work with below 50°F. Below 40°F the coil will need to be kept warm immediately prior to installation.
2. The channels must be reasonably dry and clean immediately prior to installing the tubing into the channels. (Warmboard is typically fastened to the floor joists and the tubing is installed on the same day.)

Protecting Panels and Tubing:

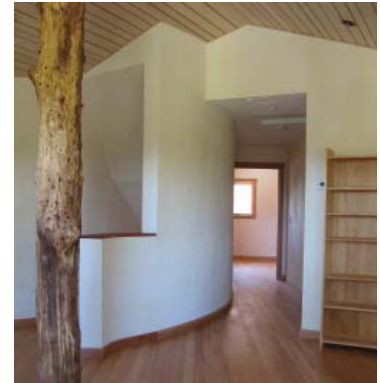
Most Warmboard designs require the tubing to be installed before the walls. **We recommend installing the tubing, framing walls, and then covering the panels and tubing with masonite or plywood in high traffic areas.** Remove all the panel protection before installing finish floors.



Installing Solid Wood Flooring Over Warmboard

The application of solid hardwood floors installed over a radiant heated floor is approved by many hardwood manufacturers and trade organizations. Warmboard installed with hardwood floors is a proven successful technology. If you would like to research this topic, please check out the following:

Radiant Panel Association	www.radiantpanelassociation.org
The Hardwood Council	www.hardwoodcouncil.com
National Wood Flooring Assoc.	www.woodfloors.org
Launstein Floors	www.launstein.com
Lumber Liquidators	www.lumberliquidators.com
Carlisle Wide Plank Floors	www.wideplankflooring.com



First and Always...

Follow the specifications and recommendations of the wood floor manufacturer.

Also follow all installation specifications and guidelines documented by the National Wood Flooring Association.

- The hygroscopic nature of wood is actually why wood moves.
- The changing atmosphere of humidity will cause **hardwood** to **expand** and **contract**.
- These changes that finish hardwood floors can experience from humidity swings are referred to as “**gapping**” and “**cupping**.”

Avoiding Gapping and Cupping of Hardwood Floors

Type of Lumber

Use a wood species that is dimensionally stable. There are three types of cuts from the tree: Quartersawn, Riftsawn, and Plainsawn. Quartersawn is nearly all vertical grain lumber which is a better quality cut and dimensionally stable. Riftsawn is the next best choice. Anything wider than 3 1/4” is referred to as plank flooring. Anything narrower than this is called strip flooring. In general, strip flooring is more dimensionally stable. However, plank flooring has been installed over Warmboard successfully in many projects with widths of up to 12” on occasion.



Acclimate Wood

Low moisture content of the wood strips is an important condition for stability. It is crucial to acclimate the wood. Bring the wood strips to the job site and sticker them. This means pull them out of their boxes and set them up so air can circulate around them. Acclimation time can vary, but two weeks is recommended. The wood flooring should not be delivered on the job site until the interior plastering is completed and dry.

The radiant floor heating should be in good operation also before the hardwood arrives. It is best to operate the radiant floor system for a few weeks to help bring down the moisture content of the Warmboard Subfloor. This procedure should take place no matter what time of year the hardwood is being installed.

Humidity control on the job site is crucial in some areas of the country. It may be required to operate the air conditioner to control the indoor humidity a few days before the wood is delivered. Keeping the indoor humidity between 30%-50% will keep the wood stable.

The hardwood should not experience any large swings in humidity or temperature once it arrives on the job site. It is best to keep the ambient temperature in the house between 60° and 80° and keep the indoor humidity between 30%-50% range. To meet these specifications, it will be required to operate the radiant floor heating or the air conditioner during wood acclimation and after hardwood installation.

Hardwood floor installers will often test the moisture content of the subfloor and the wood finish floor prior to an installation. The moisture content of Warmboard should be at 12% or less. The moisture content of the finish hardwood should read within 4% of the Warmboard reading. The ideal reading of the hardwood would be between 6%-9%, however, this reading can vary in your climate zone.

It is difficult to get a proper moisture content reading from the Warmboard subfloor due to the aluminum skin. For an accurate moisture reading from the top side of the Warmboard panel, use a moisture meter with insulated contract pins that have hammer probes. An example of this meter is model J4 or J2000 which is available at www.delmhurst.com.

Be aware of any moisture or humidity intrusion that may take place on a project. For example, a crawl space under Warmboard that is dry in the summer and experiences water intrusion in the winter months could cause large humidity swings and movement of the finished hardwood floor (gapping and cupping).



Nailing Hardwood to Warmboard

Installing the Hardwood

Hardwood should be nailed directly to the Warmboard. The required moisture barrier is built into the panel itself: the aluminum. Installing the hardwood perpendicular to the tubing is the easier method. It is important to see the tubing as strips are nailed to avoid tubing damage. It is recommended to tongue nail at a 45 degree angle at 6" on centers and use 2" flooring nails. Occasionally, the strip flooring will run the same direction as the tubing. When this occurs, either glue with Bostik's Best (bostik.com), SikaBond T35 or T55 (sikaconstruction.com) or face nail the strip.

Operating the Radiant Heating System

We recommend circulating low water temperatures for the first few days of operation under newly installed wood floors. Then, gradually bring the water temperature up to the designed set point. For example, start with 90° water and after a few days, bring it up to 100°. Then, finalize a set point of 110°.

