ecowarm™ RADIANT BOARD

Aluminum Laminated Radiant Floor System

HIGH PERFORMANCE | *COST-EFFECTIVE* | *CONTRACTOR FRIENDLY*

DESIGN *and* INSTALLATION MANUAL | 2021

VOLUME 21 VERSION 4

www.ecowarmradiantheat.com

866-341-1854 TOLL-FREE U.S. PATENT #6,533,185 and patents pending

FSC www.fsc.org FSC® C041262

INSTALLER NOTES

APPLICATION AND INSTALLATION MANUAL – TABLE OF CONTENTS

INSTALLER CAUTION:

This manual is deemed to be current at the time of publication. It is the installer's responsibility to install our product according to the most current Ecowarm™ Radiant Board Installation Manual. This guide does not purport to address all relevant issues; it assumes the installer's knowledge of good practices in both hydronics and construction methods. Installers should always consult all relevant local, regional and national codes, and adhere to good construction practices. Ecowarm™ Radiant Board should only be installed by knowledgeable, qualified installers. Ecowarm™ Radiant Board installations frequently require the coordination of trades. These are, most typically, mechanical and flooring trades. Any issues regarding this coordination should be worked out in advance. Failure to follow the instructions in this guide, failure to adhere to relevant local, regional and national codes, failure to coordinate trades, and failure to follow good construction practices may cause an unsatisfactory result, for which we are not liable. See also "Limitations of Use" elsewhere in this publication. Other manufacturers' limitations and instructions of use – for PEX pipe and other hydronic components – shall also be referenced and followed during installation; this manual does not address many aspects of a hydronic installation.

INTRODUCTION

Ecowarm™ Radiant Board – the hydronic radiant heating everyone loves – is now more efficient, more responsive, more environmentally responsible and, as always, compatible with standard construction practices. Ideal for new construction and remodeling alike: low profile, light weight, and with a rapid response performance. Ecowarm™ Radiant Board offers today's consumer genuine advances in the best heating system you can buy. . . hydronic radiant heat.

WHY IT WORKS SO WELL

Non-structural Ecowarm™ Radiant Board is designed specifically for subfloor applications. Ecowarm™ Radiant Board is constructed of 6 to 7-ply plywood covered with aluminum that spreads heat evenly and quickly from warm water circulating through hydronic tubing. Ecowarm™ Radiant Board heats rapidly and is easy to control using setback thermostats for maximum energy efficiency. It contains just enough thermal mass to be effective and to allow for easy temperature control. This is the only available FSC*-certified radiant board on the market. *Wood is harvested from sustainably managed forests.

No other product offers our unique combination of performance, cost-effectiveness, ease of installation, and environmental prudence. Ecowarm™ Radiant Board is typically glued and screwed, or glued and stapled, to a wood subfloor. Then 1/2" PEX tubing, which will carry warm water, is walked into the groove. Heat is transferred from the tubing to the conductive aluminum layer and the board.

Quick Response

- ***Low profile, light weight, for easy installation***
- ***Avoid the moisture, weight and mess of installing in gypsum, cement or concrete***
- ***Radiant installations, big or small, are easy to schedule, with no lost time waiting for concrete to cure***

Ecowarm™ Radiant Board is manufactured from 6 to 7-ply plywood, cut to a versatile size, grooved with one of two patterns – Straight or Supercombo – then laminated with a substantial top layer of highly conductive aluminum (with recycled content, adhered with a water-based glue that is no-VOC when dried) to efficiently disperse and transfer heat away from the groove, to the entire surface area of the board.

ACCELERATION

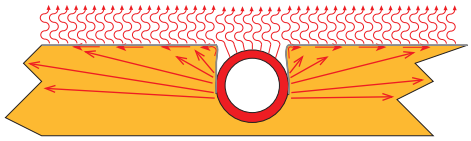


Illustration A-1:
Board cross-section,
radiant heat disbursed

Acceleration is the measure of how quickly a radiant heating system responds. Aluminum is approximately 1000 times more conductive than wood. Thus, the layer of aluminum on Ecowarm™ Radiant Board, which extends down into the groove, significantly enhances both the transfer of heat and the evenness of the board's heat distribution. Illustration A-1 shows how the heat transfers through Ecowarm™ Radiant Board. The thin profile and metal layer contribute to the superior acceleration and deceleration of Ecowarm™ Radiant Board.

Traditional radiant heating systems in concrete work well, but they must first charge (heat) a large thermal mass before heat will begin to radiate from the panel. They also accelerate and decelerate very slowly due to the large thermal mass, which can make these systems hard to control. Ecowarm™ Radiant Board, being thin but relatively dense, and aided by its conductive aluminum layer, responds very rapidly. This results in greatly improved response times, with almost no overheating since there is almost no "thermal lag" to overcome. The heating performance of Ecowarm™ Radiant Board can be controlled with standard set-back thermostats.

ECOWARM™ RADIANT BOARD WARMCOAT™

The Ecowarm™ Radiant Board Warmcoat™ aluminum top layer provides multiple benefits. It is highly conductive, and also moisture resistant. Sealing the edges and grooves of Ecowarm™ Radiant Board with silicone caulking provides significant moisture protection for the board. Sealing also provides a barrier to the transmission of any outgassing from the board. Ecowarm™ Radiant Board is manufactured to meet the Federal Housing Authority (FHA) and California Air Resources Board (CARB) formaldehyde outgassing standards. Because we use a benign water-based glue (that is no-VOC when dried) to adhere our Warmcoat™ aluminum layer, which impedes outgassing, Ecowarm™ Radiant Board has virtually no detectable levels of formaldehyde outgassing.

ADVANTAGES OF ECOWARM™ RADIANT BOARD

Hydronic radiant heating is the most comfortable and efficient way to heat your home or building, with many construction benefits and unsurpassed flexibility in zoning. For many years, typical radiant systems involved embedding tubing in concrete slabs or pouring "lightweight concrete" over tubing stapled to subfloors. Designers overlooked the limitations and disadvantages of concrete systems due to a lack of good alternatives. Now Ecowarm™ Radiant Board provides that alternative. It is designed for the application of hydronic radiant tubing over a variety of construction types. It may be used in new construction and also the growing retrofit market. While only adding 3/4" to the existing floor height, Ecowarm™ Radiant Board provides a superior performing radiant heating system. Application of the system is easy: only two board designs are required for installation.

CONSTRUCTION FRIENDLY Ecowarm™ Radiant Board eliminates the need for joist upsizing, double plating and hardwood nailing strips associated with gypsum-based concrete radiant heating systems. Also, Ecowarm™ Radiant Board eliminates substantial drying costs required by moisture-laden concrete and gypsum-based cement. Ecowarm™ Radiant Board eliminates scheduling and curing delays. Time is money.

COST FRIENDLY Ecowarm™ Radiant Board is installed using conventional construction practices and commonly used tools. With a layout plan, the two board panel patterns can be systematically arranged on the subfloor. Not only are the boards light weight, they are also easy to handle, cut and attach.

FLOORING FRIENDLY Ecowarm™ Radiant Board provides a quality flat surface for floor covering assemblies. Each of these flooring assemblies, below, is supported by detailed drawings and instructions such as those illustrated in our Installation Manual.

- HARDWOOD
- ENGINEERED WOOD
- TILE / STONE
- CARPET
- VINYL / RESILIENT FLOORING
- LAMINATE

PLANET FRIENDLY – UNIQUELY GREEN Ecowarm™ Radiant Board is currently the only FSC certified™ radiant board product available, made from 6 or 7-ply USA plywood. The aluminum layer contains recycled content, and is adhered with a water based adhesive (no-VOC on drying).

DESIGN AND PERFORMANCE

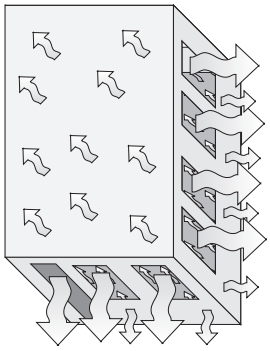


Illustration A-2: Account for all heat losses of the building

HEAT LOSS ANALYSIS AND SYSTEM DESIGN

Systematic heat loss and design for the structure to be heated should be done prior to any Ecowarm™ Radiant Board installation. As with all floor heating jobs, a detailed and accurate heat loss must be calculated in order to determine proper design conditions. This may be provided by a design service (see Design Services pgs). Refer to RPA Guidelines for the Installation of Radiant Panel Systems for standards on insulation and heat loss. www.**radiantprofessionalsalliance.org**

DESIGNER'S NOTE

Perform the heat loss analysis of your structure at the design stage. This way, the selection of floor coverings can be made with system requirements in mind. If the heat loss is too high, add insulation or auxiliary heat. In a very high heat loss room, Ecowarm™ Radiant Board can be added to the walls or ceilings for extra heat.

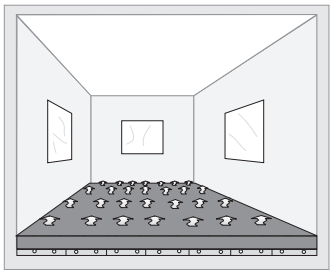


Illustration A-3: Always account for the resistance of floor coverings

R-VALUE OF FLOOR ASSEMBLIES

While Ecowarm™ Radiant Board will work with a wide variety of floor coverings, it is important to realize that all floor coverings offer a resistance to heat transfer typically measured by their R-Value. As with all radiant systems, the higher the R-Value of a floor covering, the higher the average water temperature required to overcome this resistance and to generate the desired amount of heat. With any radiant heating system, if the R-value of any covering on top of Ecowarm™ Radiant Board is excessive, as performance will be compromised due to lack of heat transfer, or would require exceeding the 150°F maximum recommended supply water temperature for Ecowarm™ Radiant Board.

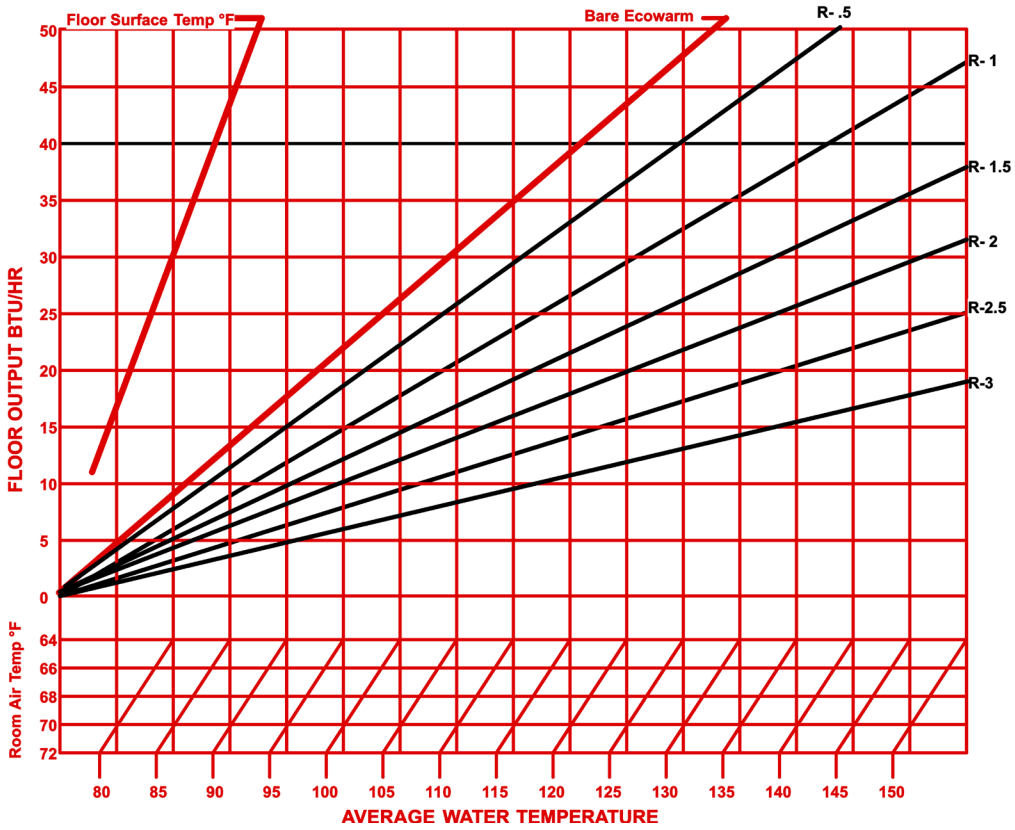
DESIGNER'S NOTE

Remember, average water temperature means the average of the supply and return water temperatures flowing to and from the loop. Most typically, Ecowarm™ Radiant Board is designed with a 20°F temperature drop. This means the supply water temperature would typically be 10°F higher than the average water temperature.

TYPICAL R-VALUES OF FLOORING GOODS AND MATERIALS

Material	Typical R-Value	R-Value Per Inch	Typical Thickness
Plywood	0.825	1.10	0.750
Plywood Underlayment (1/4)	0.275	1.10	0.250
Softwood	0.825	1.10	0.750
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/Plastc Laminate	0.500	1.00	0.500
Laminate Floor Pad	0.300	1.92	0.160
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
Engineered Bamboo	0.720	0.96	0.750
Oak	0.638	0.85	0.750
Ash	0.750	1.00	0.750
Maple	0.750	1.00	0.750
Pine	0.975	1.30	0.750
Fir	0.900	1.20	0.750
Carpet Pad/Slab Rubber 33lb	0.320	1.28	0.250
Carpet Pad/Slab Rubber 33lb	0.480	1.28	0.375
Carpet Pad/Slab Rubber 33lb	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

CHART 1: SYSTEM OUTPUT



HOW TO USE THIS CHART: First, calculate the heating output required in BTU/hr/sq.ft. Proceed horizontally right until you intersect the R-Value line of your floor covering(s), then drop straight down vertically to the horizontal line of desired room temperature, then angle down to the left to read the average required water temperature. For example, if you need 15 BTU/hr/SF with an R-.5 floor covering and a 70°F room temperature, you'll need 93°F average water temperature. A larger version of this chart may be downloaded from **https://ecowarmradiantheat.com/performance/**

DESIGNER'S NOTE

Learn about the resistance of intended floor coverings at the design stage, and make sure they are within the requirements of the system. Realize also that your calculation should include the resistance of the whole flooring assembly above the Ecowarm™ Radiant Board. If you are unfamiliar with hydronic design, good practices and the physics of hydronic heat transfer, you should not design a Ecowarm™ Radiant Board system. For design assistance: p. 39-42.

CAD LAYOUT & DESIGN SERVICES

Third party services can provide complete system design and CAD layouts for the installation of Ecowarm™ Radiant Board. Contact your Ecowarm™ Radiant Board distributor for details. For a description of our design team services, see pages 39-42. All Ecowarm™ Radiant Board systems should be installed by qualified installers.

Custom CAD layouts are particularly useful for first time installers.

ESTIMATING THE REQUIRED NUMBER OF BOARDS

For simple and fast installation, it is highly recommended that a full Ecowarm™ Radiant Board layout be used, indicating the precise panel and tubing layout. This can be provided through Ecowarm. A full professionally drawn plan is recommended for your first few jobs. Contact us about doing a layout and a design. The following calculations can be used for estimating the required number of boards. For experienced installers, calculate the net heated floor square footage of each room and multiply by the following factors: *Straight x 0.0805 Supercombo x 0.0494* (rule of thumb: 62% of a job requires Straight boards, 38% Supercombos).

EXAMPLE: A 600 sq. ft. room. Multiply 600 by 0.0805 to get approximately 49 Straight boards, and by 0.0494 to get 30 Supercombos. We always recommend adding another 5%-10% material excess to your estimation to acount for waste. Doing an exact layout will give you the most accurate estimate of boards needed. The above percentages are estimates based on many jobs, not an individual job. Large rooms use fewer Supercombos and more Straights. Small rooms typically use fewer Straights and a larger number of Supercombos.

TUBING AND LOOP LENGTHS

Ecowarm™ Radiant Board is designed for use with 1/2" nominal ASTM F-876 or F-877 PEX (cross-linked polyethylene), with an average outer diameter measuring 0.625 inch. Loops shall never exceed 350 feet, including sufficient leaders to the manifolds. For areas expecting a heat loss of greater than 25 BTU/Sq.Ft., loops shall never exceed 250 ft. This is due to high pressure drops and water velocity, as shown in Chart C-2 on the following page (gray area = more than 25 BTU/Sq. Ft). Friction losses in the chart are approximate; actual friction losses depend on fluid viscosity and temperature.

*The shaded area in the 350' loop chart C-2 on the following page indicates a high pressure drop. It is recommended that you use the shorter 250' loop length in this case, as shown in the second chart. Once the room square footage is determined, multiply the total by 1. Example: For a 600 Sq.Ft. room, multiplying 600 by 1 gives 600 lineal feet of 1/2" PEX tubing.

Loop Lengths

- ***Notice that loop lengths should never exceed 350'. For heat loss areas over 25 BTUs/Sq.Ft., loop lengths should not exceed 250'.***
- ***Since the tubing is placed 11.75"on center, a 350' loop will cover a maximum of 350 Sq.Ft. A 250' loop will cover a maximum of 250 Sq.Ft.***
- ***Remember to allow extra length to reach the manifolds.***

CHART C-2:

LOOP LENGTH AND TEMPERATURE

ECOWARM RADIANT BOARD 350' LOOPS 20°F TEMPERATURE DROP

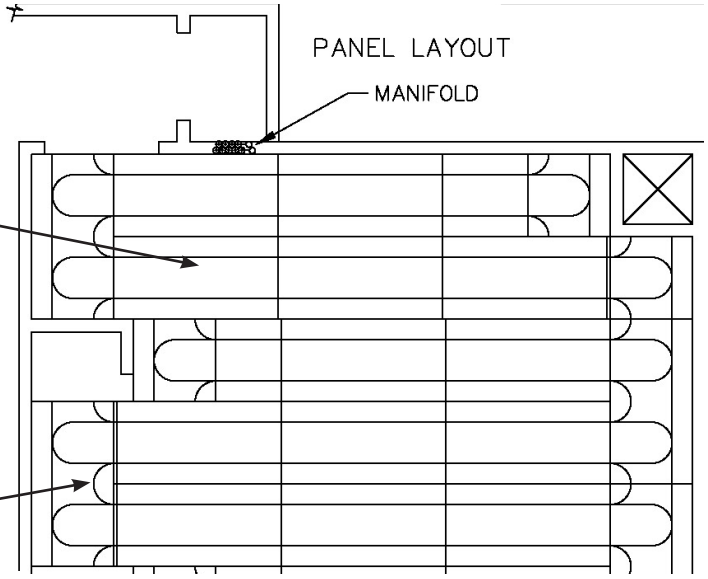
Length (L)	Flow (GPM)	Pipe ID	Ft Of Hd (hf)	Velocity Ft/Sec	BTU/SQ.FT.
350	0.1	0.475	0.24	0.18	2.86
350	0.25	0.475	1.29	0.45	7.14
350	0.5	0.475	4.66	0.91	14.29
350	0.75	0.475	9.86	1.36	21.43
350	1	0.475	16.79	1.81	28.57
350	1.25	0.475	25.37	2.26	35.71
350	1.47	0.475	34.24	2.66	42.00

ECOWARM RADIANT BOARD 250' LOOPS 20°F TEMPERATURE DROP

250	0.1	0.475	0.17	0.18	4
250	0.25	0.475	0.92	0.45	10
250	0.5	0.475	3.33	0.91	20
250	0.75	0.475	7.04	1.36	30
250	1	0.475	11.99	1.81	40
250	1.05	0.475	13.12	1.90	42

Straight

Supercombo



DESIGNER'S NOTE

Remember, average water temperature means the average of the supply and return water temperatures flowing to and from the loop. Most typically, Ecowarm™ Radiant Board is designed with a 20F° temperature drop. This means that the supply water temperature would typically be 10F° higher than the average water temperature.

INSTALLATION

UNDERSTAND THE PRODUCT

COMPONENTS

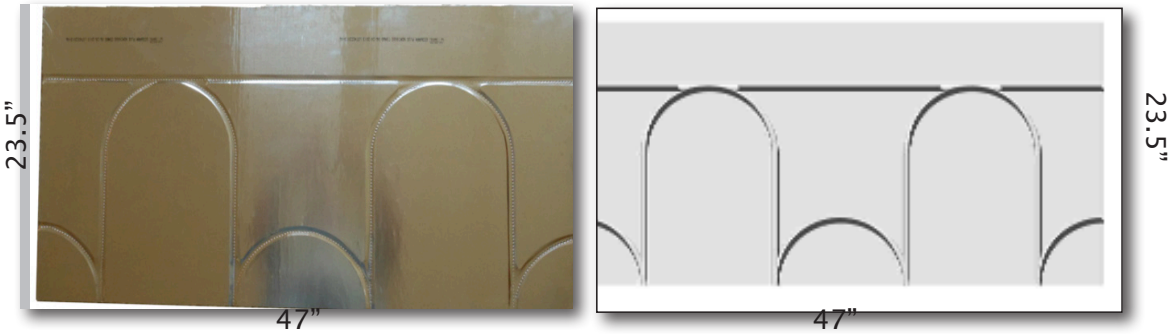
Ecowarm™ Radiant Board comes in two different board configurations: STRAIGHT and SUPERCOMBO. The boards are installed, according to a layout plan, to create a pre-determined channel for the PEX tubing. Ecowarm™ Radiant Board cuts easily with a circular saw.

Always Plan Ahead

- ***Carefully read and follow the installation Instructions.***
- ***Familiarize yourself with the materials and installation methods before you start.***
- ***Use and follow a CAD layout, particularly if you are a first time radiant board installer.***

STRAIGHT – USED ABOUT 62% of the time

SUPERCOMBO – USED ABOUT 38% of the time for BYPASS or RETURN needs



ECOWARM™ RADIANT BOARD is the only radiant board product available with FSC® certified plywood from sustainably managed forests. The heavy aluminum layer is bonded with a water-based adhesive that is no-VOC when dry. Cut from standard 4’ x 8’ plywood, both our Straight and Supercombo finished boards measure 47” x 23.5”.

1/2” PEX TUBING is spaced 11.750” on center. One-quarter radius turns measure 5.935” from the edge. Tubing is walked into pre-slit grooves in the Straight boards, or into the pre-perforated grooves of the Supercombo. See also loop length and precaution guides.

USE THE CORRECT TUBING

Ecowarm™ Radiant Board has a slightly undercut groove and is designed to use ASTM 876-877 regular 1/2" PEX. Do not use PEXALPEX because it won't rebound into the undercut board, but will remain ovaled and will protrude above the top of the board. NOTE: Please adhere to loop length limitations.

UNDERSTAND HOW TO SPACE THE BOARDS

The actual width of each board is 23.5", which provides for installing the boards with a slight gap in between boards. This allows the boards to expand in different temperatures, and accounts for normal variances in humidity in a finished home. When aligning Straights with Supercombo boards, use a 6" piece of tubing as a guide, as shown on the next page. A slight gap of approximately 1/32" will naturally occur between the Straight boards. This is normal. Try to allow a similar 1/32" inch gap between the ends of all boards, but always make sure all grooves align, as described in the following section.

INSTALLER'S NOTE: CUT YOUR BOARDS ACCURATELY

Since Ecowarm™ Radiant Board is a modular system, the boards are manufactured to tight tolerances in groove spacing and as to the squareness of the sides and ends. When cutting Ecowarm™ Radiant Board, make sure to cut the boards squarely and to carefully allign the boards so that subsequent pieces will fit correctly. This is not difficult, but attention to this easy step will prevent major problems. See tips for groove alignment, p. 14

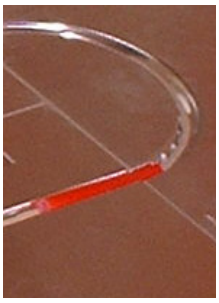
PRODUCT SHIPPING / STORAGE

Nominal dimensions: *Each board is 23.5" x 47" x 3/ 4" thick, or 7.83 square feet a board*
Weight: *Approximately 2.3 lbs. per square foot, 18 lbs. per board*
Pallet Size: *4' x 4' x 32" tall (2 ECOWARM RADIANT BOARDS™ to a row, 37 rows high)*
Approximate Pallet Weight: *1370 lbs.*
Approximate Truckload Quantity: *Approx 20,008 square feet*
Pallet Appearance: *Shrink wrapped, corner protected, with color coded corners by part #*
Recommended Product Mix: *Straight 62%, Supercombo 38%. Additional 5%-10% for waste.*

PROPER STORAGE AND MOISTURE CONTACT

Ecowarm™ Radiant Board should always be stored in a temperate, dry place (40F°-90F°). Avoid prolonged exposure to sunlight. Do not store in a damp location. Be sure to follow all instructions elsewhere in this manual regarding protecting the board from prolonged moisture contact, or expansion of greater magnitude could create undesirable effects.

USE THIS METHOD TO ALIGN THE GROOVES



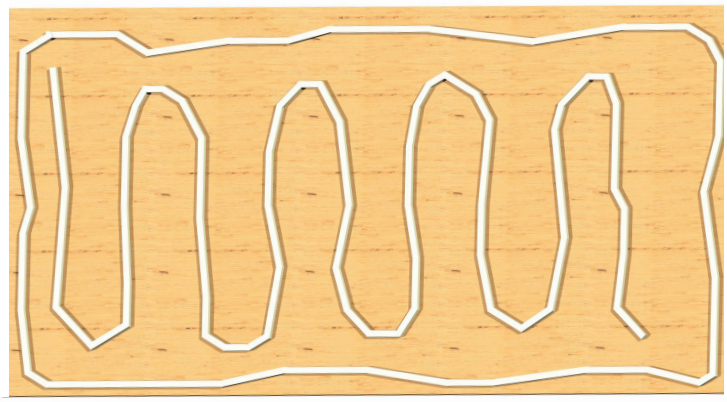
The easiest way to assure the tubing grooves are fully aligned between boards is to cut 6” pieces of 1/2” ASTM F-876 or -877 PEX to use as alignment tools. Place the boards close to desired alignment, then press a piece of 6” tubing into each groove, lapping 3” into the grooves of each board, as shown. After the boards are attached, remove the guides.

HOW TO ATTACH ECOWARM RADIANT BOARD™ TO A SUBFLOOR

Each Ecowarm™ Radiant Board should be glued to the wooden subfloor using low VOC construction adhesive-type glues at a minimum 1/8” bead. Use the gluing pattern shown.

Tips For Gluing

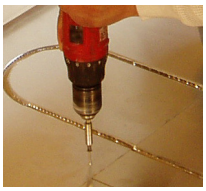
- ***Avoid getting glue in the groove or where it may come into contact with the tubing.***
- ***Use only recommended glues. Many glues can damage PEX tubing.***



After gluing and placement, the boards are cross stapled or screwed to the subfloor.

AFTER GLUING BOARDS:
SCREW OR CROSS STAPLE TO THE SUBFLOOR

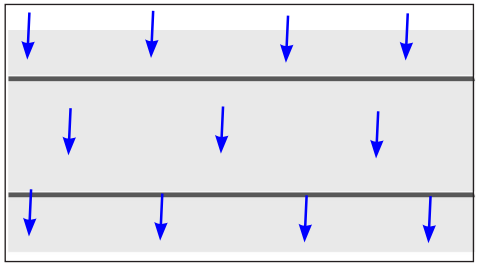
After you have glued Ecowarm™ Radiant Board using the proper glue applied in the proper pattern, the boards should then be screwed or cross-stapled to the subfloor.

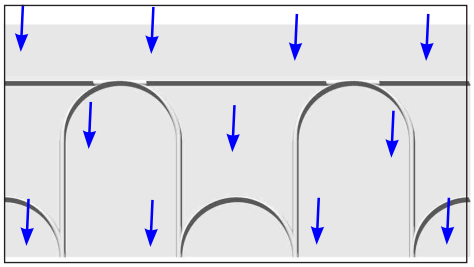


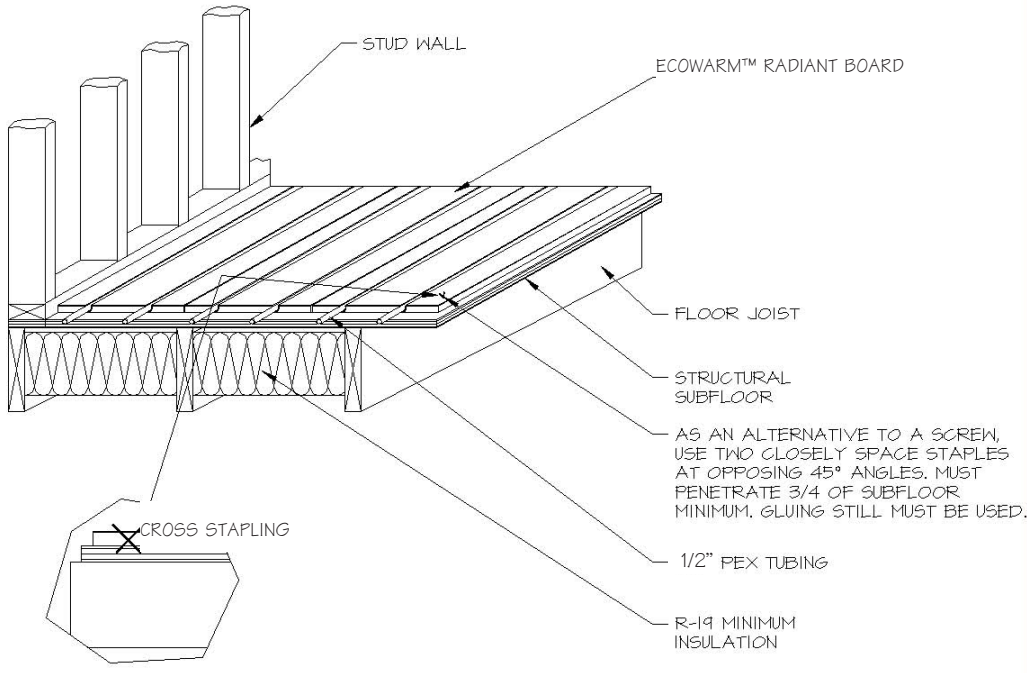
SCREWS: On full size pieces (23.5" x 47"), 11 screws should be used: 8 on the perimeter and 3 in the middle. As a general rule, 12" O.C. for the perimeter, 16" O.C. for the interior. Pattern is shown below.