It is ideal for the heating system to be designed with a control strategy referred to as Outdoor Reset. This technology sets up a heating curve that will gradually change the delivered water temperature based on the current heat loss of the house. This is an excellent strategy for gradually heating hardwood floors.

Important - Surface temperatures of the installed hardwood should not exceed 85°F.

Note: Warmboard has a vapor barrier built into the panel, therefore no additional vapor barrier is required. Wood can be installed directly over Warmboard.



Installing Engineered and Laminate Flooring

Engineered floors work really well with Warmboard and are highly recommended for the following reasons:

- Very stable product, so it is not sensitive to expanding and contracting due to environmental conditions.
- Easy to work with: floors are available finished and pre-finished and there are many manufacturers to choose from.
- Many manufactures offer a floating floor installation where no gluing or nailing is required.
- They have a life span ranging from 30 to 100 years.

First and Always...

Follow the specification and installation recommendations provided by the Engineered Wood Manufacturer. Also, follow installation specifications and guidelines documented by the National Wood Flooring Association.

Note: Warmboard has a vapor barrier built into the panel, therefore no additional vapor barrier is required. Wood can be installed directly over Warmboard.

Floating Floor Method

This is a great option because the floorboards are locked together at the joints of each board and not nailed or adhered to the subfloor. This allows the whole floor to move as a single unit if a dimensional change within the floor takes place. There is an acoustic padding available that is placed between the Warmboard and the Engineered wood. This padding is an acceptable option for our system.

Glue Down Method

When installing with glue, use Bostiks Engineered Flooring Adhesive or SikaBond T35 or T55. These are moisture cure urethane adhesives designed for engineered wood. Refer to www.bostik.com / 800-726-7845 or sikaconstruction.com / 800-933-7452.



Installing Engineered and Laminate Flooring (con't)

Nail Down Method

Engineered wood should be nailed directly to the Warmboard. The required moisture barrier is built into the panel itself; the aluminum. Installing the hardwood perpendicular to the tubing is the easier method. It is important to see the tubing as strips are nailed to avoid tubing damage. It is recommended to tongue nail at a 45 degree angle at 6" on centers and use 2" flooring nails. Occasionally, the strip flooring will run in the same direction as the tubing. When this occurs, either glue with Bostiks EFA (bostik.com) or face nail the strip.

Acclimate Wood

Low moisture content of the wood strips is an important characteristic for stability. It is crucial to acclimate the wood. Bring the wood strips to the job site and sticker them, meaning pull them out of their boxes and set up so air can circulate around them. Acclimation time can vary, but two weeks is recommended. The wood flooring should not be delivered on the job site until the interior plastering and painting are completed and dry.

The radiant floor heating should be in good operation also before the wood arrives. It is best to operate the radiant floor system for a few weeks to help bring down the moisture content of the Warmboard Subfloor. This procedure should take place no matter what time of the year the wood is being installed.

Humidity control on the job site is crucial in some areas of the country. It may be required to operate the air conditioner to control the indoor humidity a few days before the wood is delivered. Keeping the indoor humidity between 30%-50% range will keep the wood stable.

Important - The surface temperature of the installed Engineered Wood should not exceed 85°.



Hardwood Manufacturers

Company	Phone	Website	Engineered Products	Solid Wood Products
			Approved for Radiant	Approved for Radiant
Anderson Wood Floors	864-833-6250	www.andersonfloors.com	some	no
Armstrong, Bruce, Robbins	800-233-2823	www.armstrong.com	some	no
Authentic Pine Floors	800-283-6038	www.authenticpinefloors.com	yes	yes, 6" wide and less
Award Hardwood Floors	715-849-8080	www.awardfloors.com	yes	yes
Bellwood Hardwood Floors	800-HARDWOOD	www.bellwood.com	yes	yes
Boen Hardwood Floors	888-897-0800	www.boen.com	yes	N/A
BR-111 Exotic Hardwood Floors	800-525-2711	www.br111.com	yes	no
Broad-Axe Beam Company	802-257-0064	www.broad-axebeam.com	N/A	yes
Carlisle Wide Plank	800-595-9663	www.wideplankflooring.com	N/A	yes
Columbia Forest Products	800-654-8796	www.columbiaflooring.com	yes	no
Goodwin Heart Pine Company	800-336-3118	www.heartpine.com	N/A	yes
Heartwood Pine Flooring	800-524-7463	www.heartwoodpine.com	yes	yes
Heritage Wide Plank Flooring	877-777-4200	www.heritagewideplankflooring.com	N/A	yes
Homerwood Hardwood Flooring	814-827-3855	www.homerwood.com	yes	no
Junckers Hardwood Flooring	800-878-9663	www.junckersh hardwood.com	most	yes
Karelia Hardwood Floors	888-840-3435	www.kareliafloors.com	N/A	most
Launstein Floors	888-339-4639	www.launstein.com	yes	yes
Lauzon Hardwood Flooring	877-427-5144	www.lauzonltd.com/index_en.html	yes	no
LM Flooring	972-417-9900	www.lmflooring.com	some, floating only	N/A
Mannington Wood Floors	856-935-3000	www.mannington.com	yes	yes
Max Windsor Hardwood Floors	909-477-6698	www.maxwindsor.com	most	N/A
Mercier Wood Floors	800-463-7048	www.mercierwoodflooring.com	most	most
Mirage Floors	800-463-1303	www.miragefloors.com	yes	most
Mountain Lumber	800-445-2671	www.mountainlumber.com	yes	yes
Muskoka Hardwood Flooring	800-461-5386	www.muskokaflooring.com	yes	no
Mohawk Hardwood Flooring	800-266-4295	www.mohawk-flooring.com	yes	no
Nordstar Hardwood Flooring	207-799-0010	www.nordstar.net	some	N/A
Satin Finish Hardwood Flooring	800-60-SATIN	www.satinfinish.com	yes	no
Shaw Hardwood Floors	800-441-7429	www.shawfloors.com	some	no
Southern Wood Floors	888-488-7463	www.southernwoodfloors.com	yes	no
Swedish Flooring	360-752-0350	www.swedishflooring.com	yes	N/A
Tarkett Wood Floors	800-842-7816	www.tarkett-floors.com	some	no
The Woods Company	888-548-7609	www.thewoodscompany.com	N/A	yes
Torlys	800-461-2573	www.torlys.com	yes	N/A
What It's Worth	512-328-8837	www.wiwpine.com	N/A	yes
Zickgraf Hardwood Company	800-243-1277	www.zickgraf.com	N/A	yes, less than 5"



Installing Bamboo Flooring Over Warmboard

In the last 10 years bamboo flooring has become very popular and is an excellent choice for finished floor application over Warmboard. Benefits of bamboo include:

- It is a true grass that is dimensionally stable and offers durability and hardness equivalent to red oak.
- Bamboo is considered a green building / sustainable product that can grow more than three feet per day, and reach a maturity for harvest in 4 or 5 years.
- Bamboo can last decades and be sanded and refinished when necessary. It is typically available in 1/2", 5/8" and 3/4" thicknesses.

Installation

All three normal installation methods work very well with Warmboard: nail down, glue down, and floating floor applications. It is important to carefully read the installation instructions supplied by the bamboo manufacturer and follow their specifications.

Acclimation of any wood floor - including bamboo - is recommended. Moisture content of 10%-12% is ideal and should be the benchmark figure to shoot for although not absolutely necessary. To achieve proper acclimation, remove all bamboo from boxes and sticker planks for proper air circulation. During installation, ambient humidity should be between 30%-50%. Ambient air temperature should be between 60 and 80 degrees. Moisture content of the Warmboard panels is also an important consideration and should be between 10%-12%. To achieve this we recommend operating the Warmboard system for a few weeks prior to bamboo installation.

Notes:

- When using the glue down method we recommend the use of a urethane adhesive called Bostik's Best .
- Follow Radiant Panels Association Guidelines - **Maximum allowable surface temperature of any floor covering is 85°F.**
- For more information about bamboo flooring and to order samples please visit the sustainable flooring site listed below.

References:

www.bostik.com

www.sustainableflooring.com



Installing Tile Over Warmboard

Warmboard is a nominal 1-1/8" thick, 4' x 8' sheet of structural tongue and groove subfloor that is rated Exposure 1. Tile set to Warmboard panels is subject to all of the tile setting requirements of any ordinary unheated wooden subfloor.

Warmboard recommends installing tile over Warmboard subfloor panels according to the Tile Council of America (TCA), as set forth in the Industry's Guide for Installation Practices and as referenced in the American National Standard Specifications for the Installation of Ceramic Tile, which have been approved by the American National Standards Institute, Inc. (ANSI).

Note: Failure to follow these requirements may result in tile installation failure. Under ordinary circumstances, and as referenced in the Industry's Guide for Installation Practices, the TCA does not consider a plywood subfloor firm enough to tile directly over it without the use of one of the methods described below. Please reference the section on Tile over Wood Subfloor, referenced in The TCA Handbook for Ceramic Tile Installation.

Important - The TCA specifies that tile should never be installed directly over a subfloor panel without the use of one of the methods listed below; either a mortar bed or a backer board installed between the subfloor and the tile.

Installation methods recommended by the TCA:

Method 1 - Mortar Beds

Mortar beds have been the traditional method of addressing the expansion, contraction and deflection properties of wooden subfloors. They have the advantage that by their very nature they provide a thick, continuous, stable surface to which tile readily adheres. They have the disadvantage that they tend to be expensive, add significant mass to a system, and due to their thickness, often cause the elevation of tile areas to not match up well with adjacent carpeted or hardwood areas. When applying mortar beds, either a 15-lb. felt, or a 4-mil polyethylene membrane preparation can be used. Fasten down a metal lath over the membrane and finish with a minimum 3/4" mortar bed. After the mortar bed has cured, thin set and tile may then be applied.

Note: Care should be taken to avoid tubing damage.

Method 2 - Backer Boards

There are a variety of cementitious backer boards available that range in thickness from 1/4" to 1/2". Because all subfloors fail to be perfectly flat, these backer boards will provide a more stable surface when they are thin set to the Warmboard. Prior to installation, apply thin set to the bottom side of the backer board using a 1/4" square-notched trowel.