STAPLES: As an alternative to gluing and screwing, Ecowarm™ may be installed by gluing and stapling, and then cross stapled as shown for extra strength. Cross stapling means 2 staples are put closely together at opposing 45° angles, as shown below.

Attach Ecowarm™ Radiant Board to the subfloor at locations shown by blue arrows.

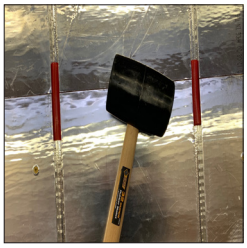






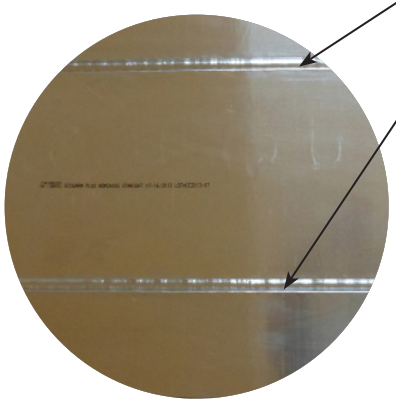
Installing Tubing in the Channels of Ecowarm Straights and Combos

Note: Do not use PERT or PEX-AL-PEX with Ecowarm, **use ASTM 876-877 1/2" PEX.** When installing over a subfloor: Immediately after glueing the bottom of the boards with construction adhesive (so it has not yet set) and before attaching Ecowarm boards to subfloor, cut small pieces of the 1/2" PEX pipe to use as alignment strips for the boards. Step or pound them into the boards to align them. Then staple or screw the boards down as shown in the manual.

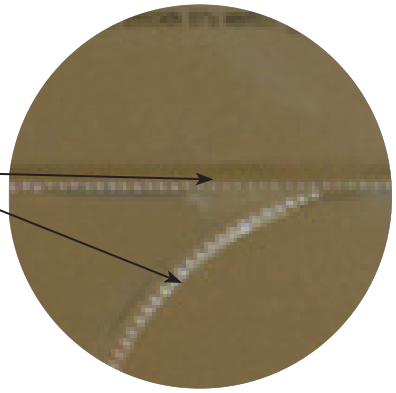


To install PEX tube in boards note that Ecowarm straights and combos are made differently for a reason. The straights are grooved and then aluminum is placed in the grooves. Then the whole top of the board is laminated with aluminum which is slit and folded over the aluminum in the grooves. Since the combos have multiple channels to choose from, they are made differently. The combos are first laminated with aluminum on top, then the channels are indented and then perforated down the middle. This allows keeping the aluminum intact over the channels that are not used. Since the aluminum is over 1300 times the conductivity of the wood, this helps the overall efficiency of the board. When installing the PEX tubing in the perforated panels, the aluminum splits at the perforated channel and then is pressed against the side of the tube. Thermal imaging has proven it works very well and this value engineering reduces the cost the board to you with negliable reduction of performance.

Tubing is usually easy to walk in the channels of the straights



when installing tubing in the chosen perforated channels in the Combos several methods work as described below:



When installing tube in the chosen perforated channels the following methods are suggested: often the tubing may be walked or pounded with a mallet into the straight by-pass channel. The curves are best done by taking a cut length of tubing and pounding it into the channel with a rubber mallet and removing it and then putting the actual tubing in. Another method is to put the sharp point of the multi tool shown at right at the starting point and rock it downward around the corner. It can be done more slowly with a utilty knife. Push downward do not pull up.

Cutting Ecowarm Straights and Combos

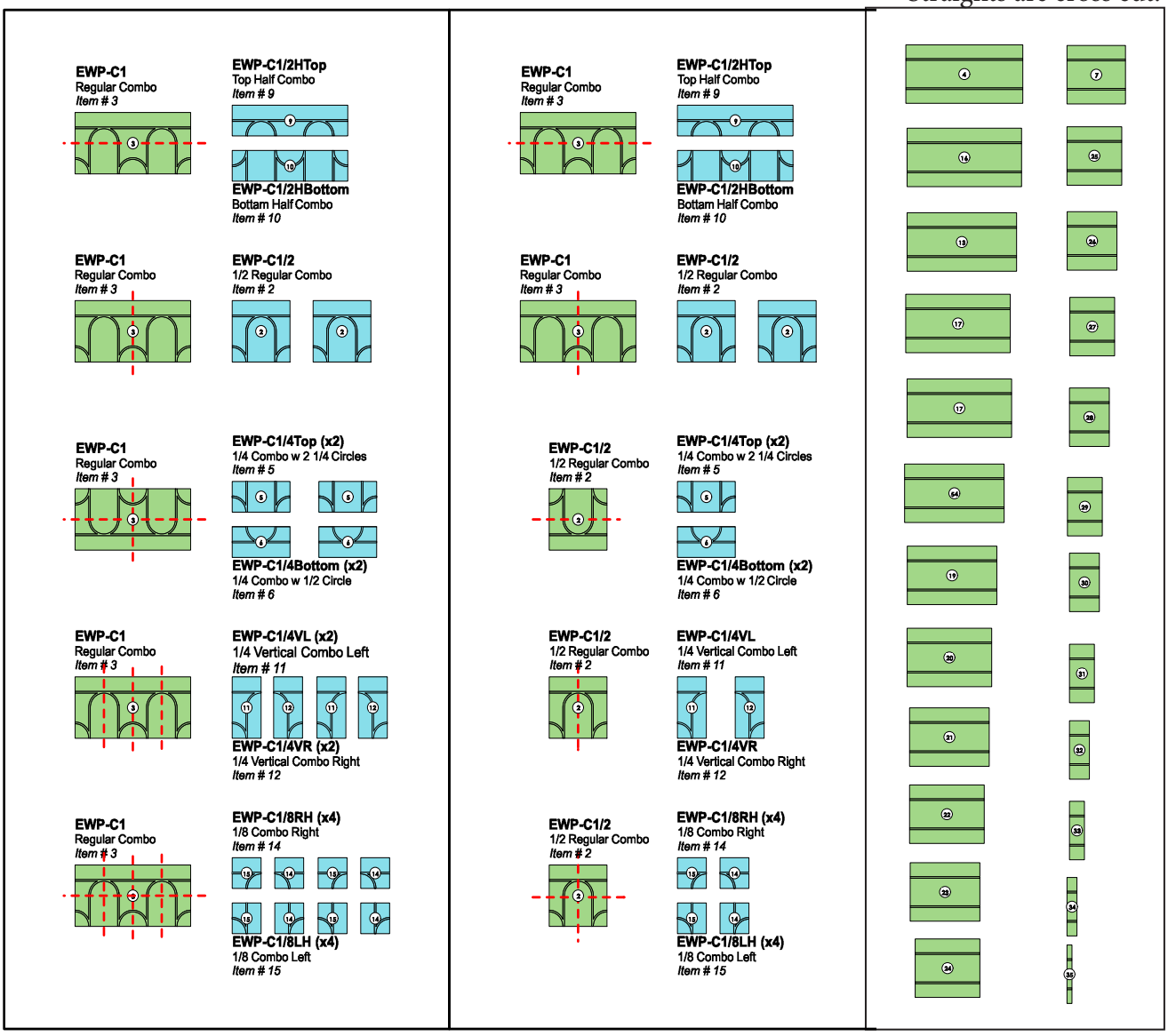
Ecowarm boards are cut on a router table out of 4'x8' sheets of plywood and lose the kerf of the router and measure 47" x 23.5",

They may be easily cut using a high tooth carbide tipped multi purpose blade on a table saw or radial arm saw. They can be cut with a circular saw with a similar high tooth blade but due to the precision of the boards, the more precise cuts of a well adjusted table or radial arm saw is preferred.

On Ecowarm CAD Layouts, a parts list is provided for reference, but cutting is done in the field. Straights are laid out using as many of the full length 47" Combos as possible and the shorter lengths are laid out in 2" increments so actual lengths of the shorter Straight boards should be field verified before cutting. The factory normally includes an extra 5% for waste and errors but it is expected that most of the cut offs will be used so do not discard before project is complete.

Many projects use only full and 1/2 Cuts of Combos but depending on the job can be more complex and the chart below shows the yield of the different possible shapes for reference:

Straights are cross cut:



OVERVIEW OF FLOOR SURFACE REQUIREMENTS

NOTE: See also the specific application drawings and notes for installing Ecowarm™ Radiant Board and floor coverings on pages that follow in this manual.

SUBFLOOR REQUIREMENTS – GENERAL

THE SURFACE OF THE SUBFLOOR MUST BE FLAT: The requirement for flatness is defined as the maximum difference between two adjacent high points and the intermediate low point. The maximum acceptable difference in level is 3/16 of an inch in a 10-ft. radius.

FIRST, FILL EXCESSIVE VOIDS OR LOW AREAS USING A LEVELING COMPOUND: High areas can be ground down or floated over with a self-leveling compound. Check with the leveling compound manufacturer to be sure it is appropriate for the application. Allow the leveling compound to dry thoroughly before you begin the installation. The surface of the subfloor must be clean and dry.

SUBFLOOR REQUIREMENTS – WOOD SUBFLOORS

Wood subfloors must have a stable moisture content, between 6 – 10%. Creaking subfloors must be repaired before installation. If the subfloor sags, inspect the joists below for twists or weakness. If the subfloor is cupped or uneven at the joints, recheck the moisture content of the subfloor to be sure it is in the 6 – 10% range. Check for excessive moisture in the crawl space or basement and look for other signs of a potential water problem. High areas are to be sanded or planed; low areas are to be patched or filled with an appropriate leveling compound, or covered with a rigid underlayment. When using a leveling compound, be sure to follow the manufacturer's recommendations, and allow the compound to dry completely before starting to install the floor.

IMPORTANT NOTE: CONCRETE SUBFLOORS with Ecowarm™ Radiant Board

Ecowarm™ Radiant Board was initially designed to be installed over a wood subfloor. Installation over concrete has been successfully done, but requires extra care and an assured dry slab. Please consult and follow the instructions, limitations and details later in this manual when installing Ecowarm™ Radiant Board over concrete.

EQUIPMENT REQUIRED

FOR INSTALLATION OVER A WOOD SUBFLOOR

The following are necessary for the installation of Ecowarm™ Radiant Board:

- A table or circular saw. A carbide blade is recommended.
- Caulking gun for 1/8" bead of adhesive.
- Electric or cordless drill gun (if you are screwing down boards) with a No. 2 Phillips bit and 5/8" drill bit for supply and return bury points.
- Sheathing type pneumatic stapler (if you are cross stapling boards).
- Rubber or hard hide mallet – possibly needed to apply tubing to groove.
- Chalk line, marking pencils and a square.
- Vacuum cleaner to clean grooves prior to installation of the tubing.
- Pre-cut 6" pieces of 1/2" PEX for aligning grooves.
- A tubing uncoiler is recommended for installing tubing.

INSTALLERS NOTE: CUTTING Ecowarm™ Radiant Board

Ecowarm™ Radiant Board cuts easily with a quality carbide circular saw blade. Pieces must frequently be cut to provide an accurate fit for each room. It is important that they be cut squarely to keep the alignment of grooves accurate in the installation. If you are cutting a large number of boards for a complicated space, number them and make a map or use a plan so you remember where they go.

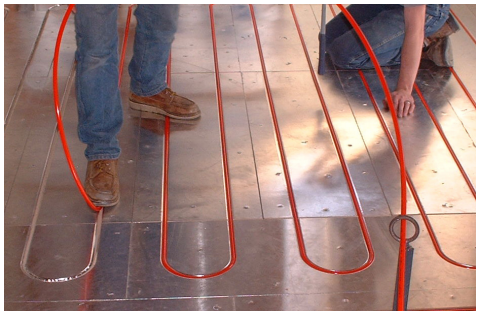





INSTALLING TUBING IN THE GROOVES (See also page 16)

First, vacuum the grooves so there is nothing that will damage the tubing or prevent it from properly going into the groove. The use of a tubing uncoiler is recommended. Start at the intended manifold location, and allow enough tubing as a 'leader" to attach the tubing to the manifold. You may then begin laying your tubing, but make sure you understand the layout and where and how you will return to the manifold. There is, intentionally, a tight tolerance between the ASTM F-876 or -877 PEX tube and the slightly undercut groove. This allows the tubing to be retained in the grooves once it is pushed into place. Usually, this only requires "walking" the tubing into the groove, as shown. Occasionally tubing installation may require the use of a rubber or hide mallet, as shown on the previous page, to force the tubing into place in the grooves.

After installing a loop of tubing, always walk the entire loop and make sure the tubing is fully in the groove for the entire length of the loop. This is very important! The top of the tubing should be just below the level of the top of the Ecowarm™ Radiant Board, and fully retained in the groove.



INSTALLER'S NOTE: ALUMINUM, GROOVES and TUBING

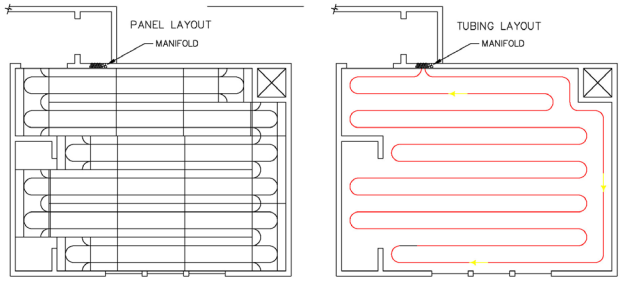
Ecowarm Straight boards are fully clad with aluminum on top and in the grooves. Usually, the tubing may be walked right into these slightly undercut grooves, but you may occasionally need to use a leather or rubber mallet to fully seat the tubing. The Supercombo boards are made differently: the aluminum layer is slightly indented and perforated over the grooves. This allows you to use only those grooves designated in your tubing layout – the remainining aluminum remains intact, allowing it to maintain full conductivity.

To help align the grooves in adjacent boards, use a 6" piece of tubing as a guide, with 3" in each adjacent panel. Again, when placing tubing in Supercombo boards, install the tubing by "walking" it into only those channels designated in the system layout plan.

EXAMPLE LAYOUT AND INSTALLATION: BOARDS AND TUBING

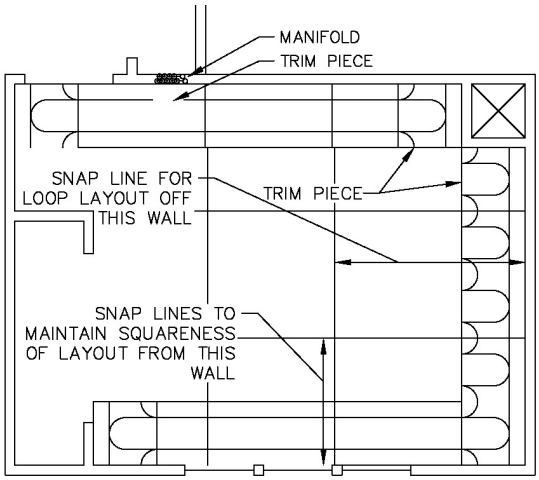
INSTALLATION STEP 1:

Utilizing your layout plan, determine the number and type of boards you'll need and tubing lengths required. Be sure to allow for enough tubing at the ends to serve as leaders up to the manifolds.



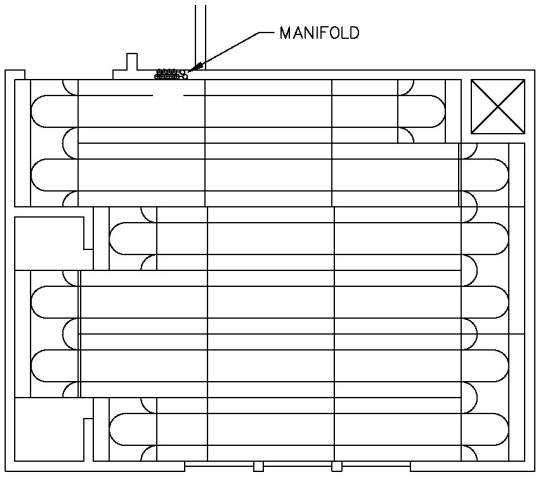
INSTALLATION STEP 2:

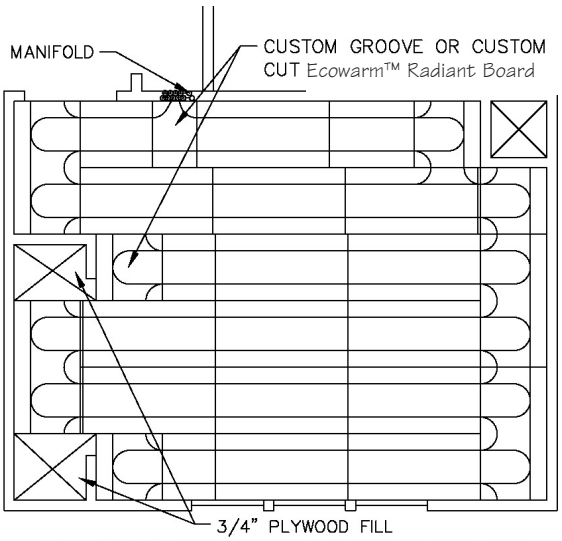
Begin your Ecowarm™ Radiant Board layout by starting the board at the beginning of the supply run into the space, then running boards along the perimeter of the heated space to the area of highest heat loss.



INSTALLATION STEP 3:

Add end pieces and straight pieces, working your way back away from the area of highest heat loss. Once all the boards are in place, confirm your tubing route allows for supply and return leaders to the manifold(s). Route the leader to the manifold, either via the existing panels, custom grooves, grout (slab or existing sub-floor application) or by drilling holes into the subfloor for access.



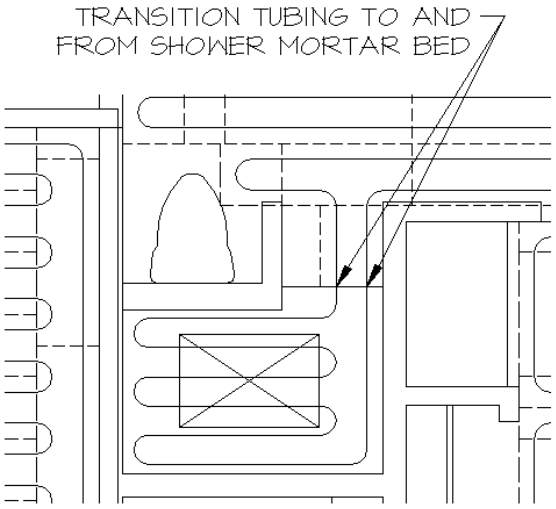


INSTALLATION STEP 4:

Finish laying out your Ecowarm™ Radiant Board pieces according to your design layout, and do any special grooving necessary to route the tubing back to the manifold.

INSTALLATION STEP 5:

Feed enough supply tubing to route to your manifold through a drilled supply hole below the floor, or before the start of groove (if the groove goes directly to the manifold). After every groove has been thoroughly cleaned with a vacuum cleaner, tubing may then be "snapped" into the grooves, per your layout plan. Once tubing has been routed back to the return location, cut enough tubing to route it to the return manifold.



SPECIAL COVERAGE AREAS:

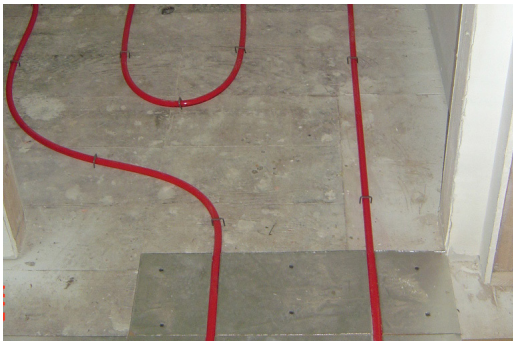
In areas of special coverage, such as shower basins using tile grout as a base, tubing may be routed to and from Ecowarm™ Radiant Board in order to accommodate the desired coverage.

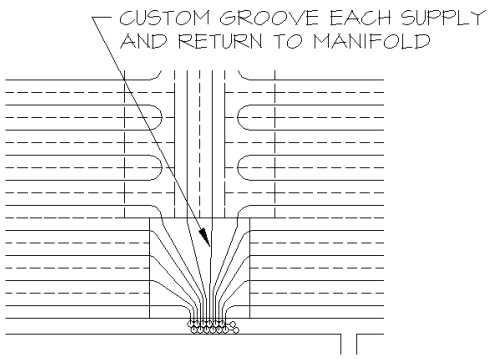
CONNECTIONS AT THE MANIFOLD

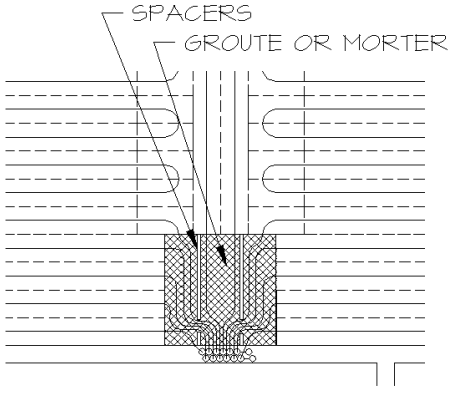
Manifolds are usually located near and above the heating zone they serve, in such places as the back of a closet. Route tubing to the manifold in one of four ways:

1. Insert the tubing directly from the grooves: this works when just a few loop ends are adjacent to the manifold location.
2. Drill an access hole, dive the tubing under the floor, and bring it back up at the manifold, assuring you've allowed enough leader length of tubing.
3. Place a solid Ecowarm™ Radiant Board or plywood sheet next to the manifold into which supply and return lines are custom-routed to the grooves of the Ecowarm™ Radiant Board.
4. Finally, tubing may be run out of Ecowarm™ Radiant Board, stapled to the subfloor, and routed directly to the manifold. Use grout to cover the tubing and level it to the Ecowarm™ Radiant Board. If needed, sleepers may be placed between the tubing to provide a nailing or screw-in base for the floor coverings. Use nailing plates as necessary to protect tubing from damage.

Depending on how many circuits are included on a given manifold, various sizes of grooved sheets or grouting areas may be required.





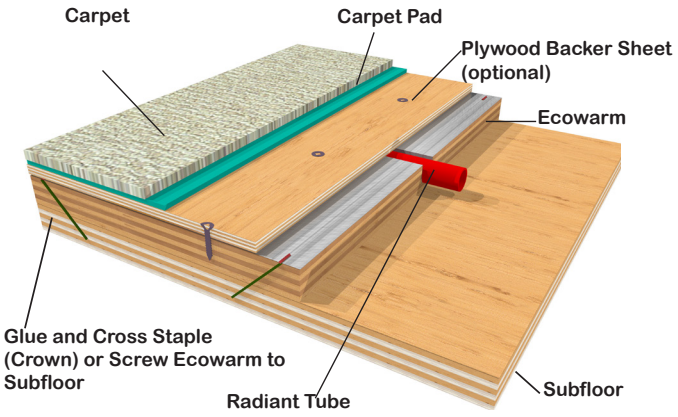


ECOWARM™ RADIANT BOARD INSTALLED OVER A WOOD SUBFLOOR

GENERAL INSTALLATION REQUIREMENTS FOR ALL FLOORING OVER WOOD SUBFLOOR

1. Do not install Ecowarm™ Radiant Board without an accurate room-by-room heat loss analysis of the structure to be heated and a design/layout for Ecowarm™ Radiant Board that takes into account the resistance and heat transfer of the actual floor coverings. If Ecowarm™ Radiant Board cannot provide all the necessary heat, make provisions for additional back up heat.
2. Thoroughly clean all surfaces that Ecowarm™ Radiant Board will be applied to. The surface to which Ecowarm™ Radiant Board will be attached must be flat and dry prior to installation. See requirements for flatness and moisture. The requirement for flatness is defined as the maximum difference between two adjacent high points and the intermediate low point. The maximum acceptable difference in level is 3/16 of an inch in a 10-ft. radius. Wood subfloors must have a stable moisture content between 6–10%. Creaking subfloors must be repaired before installation. If the subfloor sags, inspect the joists below for twists or weakness. If the subfloor is cupped or uneven at the joints, recheck the moisture content of the subfloor to be sure it is in the 6–10% range. Check for excessive moisture in the crawl space or basement and look for other signs of a potential water problem. High areas should be sanded or planed, low areas patched or filled with an appropriate leveling compound, or covered with a rigid underlayment. When using a leveling compound, be sure to follow the manufacturer's recommendations, and allow the compound to dry completely before starting to install the floor.
3. Chalk lines square for a reference, as walls may be out of square.
4. Lay out boards according to the plan.
5. Secure boards with construction adhesive to the wooden subfloor. Be sure to use adequate adhesive and follow the recommended pattern.
6. Start layout of all pieces by securing a corner to allow for proper alignment.
7. Use 6" lengths of tubing in the grooves, lapping 3" into each board to help align the grooves of the boards.
8. A 1/32" width space shall be used between boards (or thickness of credit card).
9. After gluing boards in place, drill and screw or cross staple Ecowarm™ Radiant Board to the subfloor, according to the recommended pattern.
10. Once all boards are installed, clean out all grooves with a vacuum.
11. Snap tubing into the clean grooves and route to manifold per plan.
12. Follow specific recommendations for each floor covering, and refer to the complete installation manual for further instructions on the installation of an Ecowarm™ Radiant Board system.

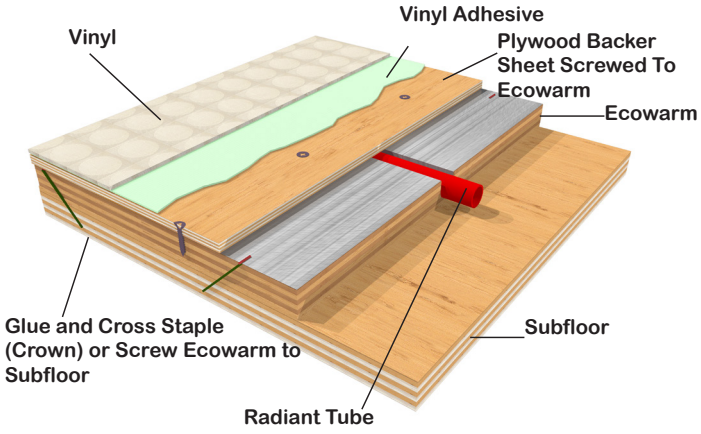
CARPET
over Ecowarm™ Radiant Board



Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor".

In addition, the following specific precautions and instructions shall be followed: Carpet and pad may be installed over Ecowarm™ Radiant Board. When installing the pad, care should be taken to avoid puncturing tubing. As with all radiant heating installations, to allow for adequate heat transfer, a thin slab foam rubber pad and short, high density carpet should be used. If the carpet pad is glued, first install the optional plywood backer sheet, since removal of the bonded pad in the future may damage and compromise the aluminum layer. Maintain a 2" minimum tubing clearance from carpet tack strips. While optional, it is advised that a thin layer of underlayment plywood be applied over Ecowarm™ Radiant Board prior to carpet and pad installation to protect the tubing from point loads such as a piano. Without this thin underlayment, thin carpet and pad may eventually show striping where the tubing is and, while less likely, tubing may be vulnerable to puncture from sharp cleats, golf shoes etc.

VINYL
over Ecowarm™ Radiant Board



Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor".

In addition, the following specific precautions and instructions shall be followed: When installing vinyl flooring, we require that a thin layer of underlayment plywood be applied over Ecowarm™ Radiant Board. In wet locations, a sealant layer should also be added. Underlayment plywood with a grid printed on it helps locate tubing runs and prevent puncturing of the tubing when the plywood is being screwed to the Ecowarm™ Radiant Board. In the case of vinyl, use underlayment, filler and glues suggested by the manufacturer for use over radiant heat. Most vinyl flooring is manufactured to an ASTM standard with an upper limit of floor temperatures of 85°F. This limit should be followed. Attach required underlayment with care to not puncture tubing.

THINSET TILE OR STONE over Ecowarm™ Radiant Board

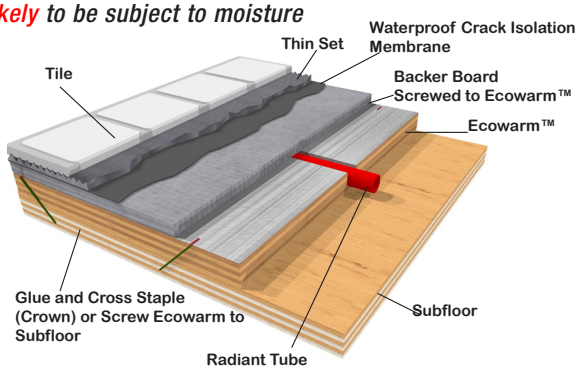
Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Installation Requirements For All Flooring Over Wood Subfloor". In addition, the following specific precautions and instructions shall be followed: When installing masonry, tile or stone, backer board shall be used over Ecowarm™. Thin set and screw the backerboard to the Ecowarm™ with a thinset compatible with PEX tubing. Thinset installation on top of backerboard shall follow TCA Guidelines. In the kitchen, baths, laundry or any other area where water may be present, a water sealant layer (i.e. Nobleseal) shall be used. Where tile or stone is going to be thin-set, anti-fracture membrane (Nobleseal) or equivalent shall be installed over the backerboard. Maintain 2" minimum tubing clearance when screwing backer board down. Refer to the complete installation manual for further instructions on the installation of an Ecowarm™ system.