Immediately fasten the backer board before the thin set dries, following recommendations of the backer board manufacturer (typically, fasten using special screws). Please note that backer board panels should run perpendicular to Warmboard panels and seams should be staggered so as not to line up with the Warmboard seams. Care should be taken during fastening to note tubing positions and avoid them. Backer boards have the advantage that they have low mass, are quick and relatively inexpensive to install, and that because of the thicknesses available, provide a base for tiled areas to match up well with adjacent floor coverings.



Installing Tile Over Warmboard (con't)

Method 3 - Schluter - DITRA

Ditra is a polyethylene membrane with a grid structure of square cut cavities and an anchoring fleece laminated to its underside. Apply a layer of Mapei –“Granirapid”, a Premium Rapid-Setting, Flexible- Polymer Modified Mortar directly to the Warmboard, using a 1/4” or 5/16” V-notch trowel, and then install the Ditra grid. (An equivalent brand of a Rapid-Setting, Polymer Modified Mortar that meets and exceeds ANSI A118.4 can be used) Wait until the mortar is completely dry below the Ditra. Then trowel on an unmodified thin set mortar that meets and exceeds ANSI A118.1 on the topside of the Ditra, and immediately install tile or stone. There have been hundreds of successful tile installations installed by this method with no reports of problems or failure.

However, Schluter does not warranty this installation pending further testing. The tile floor covering warranty may be invalidated by the assembly mentioned above. If

this is the case, installation of Ditra does require a tile backer board installed or a 1/4” or 1/2” APA listed plywood underlayment between the Ditra and the Warmboard. For complete installation details, refer to the “Engineered Wood Construction Guide” at www.apawood.org.

Important - Do not let surface temperatures of tile exceed 85°

Please note: Warmboard is not an agent for the manufacturers listed below, and gives no actual or implied warranty of fitness for any of these products or manufacturers.

A word of caution: Whatever method you use, make sure that the product meets the standards set forth and accepted by the TCA, ANSI, and the ICC (formerly ICBO). Be sure to follow each manufacturer’s specific recommendations when using these products.

Resources:

American National Standards Institute (ANSI) <http://www.ansi.org>

Tile Council of America (TCA) <http://www.tileusa.com>

National Tile Contractors Association (NTCA) <http://www.tile-assn.com>

Ceramic Tile Backer Board Resources:

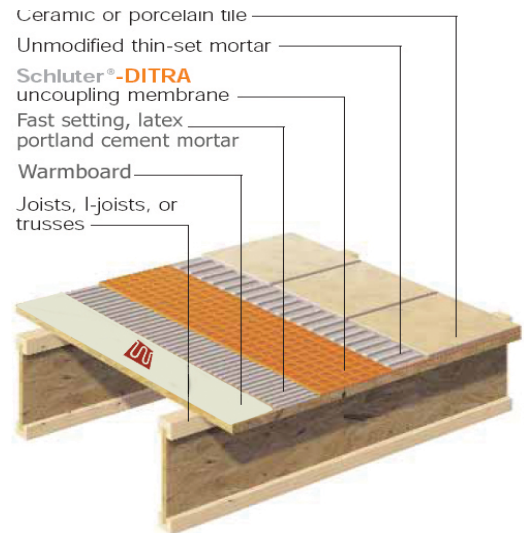
Durock <http://www.usg.com/brands/drck.asp>

Fiberock <http://www.usg.com/brands/fbrck.asp>

Hardibacker <http://www.jameshardie.com/backerboard/default.php>

Mapei <http://www.mapei.us/>

Wonderboard <http://www.custombuildingproducts.com/onlyproducts/WonderBoard12.htm>





Installing Carpet Over Warmboard

Padding and carpet is a very common finish floor to use over Warmboard. The carpet cushion (padding) can be installed directly over the Warmboard panels. Before installing the carpet cushion it is necessary to fill all of the empty grooves to provide an even surface for installation. Empty grooves can be filled with scrap pex tubing. Another option is to use a floor leveling compound or Portland cement to fill the empty grooves making them flush and level with the panel surface. Do not install padding and carpet until all the loops have been properly pressure tested.

When choosing a carpet cushion/carpet assembly we recommend a product that has a low R-value rating. The advantage of using a product with a low R-value is to keep the radiant floor system very simple. Meaning the system can use the same water temperatures for the tile, hardwood, and carpet in a home. This type of system is referred to as a one temperature system. To achieve a simple one temperature system, it is best to purchase a carpet and carpet cushion assembly that does not exceed an R-value of 2. If the R-value assembly exceeds R-2, a two temperature system may be required.

The Radiant Panel Association recommends that the surface temperature of carpet does not exceed 85 degrees. Warmboard Inc. supports this RPA recommendation.

For other carpet cushion options review Group Two on page 21.