Notes On Sealing

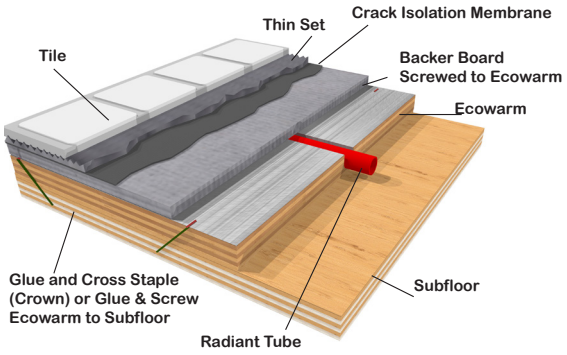
The aluminum layer on top of each Ecowarm™ Radiant Board is highly water resistant. Thus, a significant degree of moisture protection is provided simply by using a silicon sealant as a caulk between the boards. Properly applied, this will profoundly reduce the likelihood of water transmission into the boards.

This is not a substitute, however, for our recommended installation methods in wet areas.

THINSET TILE OR STONE
for areas likely to be subject to moisture



THINSET TILE OR STONE
for areas unlikely to be subject to moisture



INSTALLER'S CAUTIONS :

Do not omit the backerboard layer. Do not thinset tile or stone directly to Ecowarm™ Radiant Board. Do not install crack isolation membranes directly to Ecowarm™ Radiant Board – they may not get a good bond and many use materials incompatible for contact with PEX.

MORTAR BED SETTING OF TILE OR STONE over Ecowarm™ Radiant Board

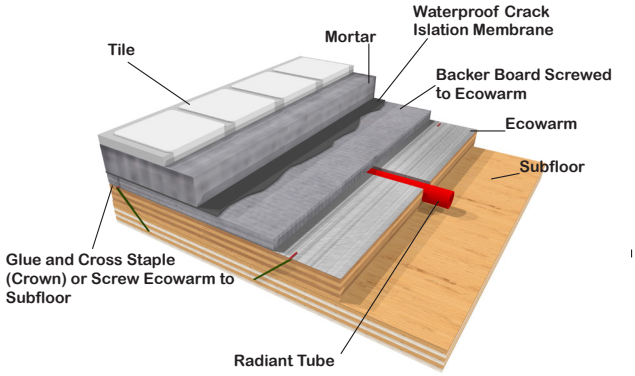
Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor". In addition, the following specific precautions and instructions shall be followed: When installing masonry, tile and stone, backer board shall be used over Ecowarm™ Radiant Board. Thin set and screw the backerboard to the Ecowarm with thinsets compatible with PEX Pipe. The installation on top of the backerboard shall follow TCA Guidelines. A conventional mortar bed shall then be used. In the kitchen, bath, laundry or any other area where water may be present, a water sealant (i.e. Nobleseal) shall be used. Maintain 2" minimum tubing clearance when screwing backer board down. Refer to the complete installation manual for further instructions on the installation of the Ecowarm™ Radiant Board system.

Notes On Sealing

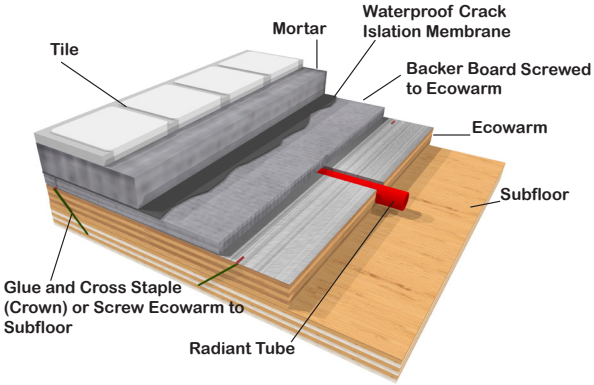
The aluminum layer of each Ecowarm™ Radiant Board is highly water resistant. Using silicon sealant to caulk between boards gives significant moisture protection. Properly applied, this reduces the likelihood of water transmission into the boards.

This is not a substitute, however, for our recommended installation methods in wet areas.

TRADITIONAL MORTAR SET TILE OR STONE
for areas likely to be subject to moisture



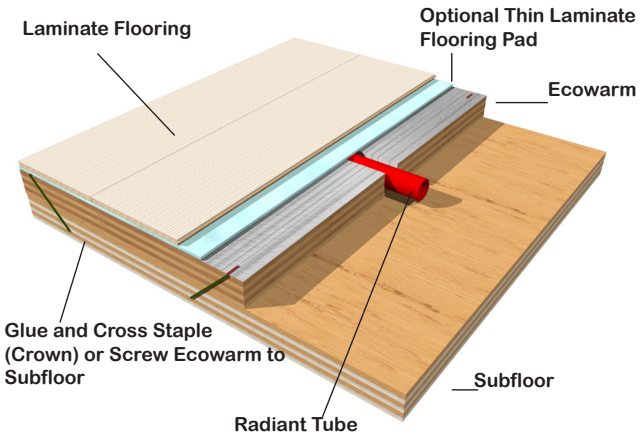
TRADITIONAL MORTAR SET TILE OR STONE
for areas unlikely to be subject to moisture



INSTALLER'S CAUTIONS :

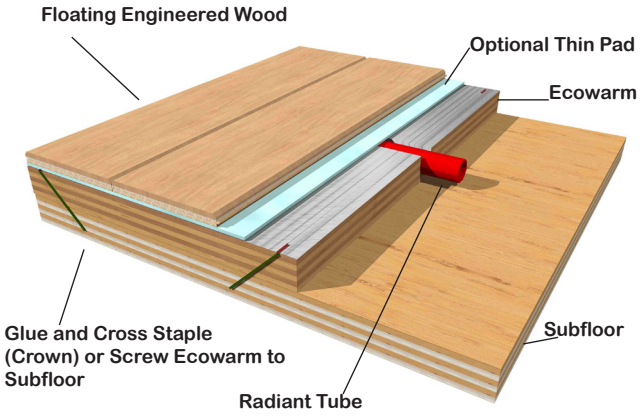
Do not omit the backerboard layer. Do not apply mortar directly to Ecowarm™ Radiant Board. Do not install crack isolation membranes directly to Ecowarm™ Radiant Board – they may not get a good bond and many use materials incompatible for contact with PEX.

LAMINATE
over Ecowarm™ Radiant Board



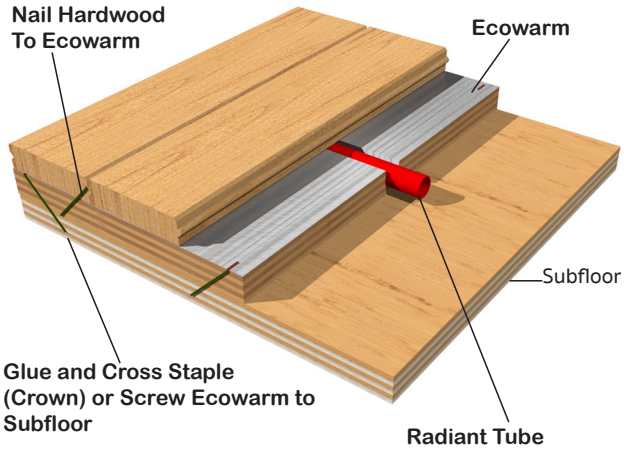
Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor". In addition, the following specific precautions and instructions shall be followed: When installing laminate flooring, a thin layer of underlayment plywood may optionally be applied over Ecowarm™ Radiant Board. In wet locations, a sealant layer should be added over an underlayment layer of plywood. Many, but not all, laminate flooring products are suitable and recommended by the manufacturer for use with radiant floor heat. Check before installing. Many laminate flooring products have floor temperature limits that need to be observed as well. Install laminate flooring crosswise to Ecowarm™ Radiant Board if possible. It is recommended that laminate flooring installed over Ecowarm™ Radiant Board shall employ controls that gradually adjust water temperature going to the Ecowarm™ Radiant Board with a reset curve. A floor temperature limiting sensor can be used to comply with the flooring manufacturer's flooring temperature specifications.

ENGINEERED WOOD
over Ecowarm™ Radiant Board



Ecowarm™ Radiant Board shall be installed over a wooden subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor". In addition, the following specific precautions and instructions shall be followed: Many, but not all, engineered wood flooring products are suitable and recommended by the manufacturer for use with radiant floor heat. Check before installing. Many engineered wood flooring products have floor temperature limits that need to be observed as well. Install engineered wood flooring crosswise to Ecowarm™ Radiant Board whenever possible. It is recommended that engineered wood flooring installed over Ecowarm™ Radiant Board shall employ controls that gradually adjust water temperature going to the Ecowarm™ Radiant Board with a reset curve. A floor temperature limiting sensor can be used to comply with the flooring manufacturer's flooring temperature specifications.

TRADITIONAL HARDWOOD Installed directly over Ecowarm™ Radiant Board



A conventional nailed hardwood floor may be installed directly over Ecowarm™ Radiant Board using nails long enough to penetrate the subfloor, and with the utilization of recommended setback controls.

See also sections on general considerations with the use of traditional wood flooring. Ecowarm™ Radiant Board shall be installed over a wood subfloor, complying with "General Ecowarm™ Radiant Board Installation Requirements For All Flooring Over Wood Subfloor".

In addition, the following specific cautions and instructions shall be followed:

1. Extreme care shall be taken to avoid nailing tubing.
2. Hardwood floor joints shall not be installed directly at a joint of Ecowarm™ Radiant Board.
3. Hardwood floor nails shall be long enough to penetrate both hardwood and subfloor.
4. Hardwood floors installed directly over Ecowarm™ Radiant Board shall employ controls with a reset curve that will gradually adjust the water temperature going to Ecowarm™ Radiant Board; the floor will expand and contract gradually with temperature changes. This will reduce the likelihood of warping, gapping or shrinkage problems. The use of a floor temperature limiting sensor is recommended.
5. It is extremely important that the designer know the desired installed direction of wood strip flooring prior to the design of Ecowarm™ Radiant Board system, since the direction of Ecowarm™ Radiant Board should run perpendicular to the direction of the strip flooring.
6. Install strip wood flooring with mallet driven nails of sufficient length to penetrate Ecowarm™ Radiant Board.
7. Structure humidity shall be kept within the range specified by the flooring manufacturer.
8. The wood flooring shall be installed at the relative humidity recommended by the manufacturer for the local climate where the structure is located.
9. The use of narrower 2"to 3 1/2" strips of wood flooring is recommended over radiant floors, not wide planks.
10. The lessons of local practice and climate shall be referenced.
11. Make sure the heating system has been running and the space has been maintained to at least 65F° long enough that temperature and humidity have stabilized to predicted future levels before installing hardwood flooring over Ecowarm™ Radiant Board.
12. The flooring product shall be allowed to acclimatize before installation.
13. Use woods that are known to be dimensionally stable.

CONSIDERATIONS

FOR INSTALLING TRADITIONAL STRIP WOOD FLOORING OVER ECOWARM™ RADIANT BOARD

The key to installing wood floors over radiant heat is to give extra care to the species of wood you choose, wood strip width and thickness, ambient moisture levels, installation practices, the heat output requirements of your system, and radiant heating controls.

BOARD WIDTH / DEPTH: Install narrow board widths, preferably 3 inches or less. Avoid boards wider than 4 inches. Narrow boards provide more gaps for expansion and contraction across a floor; therefore, any gaps resulting from natural movement are much less noticeable. The maximum recommended board depth is 3/4 inch. Thicker boards add too much resistance to heat transfer.

DIMENSIONAL STABILITY: Use quarter sawn wood. It is significantly more dimensionally stable than wood that is plain sawn. Pick a wood known to be dimensionally stable. American cherry, ash, most softwoods and teak fill this bill, and oak is reasonably stable. By contrast, hickory, maple, madronne and American beech are known to be less stable.

AGE & DRYING OF TROPICAL WOODS: If you are importing tropical or exotic woods, pay close attention to the source, age and how the wood has been dried. Tropical wood needs to dry slowly to maintain its integrity upon installation. Quick drying creates stresses that can affect the wood later as it expands and contracts. If your supplier has stored the wood in your region with no problems for one to two years, the wood is much less likely to present surprise stress-related problems. Though it can be fun to be unique, please avoid pioneering the use of a wood for which little is known about its dimensional stability.

MOISTURE: Wood naturally expands and contracts in response to changes in moisture. With this in mind, avoid installing wood flooring during such stages of construction as sheet rocking or painting, when significant moisture may be introduced into a structure. Before installation, operate the heating system until the humidity in the structure stabilizes to the average level expected for the area in which the wood floor will be installed. Then, allow the wood to acclimatize to this humidity level by "sticking" (usually several weeks) before installation. This will minimize dimensional changes due to moisture. Make sure the wood is dry, since radiant heat itself can be drying. Experienced flooring installers recommend buying wood for flooring over radiant at around 6 to 8 percent moisture content. This figure may change somewhat regionally. Use a moisture meter during the construction process, and then use the average of many readings. Remember, the average expected humidity level of a structure is an average of seasonal conditions. So if the structure is expected to average 30 percent humidity in the winter and 50 percent in the summer, the average would be 40 percent. This equates to about a 7.5 percent moisture content in the wood. Most installers consider this average the ideal moisture level at which to install wood flooring. These numbers can vary significantly by region.

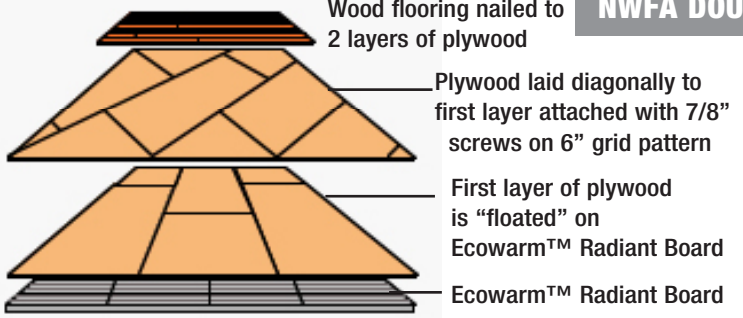
SURFACE TEMPERATURE: The maximum surface temperature of a wood floor should be limited to 85°F. Use a control strategy that ensures this will not be exceeded. Use an indoor or outdoor reset control that gradually brings the floors to temperature.

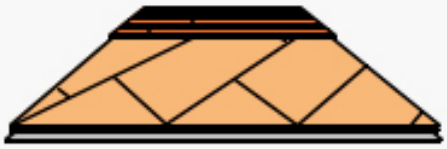
FOR INSTALLING WOOD FLOORS OVER ECOWARM™ RADIANT BOARD

Ecowarm™ Radiant Board may be used under traditional strip wood flooring in several ways. A conventional nailed and hardwood type system may be used directly over Ecowarm™ Radiant Board, with controls as described in the previous section. There are many advantages to this method: quicker response, lower cost of installation, higher heat output due to lower resistance of flooring, and an indoor or outdoor reset control that gently brings the flooring through temperature changes – evenly, gradually and accurately.

Optional floating methods for use with traditional STRIP WOOD flooring: 2 layers of 1/2-inch plywood may be floated on top of Ecowarm™ Radiant Board and strip flooring then nailed to it, as shown below in a method recommended by the National Wood Flooring Association (NWFA). This method has the advantage that it allows the wood flooring system to float independently from Ecowarm™ Radiant Board, but it also has significant disadvantages in that the additional 1" thickness of plywood limits the output of the system. For example, two layers of 1/2" plywood with 3/4" of strip oak flooring has an R-value of about R-2.3 compared to R-1.55 without. This limits heat output and requires higher water temperatures. Before choosing this system, do a careful heat loss analysis to see if this method will produce enough heat. If it won't, choose another method, or make provisions for backup heat. We recommend, but don't require, a hydronic control strategy with a reset curve that gradually adjusts water temperature going to Ecowarm™ Radiant Board.

NWFA DOUBLE PLYWOOD FLOATING METHOD





Finished flooring assembly of strip wood flooring and plywood "floats" independently on top of Ecowarm™ Radiant Board

Clip style floating strip flooring systems must be installed directly over Ecowarm™ Radiant Board such that clips will never come into contact with the tubing.

The use of a floating ENGINEERED WOOD is a preferred method. This product should have a specific warranty for use over radiant floors. Many manufacturers of these products have such a warranty, and often have extensive experience both in Europe and North America with radiant heating applications. Edge glued floating engineered wood flooring systems are preferred, since they are dimensionally stable and expand independently from any thermal mass. Ecowarm™ Radiant Board should be installed such that the hardwood runs perpendicular to the majority of the tubing runs.

Glue and nail down and glue down wood flooring systems require care and CORRECT GLUE: When using glue down and glue and nail down methods, the wood floor should be attached to the Ecowarm™ Radiant Board according to the flooring and glue manufacturers' recommendations for installation over radiant heat. Please see the next page for details.

GLUE AND NAIL / GLUE DOWN – WOOD FLOORING SYSTEMS

There has been a recent increase in the use of glue with wood flooring of all types, an increase in wide plank engineered wood flooring that recommends installation with glue and nails, and wood flooring that recommends or allows for installation by glue down methods. This text addresses these changes, recommends several glues to use when wood flooring is installed over Ecowarm™ Radiant Board with glue, and highlights concerns and limitations that should be considered.

General Considerations

Great efforts have been made to make Ecowarm as green as possible, and this applies to our glues as well. We use low VOC (Volatile Organic Compound) glues to bond the aluminum to our plywood, and our aluminum is additionally a positive barrier to outgassing from the glue and the plywood. Since wood flooring glues used to bond flooring to Ecowarm are applied on top of our aluminum, they have the potential to significantly affect the indoor air quality of a room. There is a new generation of more environmentally benign adhesives which substantially reduce these possible emissions, and we recommend their use when gluing down a floor. But consumers should be made aware that traditional nail down methods, edge glued floating engineered wood flooring and floating edge lock flooring, have, in general, less likelihood of affecting indoor air quality and can be a great choice. Traditionally, in all homes and those with radiant heated floors, wide boards have presented more problems in terms of contraction and expansion than narrow boards; narrow boards allow more small spaces for expansion and contraction from changes in humidity and temperature. Use of wide plank engineered wood floors, or stabilized reclaimed wide plank wood, requires the sophisticated manufacturing of a well stabilized product, and should be carefully researched before use over radiant heat. Wide plank boards are best glued and nailed, and wide plank flooring of species known to expand and contract significantly with changes in humidity should be avoided. Wood flooring installers are advised to discuss these issues with their clients.

Additional Considerations

Any wood flooring glue used needs to be compatible with PEX pipe. Due to our board's aluminum layer, glues dry significantly slower than when applied on a wood subfloor, so be sure to account for this in timing your installation.

INSTALLER'S NOTE : USE ONLY THESE APPROVED GLUES

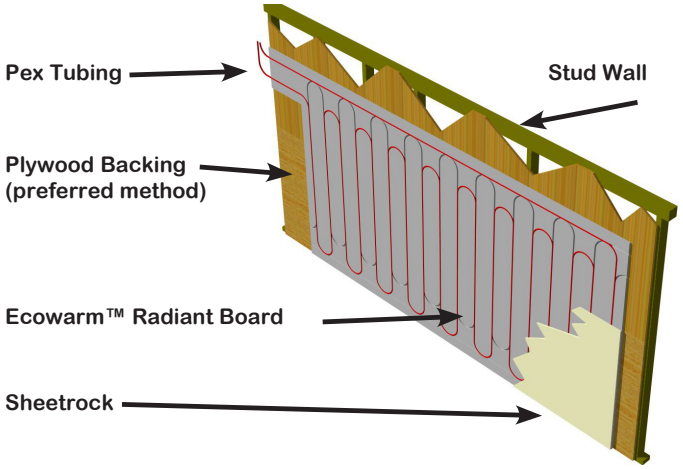
Sikabond T-35
Mapei Ultrabond Eco-980
Bostik Greenforce

For details, see Recommended Glues, page 45

WALL OR CEILING

APPLICATION OF ECOWARM™ RADIANT BOARD

Ecowarm™ Radiant Board may be installed on walls or ceilings to provide extra heat output when floors cannot provide all the necessary heat. Radiant walls and ceilings may also be used to provide all the heat of a room under certain circumstances when properly designed. The heat output of radiant walls and ceilings is different from that from floors, due to differences in the strength of the convective component of the heat, which is stronger in radiant floor heating than in walls or ceilings. However, since walls and ceilings are typically covered only with relatively low R-value 1/2" sheetrock, and acceptable surface temperatures are higher, the heat output of these systems can be quite substantial. It is very important not to overheat sheetrock, or discoloration or damage may occur. For design purposes, use chart C-1 on page 9, but correct the output in BTU's downward 14% for walls and 22% for ceilings. This is because the convective component of the heat output is lower in wall and ceiling radiant heating systems.



Ecowarm™ Radiant Board wall and ceiling systems shall be installed as follows:

As with flooring, pre-plan your layout. Ecowarm™ Radiant Board shall be installed square to framing, attached per p.15 to plywood attached to framing (preferred method), or directly to studs, rafters and/or blocking, with as many joints as possible screwed securely to the framing. Ecowarm™ Radiant Board shall be secured to plywood or framing on both sides of the grooves on every board. Layout of all pieces shall be started by securing a corner to allow for proper alignment. 6" lengths of tubing shall be temporarily placed in the grooves, lapping 3" into each board as guides, to help align the grooves of the boards during installation. Once all boards are installed, all grooves shall be cleaned out with a vacuum just prior to tubing installation. Tubing shall be snapped into the grooves and routed to a manifold per the plan. A 1" minimum tubing clearance shall be maintained for all nailing. Add steel plate protectors over tubing where tubing crosses studs. Supply water temperatures shall not exceed 120F° when Ecowarm™ Radiant Board is installed under plaster or sheetrock.

ECOWARM™ RADIANT BOARD INSTALLED OVER CONCRETE

The successful installation of Ecowarm™ Radiant Board over concrete requires special care due to moisture issues, difficulties in sealing concrete, and in attaching boards to concrete.

All concrete slabs give off supplementary moisture, whether above, on, or below grade. This can cause problems for any board product installed over concrete, including Ecowarm™ Radiant Board. Ecowarm™ Radiant Board may be installed over concrete using one of the following 3 methods on p. 33*, only when the installing parties are willing to assume full responsibility for any installation issues regarding moisture and attachment of Ecowarm™ Radiant Board to concrete.*

MOISTURE: When installing Ecowarm™ Radiant Board over concrete, moisture considerations must be carefully addressed. Remember that while a slab may appear to be, or actually be, dry during one time of year, this may change seasonally as environmental conditions change. Below is a procedure for testing the moisture of slabs, including slabs between floors, as in commercial construction. It is the co-responsiblity of the contractor and the installer to test all concrete substrates, both new and old, for moisture content to assure a slab is sufficiently dry to install Ecowarm™ Radiant Board. Moisture in concrete should be tested according to ASTM F 1869 (Calcium Chloride Moisture Test using the Quantitative Method). With a calcium chloride test, the maximum acceptable reading is 3 lbs / 4 hrs / 1,000 sq.ft. New concrete slabs and basements must be cured for a minimum of 60 days prior to installation. Before you proceed with any Ecowarm™ Radiant Board installation, determine whether the existing or new slab is sufficiently dry, and do any sealing of the slab.

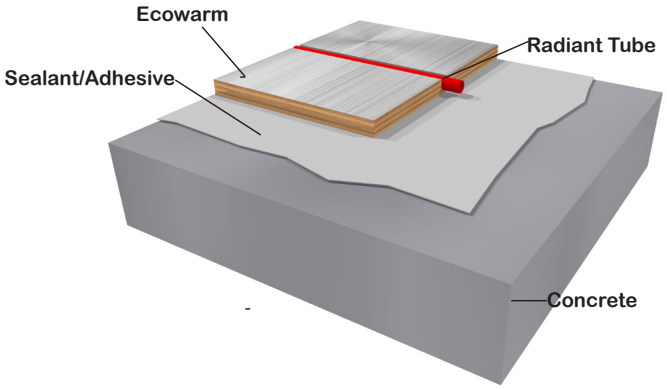
SEALING: Before installing Ecowarm™ Radiant Board, it is strongly recommended that all slabs below grade and slabs on grade be sealed against moisture penetration by means of vapor barriers or products such as Sika T-35, which is both a sealant and adhesive. It is also important that all installations of Ecowarm™ Radiant Board over concrete slabs, below grade and on grade, be insulated against downward heat loss, either as shown in the detail on p. 35, or under the slab, or downward at the perimeter, per recommendations of the Radiant Professionals Alliance. In seismic areas, the increasing use of engineered "Seismic Slabs" means that fewer radiant floor heating systems will be installed with tubing in the slab itself; there will be more need for the 3 details on p. 35 .

FLOOR COVERINGS installed over Ecowarm™ Radiant Board installed over concrete:

For general details and additional information and requirements for installing various flooring materials above the Ecowarm™ Radiant Board layer, refer to the illustrated guidelines on previous pages. However, please refer to the following page for details on how to install Ecowarm™ Radiant Board itself over concrete. For example, on pages 26-27, you'll see that tile would be installed over Ecowarm™ Radiant Board with a backerboard layer, a crack isolation membrane, mortar, etc. However...

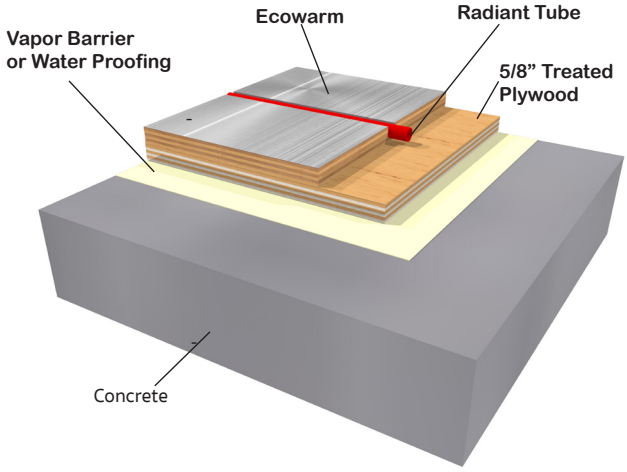
Ecowarm™ Radiant Board itself should always be installed over concrete according to one of the 3 methods shown on the next page.

ECOWARM™ RADIANT BOARD OVER CONCRETE



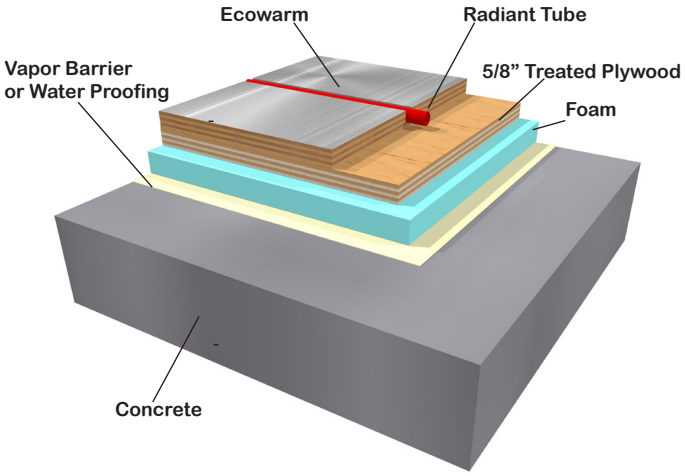
1) Ecowarm™ Radiant Board bonded to concrete using sealant and adhesive

Ecowarm™ Radiant Board may be installed directly over concrete slabs only when the contractor has verified that moisture conditions will be adequately controlled by the use of a sealant on the slab or a vapor barrier under the slab. When using a sealant and adhesive on top of the slab, the sealant may be a combination sealant/wood adhesive, such as Sika-T35, or the sealant and adhesive may be two separate but compatible products.



2) Ecowarm™ Radiant Board over plywood and vapor barrier or waterproofing

Ecowarm™ Radiant Board may be installed on 5/8" T&G treated plywood with a vapor barrier or waterproofing over concrete slabs, only when the contractor has verified that moisture conditions will be adequately controlled by the use of a sealant on the slab or by a vapor barrier over or under the slab.



3) Ecowarm™ Radiant Board over plywood, with foam insulation and vapor barrier or waterproofing

Ecowarm™ Radiant Board may be installed on 5/8" T&G treated plywood, over foam and with a vapor barrier or waterproofing over concrete slabs, only when the contractor has verified that moisture conditions will be adequately controlled by the use of a sealant on the slab or a vapor barrier over or under the slab.

INSTALLER'S CAUTION + NOTES ON GLUE

When installing traditional strip wood flooring directly to Ecowarm™ Radiant Board installed over concrete, you must use one of the methods utilizing 5/8" T&G plywood under the Ecowarm™ Radiant Board to provide adequate nailing. GLUES APPROVED by Ecowarm™ Radiant Board for gluing boards drectly to concrete. See Recommended Glues on page 47.

APPLICATION DETAILS OF ECOWARM™ RADIANT BOARD OVER CONCRETE

WHEN INSTALLING ALL REGULAR FLOORING GOODS*

*EXCEPT STRIP WOOD FLOORING

INSTALLATION OVER CONCRETE

Installation shall comply with one of the 3 details on Page 35, and installing parties must accept responsibility for, and understand, all cautions on page 34 regarding moisture, sealing, and the attachment of Ecowarm™ Radiant Board to concrete. They should also refer to this complete Installation Manual for further instructions on the installation of an Ecowarm™ Radiant Board system. Do not install Ecowarm™ Radiant Board without an accurate room-by-room heat loss analysis for the structure to be heated, as well as a design/layout for Ecowarm™ Radiant Board that takes into account the resistance and heat transfer of the actual floor coverings. If Ecowarm™ Radiant Board cannot provide all the necessary heat, make provisions for additional backup heat.