Sponge Cushion

Tel:1-800-435-4062

Fax: 800-423-3557

<http://www.sponge-cushion.com>

Product	R-Values
Luxury Step	.80
Full House	.68
Berber Supreme	.59
Berber Master	.35
Silent Walk	.46
SP 380	.66
Tred-MOR 1562	.27
Tred-MOR 2568	.46
Tred-MOR 2580	.48
Tred-MOR 2500	.34
Deci-BLOK	.10

Leggett & Platt

Tel: 1-800-866-9446

<http://www.lpurethane.com/rubber.asp>

Product	R-Values
STAINMASTER® Ultra (APC)	.80
STAINMASTER® Plus (APC)	.70
Deluxe	.68
Martinique	.73
Rise	.80
Brava	.69
Plushmate	.74
Superba	.70
GrandStand	.68
Barcelona	.44
Thunder Bay	.50
Pure Comfort	.68



Carpet and Padding R-Values

Carpet Thickness	R-Value
1/8"	R-0.6
1/4"	R-1.0
1/2"	R-1.4
3/4"	R-1.8
1"	R-2.2

Carpet Cushion R-Value					
<i>In General</i>					
Group One					
	Density	Thickness	R-Value		
Prime Urethane	2.2 lb/cu ft	1/4"	R-1.08	Not Recommended	
		3/8"	R-1.62		
		1/2"	R-2.15		
Bonded Urethane	4-8 lb/cu ft	5/32"	R-0.66	Not Recommended	
		1/4"	R-1.05		
		3/8"	R-1.57		
		7/16"	R-1.84		
		1/2"	R-2.09		
Sunburst Family	10 lb/cu ft			Not Recommended	
		SunBerber	3/8"		R-1.16
		Sunburst	15/32"		R-1.43
		BerberGuard	3/8"		R-1.25
		SunGuard	15/32"		R-1.50
Group Two					
	Density	Thickness	R-Value		
Fiber/Hair/Jute	6-8 lb/cu ft	1/4"	R-0.97	3rd Choice	
		3/8"	R-1.46		
		1/2"	R-1.94		
Waffle Rubber	25 lb/cu ft	1/4"	R-0.62	2nd Choice	
		3/8"	R-1.00		
		1/2"	R-1.33		
Slab Foam Rubber	33 lb/cu ft	1/4"	R-0.31	Best Choice	
		3/8"	R-0.47		
		1/2"	R-0.62		
NOTE: All R-Values are approximate. Check with product manufacturer for actual R-Values					



Installing Cork Flooring Over Warmboard

Always follow the specifications and installation specifications provided by the cork manufacturer.

The surface temperature of the installed cork should not exceed 85 degrees.

Cork flooring has a naturally high insulation value so it is important to choose one that is 3/8 to 1/2 inch in thickness when working with radiant heat. This will keep the R value to 1.5 or less giving better heating and response times, while simplifying the mechanical design at the same time. A more simple mechanical design means your cork floor will operate in the same water temperature range as tile, hardwood or carpet. Please always note that all finish floors including cork should never exceed 85 degree surface temperature.

Some well known industry brands are Expanko Cork (www.expanko.com), American Cork (www.amcork.com), and Natural Cork (www.naturalcork.com).

Installation Method #1: Standard Cork Flooring

The installation of an underlayment is required over the Warmboard surface before standard cork flooring is installed. Care should be taken when fastening the underlayment to Warmboard because the tubing is obscured during this step. Warmboard recommends installing a 1/4" APA listed plywood underlayment with a sanded face. For complete installation details, refer to the "Engineered Wood Construction Guide" at www.apawood.org. Complete the installation of the cork by following all the manufacturer guidelines and specifications.

Once the underlayment is installed, the cork is adhered using a urethane adhesive made for cork applications. A good product to use is Dri Tac 7500 (www.dritac.com - 1-800-726-7845).

Installation Method #2: Cork Laminate Products

Cork laminate products work well with Warmboard as well. These products are manufactured with cork on the top and bottom and an MDF layer sandwiched in between. It is not necessary to put any barrier between the cork flooring and Warmboard prior to installation. The advantage of this type of cork floor is that it installs as a floating floor and requires no adhesive or nailing for proper installation. This allows the homeowner more flexibility if they ever decide to change the floor covering.



Installing Vinyl Over Warmboard

There are many different types of vinyl flooring available and each can be used with the Warmboard system. The inlaid vinyl type or vinyl inner layer is the most durable. Vinyl floors are manufactured with a sandwich of layers. It starts with a felt or vinyl backing, then the vinyl granules are put directly on the backing all the way up to the wear surface.

First and Always...

Follow the specifications and installations specifications provided by the vinyl manufacturer.

The installation of underlayment is required over the Warmboard before the vinyl is installed. Care should be taken when fastening the underlayment to Warmboard because the tubing is obscured during this step. Warmboard recommends installing a 1/4" or 1/2" APA listed plywood underlayment with a sanded face. For complete installation details, refer to the "Engineered Wood Construction Guide" at www.apawood.org. **Complete the installation of vinyl by following all the manufacturers guidelines and specifications.**

Important - The surface temperature of the installed vinyl should not exceed 85°.



Installing Linoleum Over Warmboard

Linoleum is a floor covering made from solidified linseed oil in combination with flour or cork dust over a burlap or canvas backing. As an all natural product, linoleum offers many advantages and interfaces well with Warmboard.

First and Always...

Follow the specifications and installation recommendations provided by the linoleum manufacturer.

The installation of underlayment is required over the Warmboard before the linoleum is installed. Care should be taken when fastening the underlayment to Warmboard because the tubing is obscured during this step. Warmboard recommends installing a 1/4" or 1/2" APA listed plywood underlayment with a sanded face. For complete installation details refer to "Engineered Wood Construction Guide" at www.apawood.org. **Complete with installation of linoleum, follow all the manufactures guidelines and specifications.**

Important - The surface temperature of the installed linoleum should not exceed 85°.