1. Thoroughly clean and level all surfaces where Ecowarm™ Radiant Board will be applied.
2. Prevent moisture penetration through the slab, either by sealing concrete with a vapor membrane such as Hydroment Ultraseal per manufacturer's guidelines, or with a continuous unperforated under slab vapor barrier, or an above-slab vapor barrier as shown on page 35.
3. Follow one of the three details on page 35, chalking lines on the floor as reference points, and lay out boards according to your plan.
4. If you're gluing Ecowarm™ Radiant Board to concrete sealed with a membrane, be sure to use adequate adhesive compatible with the vapor membrane to glue down Ecowarm™ Radiant Board to the membrane. Approved glues, p.32, 47.
5. When attaching Ecowarm™ Radiant Board to plywood, lay out boards according to your plan, and then either glue and screw or glue and cross staple Ecowarm™ Radiant Board to the plywood. Be sure to use adequate adhesive.
6. Start layout of all pieces by securing a corner, to allow for proper alignment.
7. Use 6" lengths of tubing, lapping 3" into each of two adjacent boards, to help align the grooves of the boards.
8. Once all boards are installed, clean out all grooves with a vacuum prior to tubing installation.
9. Snap tubing into the designated grooves and route to the manifold, per plan.
10. Install backerboard when applying tile or vinyl flooring over Ecowarm™.
11. Maintain a 2" minimum tubing clearance from carpet tack strips or any nailing.
12. Refer to drawings on previous pages for additional details and requirements for installing various flooring goods over Ecowarm™ Radiant Board.

ECOWARM™ RADIANT BOARD OVER CONCRETE with STRIP WOOD FLOORING

Installation shall comply with one of the two details on p.33 involving the use of 5/8" treated T&G plywood. Installing parties must accept responsibility for, and understand, all precautions on page 32 regarding moisture and attachment of Ecowarm™ Radiant Board to concrete, and should refer to this complete Installation Manual for further instructions on the installation of Ecowarm™ Radiant Board systems. Do not install Ecowarm™ Radiant Board without an accurate room-by-room heat loss analysis for the structure to be heated, as well as a design/layout for Ecowarm™ Radiant Board that takes into account the resistance and heat transfer of the actual floor coverings. If Ecowarm™ Radiant Board cannot provide all the necessary heat, make provisions for additional backup heat.

1. Thoroughly clean and level all surfaces where Ecowarm™ Radiant Board will be applied.
2. Prevent moisture penetration through the slab, either by sealing concrete with a vapor membrane such as Hydroment Ultraseal, per the manufacturer's guidelines, or with a continuous unperforated under-slab or above-slab vapor barrier, as shown on page 33.
3. Follow one of the two details on page 32 that use 5/8" T&G treated plywood under the Ecowarm™ Radiant Board.
4. Chalk lines of a square reference point, as construction of walls may be inconsistent.
5. Lay out the boards according to your plan.
6. To allow for proper alignment, start your layout of all pieces by securing a corner.
7. To help align the grooves of adjacent boards, use 6" lengths of tubing as a guide, lapping 3" of the tubing into each board, as illustrated on p.14.
8. Glue and screw or glue and staple Ecowarm™ Radiant Board to plywood. Be sure to use adequate adhesive.
9. Once all boards are installed, clean grooves with a vacuum just prior to tubing installation.
10. Snap tubing into the designated grooves to route it to the manifold, per your plan.
11. Install strip flooring with mallet driven nails that penetrate the Ecowarm™ Radiant Board, with care not to puncture tubing.
12. Insulfoam under plywood may be used instead of plywood alone, as shown on page 33.
13. Hardwood floors installed directly over Ecowarm™ Radiant Board shall employ indoor or outdoor reset controls that gradually adjust the water temperature going to the floor.
14. The wood flooring shall be installed at the relative humidity recommended by the manufacturer for the climate involved.
15. Structure humidity shall be kept within the range specified by the flooring manufacturer.
16. Use narrower 2"-3 1/2" hardwood strips over radiant floors, not wider plank flooring.
17. The lessons of local practices and climate shall be referenced.
18. Make sure the heating system has been running and the space has been maintained at a minimum of 65°F for a period long enough that the enclosed structure's temperature and humidity have stabilized to predicted future levels.
19. The flooring product shall be allowed to acclimatize before installation, per p. 27-28.

CAUTIONS AND LIMITATIONS OF USE

GENERAL CAUTION

As with any radiant heating system, do not install Ecowarm™ Radiant Board without an accurate room-by-room heat loss analysis for the structure to be heated, as well as a design/layout for Ecowarm™ Radiant Board that takes into account the resistance and heat transfer of the actual floor coverings. If Ecowarm™ Radiant Board cannot provide all the necessary heat, make provisions for additional backup heat.

INSTALLER CAUTION

This manual is deemed to be current at the time of publication. It is the installer's responsibility to install according to the most current Installation Manual. This guide does not purport to address all relevant issues; it assumes a knowledge of good practices in both hydronics and construction methods. Installers should always consult all relevant local, regional and national codes, and adhere to good construction practices. Ecowarm™ Radiant Board should only be installed by knowledgeable, qualified installers. Ecowarm™ Radiant Board installations frequently require the coordination of trades. These are, most typically, mechanical and flooring trades. Any issues regarding this coordination should be worked out in advance. Failure to follow the instructions of this guide, failure to adhere to relevant local, regional and national codes, failure to coordinate trades, and failure to follow good construction practices may cause an unsatisfactory result. See also "limitations of use" elsewhere in this manual. The limitations and instructions of use for PEX pipe and all other hydronic components provided by the manufacturers must also be referenced and followed during installation. This manual does not address many aspects of a hydronic installation.

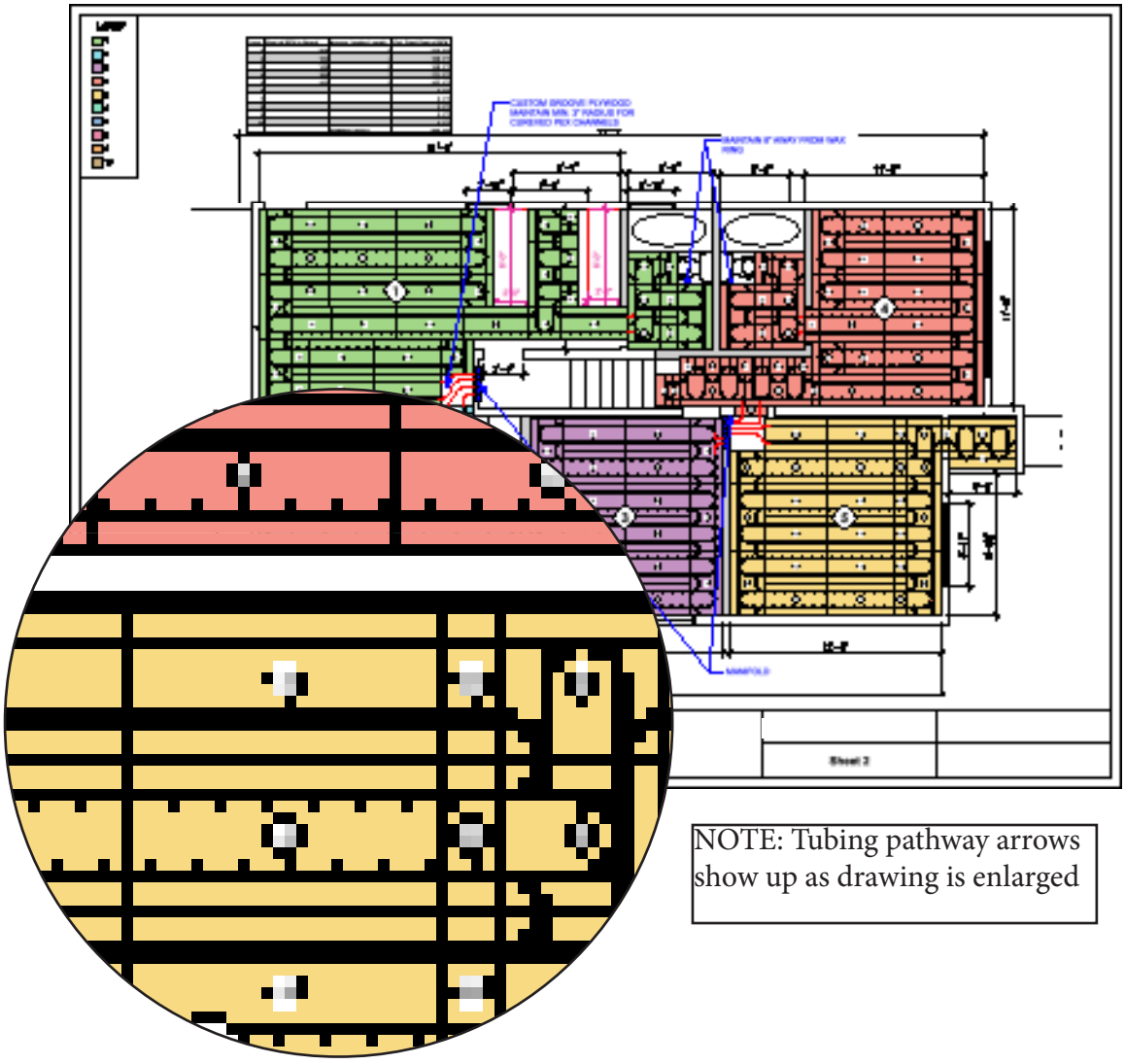
LIMITATIONS OF USE

Ecowarm™ Radiant Board is designed for interior use only, and is to be installed only on dry substrata once a structure is closed in, protected from the environment, and will remain dry. Ecowarm™ Radiant Board is not intended as, or rated as, a replacement or substitution for a structural subfloor. The BTU output of Ecowarm™ Radiant Board is limited by the R-values of the finish flooring goods applied over it, and by the recommended and available water temperatures. Ecowarm™ Radiant Board is not intended for use with finish goods that are incompatible with the temperatures and conditions present in a radiant heating system. Ecowarm™ Radiant Board is not intended as a finish floor, and should be left uncovered and unprotected only during installation.

***Ecowarm™ Radiant Board** is a patented product sold under license from Warm Brothers Inc.*

DESIGN SERVICES

Ecowarm offers 2 levels of design services. Most customers only need and choose a board layout which will provide a map of where each board goes. It will also include consulting with the drafter/designer to work out zoning and manifold locations as well loop length chart and a separate drawing with arrows of the tubing routing through the boards. In this case the job plumbing or mechanical contractor will specify the mechanical equipment and run supply and return lines to the manifolds. **Below is a sample of a board layout:**



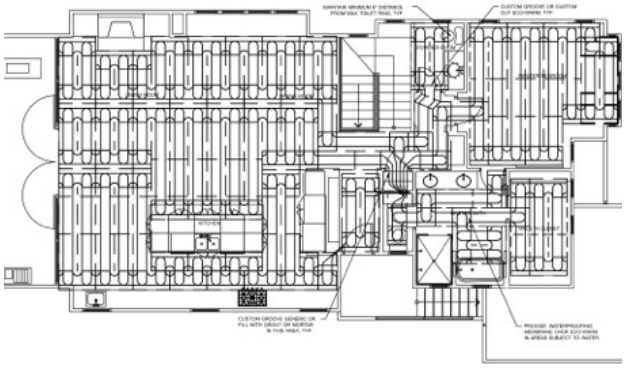
NOTE: Tubing pathway arrows show up as drawing is enlarged

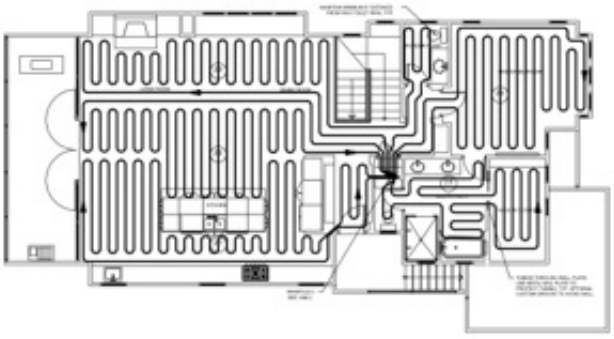
For large and complex projects Ecowarm Can offer **a complete mechanical design**
For these projects we will connect you with the Monterey Energy Group (MEG). Based in California MEG has more than 20 years of experience in the radiant industry, and having designed more than 3,000 systems across the US and in many parts of the world, MEG has the experience and knowledge to design the optimum operating system per your type of construction. A national leader and independent source of design and consultation, MEG works with homeowners, architects, installation contractors, and manufacturers to design custom heating systems for both residential and commercial buildings.

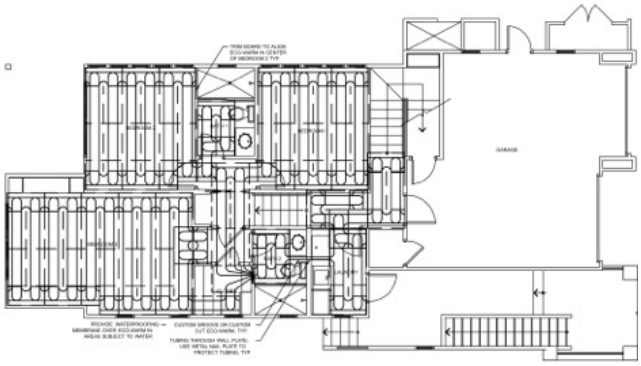
See the next page for an example of a full mechanical design

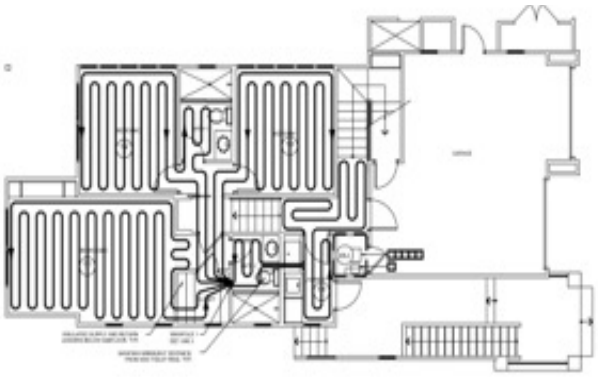
SYSTEM DESIGN – LAYOUT EXAMPLE

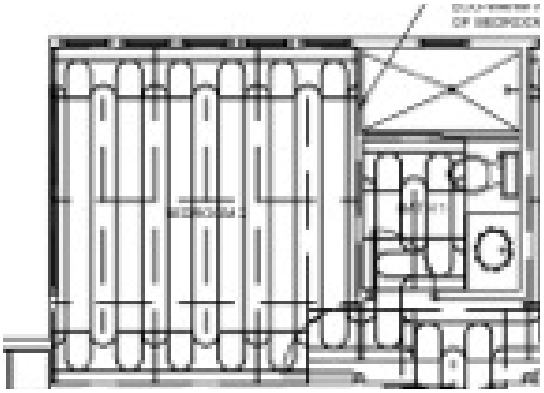
A system design includes:
detailed board and loop layout, board count and loop lengths.