Installing Warmboard Over an Existing Concrete Slab

Benefits

Installing Warmboard over an existing concrete slab can retrofit a basement or home remodel with a state of the art radiant floor heating system. Finish floor options include the broad range available with a Warmboard system such as hardwood, tile, carpet, and linoleum.

Concrete Slab Requirements

The existing slab must be level. A newly poured slab needs to be well cured which requires a minimum of 28 days. A moisture test should be conducted prior to installation to ensure the slab is properly cured. The slab must have sufficient drainage from rain and snow on a year round basis. If Warmboard panels are exposed to any standing water or any moisture problems, the wood will rot. Do not use Warmboard if these environmental conditions are possible.

When Warmboard is being installed over an existing slab, it is crucial for the panels never to be exposed to weather. If the Warmboard panels are exposed to rain or snow, the moisture will be trapped in the panel and wood rot will take place.

Testing For Moisture

There are several possible methods by which to test the moisture content of a newly poured slab, the simplest being "The Plastic Sheet Method" (ASTM D 4263-83). For this method, seal an 18-inch x 18-inch square of clear plastic sheet to the slab with tape on all 4 sides. If, after 16 hours, any condensation is found on the underside of the plastic or if the surface of the concrete is darkened, the concrete is considered too wet for coating application. Do not allow the sheet to come in contact with direct sunlight or excessive heat.

It is possible for this particular method to yield a false result, giving the impression that the slab is fully cured, when in fact it still contains moisture. For example, in cooler conditions, the concrete may retain its moisture and fail to condense on the plastic. However, an obvious appearance of moisture in this method almost always indicates excessive moisture.

With the Plastic Sheet Method, the best way to ensure a reliable result is to make sure that the surface temperatures and ambient conditions during the test are very similar to those present after the Warmboard is installed.

If no moisture test is conducted, we recommend giving a newly poured slab 90 days to cure fully.

Installation Method #1

Install a vapor retarder directly to the slab. We recommend either a 6-mil or a 10-mil polyethylene overlapped two feet (2') at the seams. Continue with Warmboard panel installation with the use of Tap Con concrete fasteners. We recommend a minimum of 21 fasteners for each panel.

Installation Method #2

Install a vapor retarder directly to the slab. We recommend either a 6-mil or a 10-mil polyethylene overlapped two feet (2') at the seams. Continue by installing 2" x 4" pressure treated sleepers attached to the slab (flat framed) on 24" centers with Tap Con fasteners. Insulate the cavity between the sleepers with rigid foam insulation. To complete the procedure, install Warmboard panels and fasten them to the sleepers with screws or ring shank nails and construction adhesive.

An excellent resource for a combination vapor retarder and rigid foam insulation can be found at: www.thebarrierinsulation.com.

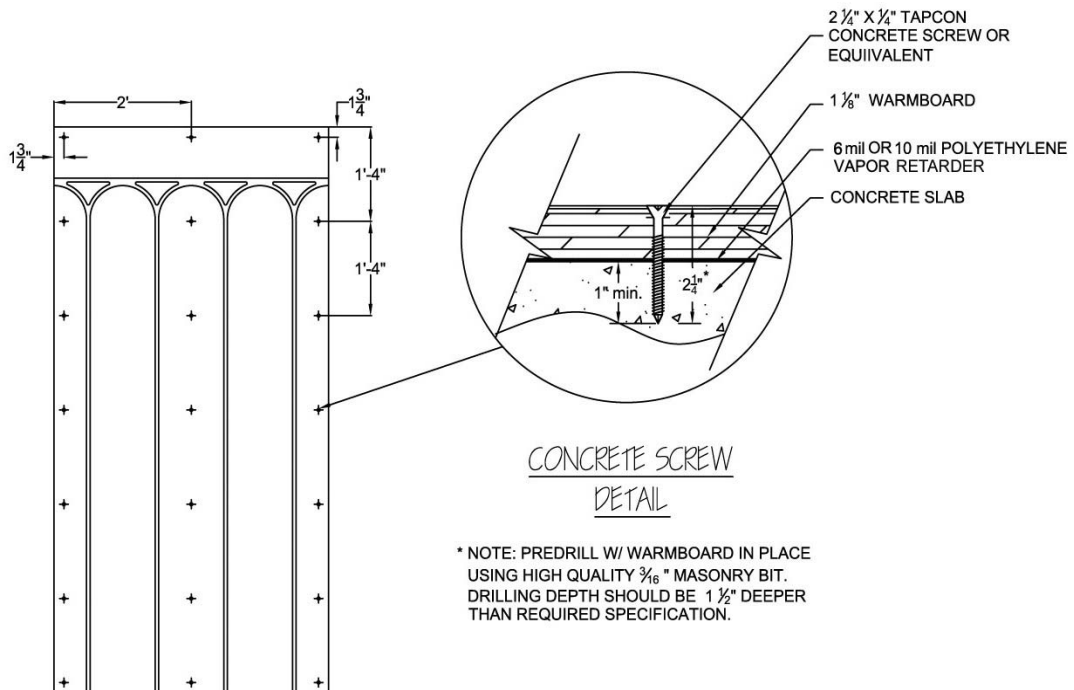
Installation Tip

Before installation of a Tap Con fastener, drill a pilot hole 1.5" deeper than the Tap Con will reach. Draw the bit in and out of the pilot hole repeatedly to loosen excess material. Then remove the excess using a shop vacuum.

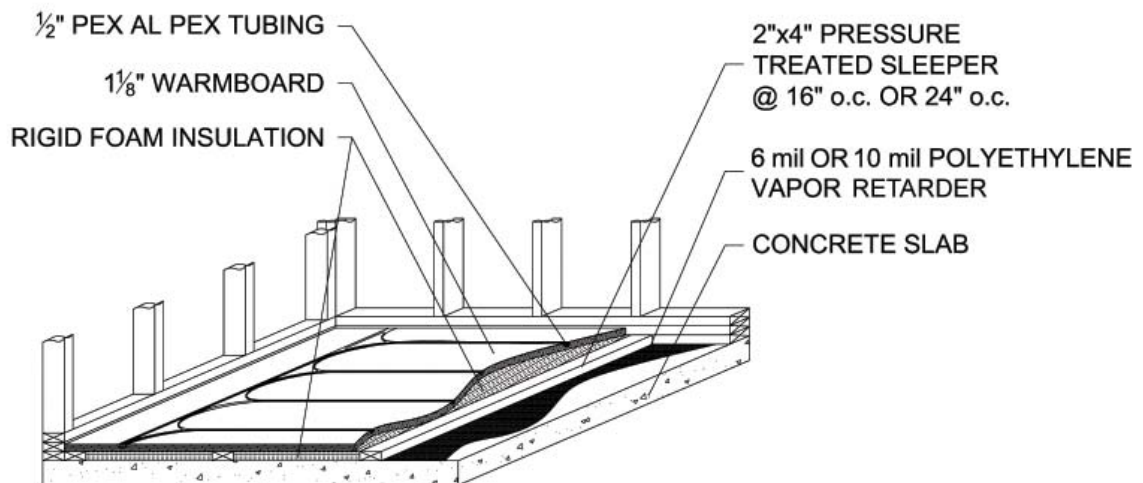


Installing Warmboard Over an Existing Concrete Slab (con't)

Warmboard Over Concrete Fastening Detail



Warmboard Over Sleepers





Installing Warmboard Over an Existing Plywood or OSB Subfloor

Preparation Prior to Installation

- The existing subfloor is required to be flat and level before installation of Warmboard. Inspect the subfloor for evenness along the joints and flatness between the joists.
- If necessary, sand the subfloor near the joints, install extra blocking, and refasten the subfloor to flatten uneven areas. Also inspect the subfloor for squeaks and refasten as necessary.
- Existing subfloor and Warmboard panels need to be completely dry and should have a moisture content reading of 8 to 12 percent before, during and after installation.

Installation of Warmboard Panels

- Review Warmboard shop drawings and notice the stagger of end joints and where the first panel starts.
- Fasten Warmboard panels down using exterior decking screws, or ring shank nails.
- Use a grid pattern of 6" on the edges and 12" on the inside; to determine the length of fastener, total the thickness of existing subfloor and Warmboard panel. For example if the existing subfloor is 3/4" thick and Warmboard is 1-1/8" thick, the total depth is 1-7/8". The required fastener would be 1-3/4". It is important to size the fastener so it will grab a large amount of the subfloor without penetrating all the way through the wood.
- When using a decking screw, purchase a 12 gauge with a top smooth shank of 3/4".
- When using a ring shank nail purchase a .099".
- We do not recommend using an adhesive to install panels.



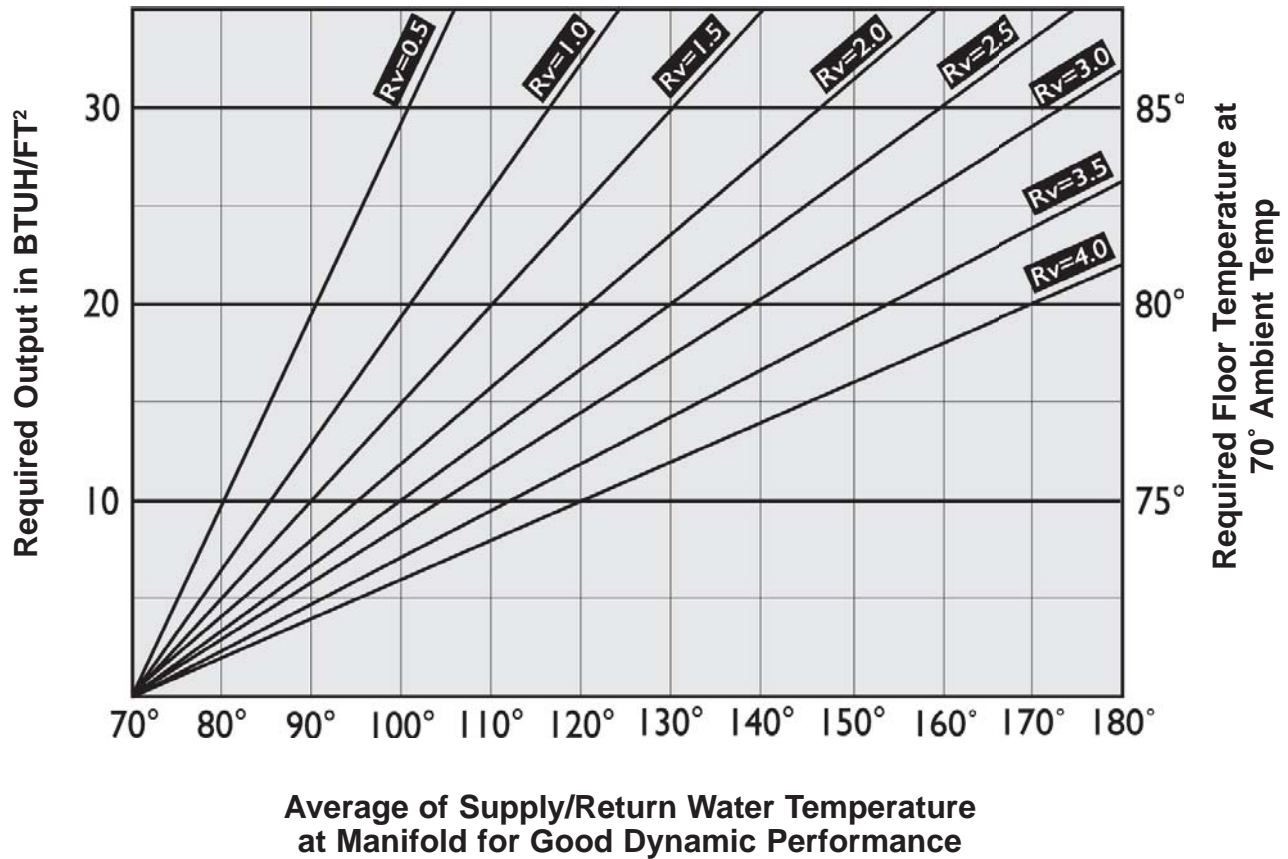
Tubing Repair

During installation, if the tubing is damaged or punctured, a repair coupling must be installed. It is crucial for the tubing manufacturer to provide the repair components. For example, if the brand of tubing installed is Kitec, the repair assembly to be purchased must be manufactured by Kitec. Generally, a nipple and two compression fittings would be used. These fittings are too large for our Warmboard channel so the channel where the repair will be placed must be modified. The depth and width of the groove should be enlarged with the use of hand tools or power tools. We recommend a sharp hand chisel, grinder, or a router.





Required Water Temperature Chart



NOTES:

1. Steady State Performance will require 10% lower supply temperature.
2. Rv = Floor Covering Resistance Value.
3. Warmboard recommends maximum floor temperature of 85°.
4. Assumes minimum R21 insulation below floor.
5. Warmboard is one component of a complete system.
6. Complete system design shall be performed in accordance with Radiant Panel Association (RPA) Guidelines, manufacturers' recommendations for ancillary components, and is the responsibility of the system designer.
7. Assumes a Designed Ambient Air Temp of 70° Fahrenheit.



Finish Floor R-Values

Material	Typical R-value	R-value Per Inch	Typical Thickness
Plywood	0.825	1.10	0.750
OSB	1.050	1.40	0.750
Softwood	0.825	1.10	0.750
Ash	0.750	1.00	0.750
Maple	0.750	1.00	0.750
Oak	0.638	0.85	0.750
Pine	0.975	1.30	0.750
Fir	0.900	1.20	0.750
Engineered Bamboo	0.720	0.96	0.750
Engineered Wood	0.250	1.00	0.250
Engineered Wood	0.375	1.00	0.375
Engineered Wood	0.625	1.00	0.625
Engineered Wood	0.750	1.00	0.750
Engineered Wood Flooring Pad	0.200	1.60	0.125
Carpet Pad/Slab Rubber 33 lb	0.320	1.28	0.250
Carpet Pad/Slab Rubber 33 lb	0.480	1.28	0.375
Carpet Pad/Slab Rubber 33 lb	0.640	1.28	0.500
Carpet Pad/Waffle Rubber 25 lb	0.620	2.48	0.250
Carpet Pad/Waffle Rubber 25 lb	1.240	2.48	0.500
Hair Jute	1.940	3.88	0.500
Hair Jute	1.250	3.88	0.325
Prime Urethane	1.400	4.30	0.325
Prime Urethane	2.150	4.30	0.500
Bonded Urethane	1.350	4.20	0.325
Bonded Urethane	2.100	4.20	0.500
Carpet	0.700	2.80	0.250
Carpet	1.050	2.80	0.375
Carpet	1.400	2.80	0.500
Carpet	1.750	2.80	0.625
Carpet	2.100	2.80	0.750
Wool Carpet	1.575	4.20	0.375
Wool Carpet	2.100	4.20	0.500
Sheet Vinyl	0.200	1.60	0.125
Vinyl Composition Tile (VCT)	0.200	1.60	0.125
Linoleum	0.400	1.60	0.250
Linoleum	0.200	1.60	0.125
Dense Rubber Flooring	0.250	1.30	0.325
Recycled Rubber Flooring	1.100	2.20	0.500
Cork	1.125	3.00	0.375
Cork/MDF/Laminate	1.175	2.35	0.500
Brick	3.375	2.25	1.500
Marble	0.400	0.80	0.500
Ceramic Tile	0.250	1.00	0.250
Thinset Mortar	0.050	0.40	0.125
MDF/Plastic Laminate	0.500	1.00	0.500
Laminate Floor Pad	0.300	1.92	0.160