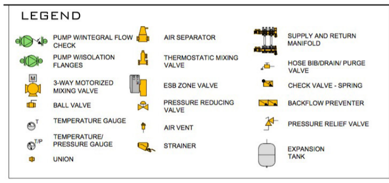


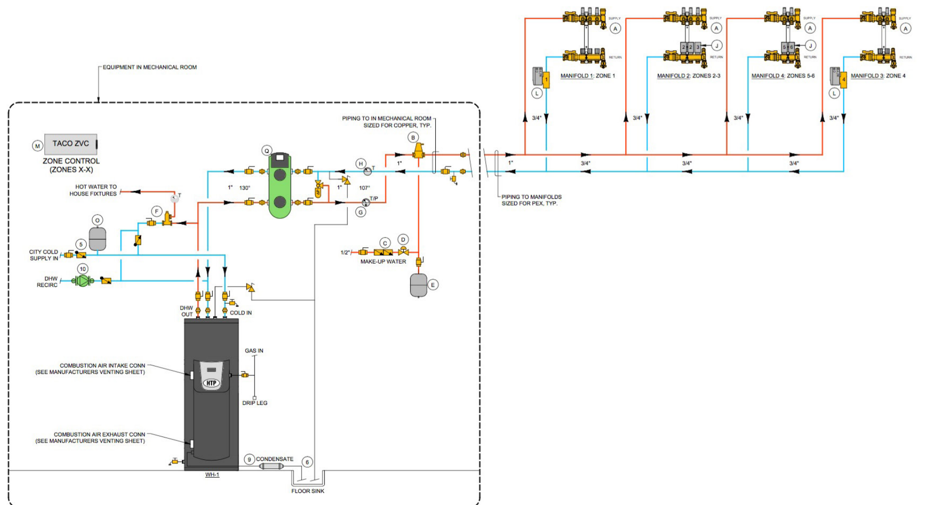
ESTIMATED PANEL SCHEDULE	
TYPE	QUANTITY
STRAIGHT	244
SUPERCOMBO	82

LOOP SCHEDULE		
MANIFOLD	LOOP #	LENGTH
1	1	269
	2	277
	3	273
	4	279
	5	280
	6	279
	7	279
	8	280
	9	277

MECHANICAL EXAMPLE – SYSTEM DESIGN

A complete mechanical design (higher cost) can include: electrical specs, mechanical specs, wiring & mechanical schematics, heat loss calcs and system flow rates. Below is a partial example. Call us for more information or a more complete example.





1 HEATING SYSTEM PIPING SCHEMATIC- PHOENIX LD - HEATING AND DHW

NOT TO SCALE

WATER HEATING DEVICES

MARK	KBTUH IN	KBTUH OUT	FAN V/PH	FAN AMPS	GAS CON.	HW/ CW CON.	WT LBS	AFUE	MANUFACTURER AND MODEL	NOTES
WH-1	76.0	72.2	-	-	1/2"	3/4"	671	97.0	HEAT TRANSFER PH76-60	B1-B3

HEAT SOURCE NOTES

B1. Phoenix LD unit is a sealed combustion direct vent unit. See manufacturers venting sheet for venting options.

B2. Separate space heating module includes a flat plate heat exchanger to separate the heating fluid from the domestic source.

B3. Phoenix LD shall be mounted min. 18" above finished floor in a garage. Provide protective damage barriers from Autos.

SYSTEM COMPONENTS

MARK	COMPONENT	MANUF.	MODEL	NOTES
A	SUPPLY & RETURN MANIFOLD	WATTS	STAINLESS STEEL	
B	AIR ELIMINATOR	TACO	4900 SERIES 49-100	
C	BACKFLOW PREVENTER	WILKINS	750-AC-1/2"	
D	PRESS. REDUC/FILL VALVE	TACO	3350	
E	EXPANSION TANK	ELBI	XT-30	
F	MIXING VALVE	WATTS	N170	12
G	TEMP/PRESSURE GUAGE	MILJOCO	PB300804	
H	TEMPERATURE GUAGE	MILJOCO	B259951-2W	
J	TELESTAT	WATTS	-	
L	ZONE VALVE	TACO	ZONE SENTRY Z075T2	
M	ZONE VALVE CONTROLLER	TACO	ZVC-406	
O	DHW EXPANSION TANK	ELBI	DXT-18	11
Q	X-PUMP BLOCK	TACO	XPB-1	

NOTES

GENERAL

1. This drawing is conceptual and diagrammatic and does not constitute a complete plan. Installer to supply and install all materials shown on this plan and all others needed to complete this hydronic system. Also, provide any incidental work not shown or specified, which can be reasonable inferred as belonging to the work necessary to provide the complete system.
2. Only qualified Plumbing or Heating technician shall install the heating system.
3. Refer to all manufactures guidelines pertaining to the installation, protection and maintenance of the hot water source.

COMPONENTS

4. System shall be tested for 30 min. At 100 psi.
5. Verify with local authority having jurisdiction for backflow prevention requirements.
6. Provide pressure relief with direct piping to approved location.
7. Where applicable, swing check valves shall be mounted in an upright position.
8. Where applicable, provide a minimum of 8 pipe diameters of straight pipe upstream of all spring check valves.
9. Condensate removal per UMC and local codes. Optional PH neutralizer or if required by local authorities can be made up of lime crystals, marble or phosphate chips that will neutralize the condensate. Never drain condensate that has not been neutralized to cast iron waste piping. Provide condensate pump kit P/N 554200 available from Heat Transfer Products where condensate cannot be drained by gravity with proper slope.
10. Recommend optional TACO On Command System circulation pump with remote sensor capability. Coordinate with plumbing contractor and size based on plumbing design.
11. Verify tank size per plumbing design. WH-18 sized for 9.5 acceptance gallons at 140 gallons of system volume (including tank), 150° max temperature and max 20ft system piping above inlet to tank. See flexconind.com for sizing different than these parameters.
12. Anti-scald thermostatic mixing valve set to 115° shall be used. Mount mixing valve no higher than 8" above hot water outlet.

PRIMARY/SECONDARY PIPING

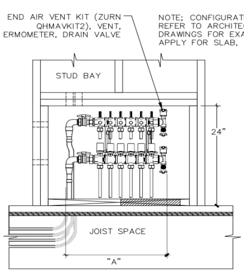
13. See tubing layout for manifold locations. Unless noted, all branches to manifolds shall be ¾".
14. Secondary piping in a primary/secondary system shall have tees plumbed 4 pipe diameters center to center, and shall have a minimum of 8 pipe diameters of straight pipe upstream of first tee.
15. Where not shown, provide ball valves and hose bibs for isolation and purging of primary and/or secondary piping. A purging valve may be used as a substitute for a ball valve/hose bib combination.
16. Unless practicality does not permit, all secondary piping shall be plumbed such that the risers go down from an overhead primary circuit.

SUBSTITUTIONS

17. Installer shall obtain authorization from the owner and design team for "Or Equal" substitutions on heating system components."Or equal" substitutions constitute components that are of equal quality and workmanship to those specified. Where possible components shall be of a single manufacturer and shall have approved ratings of all applicable agencies (UL, IAPMO, ASME, etc.). Boiler substitutions shall be of the modulating condensing type with direct vent combustion and minimum efficiencies and outputs of that specified.
Approved Manufacturer Substitions:
Manifolds – Shall be compatible with approved PEX and/or PEX-AL-PEX Systems.
Pumps – Grundfos, B&G, Laing, Wilo
Expansion Tanks – Amtrol, Elbi
Components (Valves, etc.) – Watts, Nibco

AIR FOR COMBUSTION AND GAS LINES

18. See venting sheet for venting requirements
19. All routing of gas line piping shall be based on the Chapter 7 of the 2014 California Plumbing Code and Chapter 13 of the 2014 California Mechanical Code. Piping shall be new, standard weight wrought iron or steel (exterior-only galvanized or black), with malleable iron fittings. Approved PE (Poly-Ethylene) pipe may be used in exterior buried piping systems.

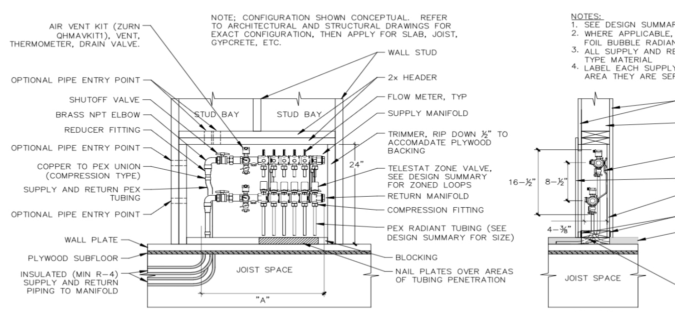


LOOPS	"A"
1	10"
2	12"
3	14"
4	16"
5	18"
6	20"
7	22"
8	24"
9	26"
10	28"

ALTERNATE CONFIGURATION

MANIFOLD INSTALLATION

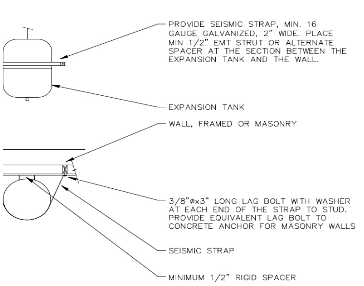
SCALE: NONE



LOOPS	"A"
1	14"
2	16"
3	18"
4	20"
5	22"
6	24"
7	26"
8	28"
9	30"
10	32"

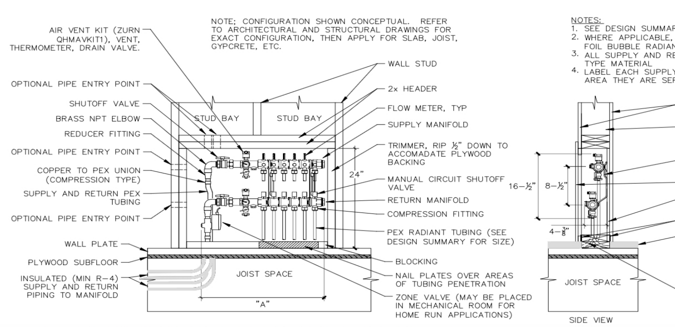
1 MANIFOLD INSTALLATION- MULTI ZONE MANIFOLD

SCALE: NONE



EXPANSION TANK BRACING

SCALE: NONE



LOOPS	"A"
1	14"
2	16"
3	18"
4	20"
5	22"
6	24"
7	26"
8	28"
9	30"
10	32"

3 MANIFOLD INSTALLATION- SINGLE ZONE MANIFOLD

SCALE: NONE

DESIGN SERVICES

SYSTEM DESIGN SERVICES – BENEFITS

Benefits to the Owner

An engineered radiant heating system can save money, time and headaches. Professionally designed Ecowarm™ Radiant Board systems offer peace of mind, ensuring optional function for new or retrofit installation of the most comfortable heating system for your budget. Properly designed and installed, radiant heating systems add value to any home or building, and plans provide a permanent record of your system for resale or for future renovation.

Benefits to the Architect or Designer

Professional system plans may double as complete mechanical systems than can be incorporated into the submittal plan to building departments. A "complete heating system design" is an attractive selling feature to a client. A professional plan designer can offer expert advice on integrating mechanical systems into the design, suggest which type of system best suits a specific construction type, explore integrating the system with building controls, if applicable, and is prepared to discuss system performance per various floor coverings, ceiling heights, window configurations, and in multilevel, multi-zoned homes and buildings.

Benefits to the Installer

With a professionally designed plan, installation contractors can quickly get material take-offs for bids. All components, including 1/2" PEX distribution tubing, are pre-sized, including exact circuit lengths. A plan also offers balancing data for all circuits in a clear, concise table. Installers spend less time on design, focusing instead on Ecowarm™ system installation. A plan "engineered to ensure proper operation" is a good selling feature to prospective clients: an exact design prior to work, and a clear, permanent record of the system.

A standard layout design

- Full size system plan of board and tubing layout, including manifold location(s)
- Separate tubing loop layout, including lengths of all loops
- Board count of required Ecowarm™ Radiant Board Straights and Supercombos

A complete mechanical design – this can include :

1. System balancing data – a computer simulation report that summarizes zones, flows, water temperatures, and tube lengths, which allows the installer to properly bid, install and balance the system for optimal performance.
2. Complete component schematic, including specifications on heat sources, pumps, valves, manifolds, expansion tank, etc., as well as sizing (length) of distribution tubing.
3. Installation notes and details.
4. A system controls page providing controls schemes.

SPECIFICATIONS

ECOWARM™ RADIANT BOARD
MODULAR NON-STRUCTURAL RADIANT BOARD SYSTEM

PART 1 – GENERAL

1.01 General

A. Provide all labor, materials, transportation, equipment and services to install an Ecowarm™ Radiant Board non-structural modular board system, as indicated by the contract documents and these specifications

B. Examine all contract documents for instructions, terms and conditions related to the installation of Ecowarm™ Radiant Board non-structural system. Provide all work as described and required and support and accommodation of related work.

1.02 References

A. Radiant Professionals Alliance Guidelines for the Design and Installation of Radiant Heating Systems, applicable portions of sections 16.2 and 19.3

B. SFI (Sustainable Forestry Initiative Inc.) certification (substrata board supplier used in the manufacture of Ecowarm)

C. American Society For Testing Materials (ASTM) Standard Specification For Cross Linked Polyethylene (PEX) Tubing

D. International Building Code (IBC)

E. Uniform Building Code (UBC)

F. Uniform Mechanical Code (UMC)

G. Applicable local modifications and codes that apply in a project's jurisdiction

1.03 Submittals

A. Verification of SFI certification substrata board supplier used in manufacture of Ecowarm™ Radiant Board

B. Verification of compliance with RPA Standard Guidelines or local code requirements for heating system design sufficient to supply heating needs of the structure or portion of heating needs as specified by contract documents.

C. Installation plan showing modular board and tubing layout, manifold locations, installation notes and other system components shall be submitted for approval as specified under the terms and conditions of the Contract Documents. No installation work shall be initiated before such approval is obtained.

1.04 Delivery, Storage, Handling And Quality Control

A. The General Contractor and, if different, the receiving sub-contractor shall ensure that the Ecowarm modular boards are received in good condition and installed without damage and installed in accordance with construction documents, the then current Ecowarm Installation Manual and applicable code.

B. The Ecowarm board shall be stored indoors in a temperate (40°F-90°F), dry location. Avoid prolonged exposure to sunlight. Do not store in a damp location. Be sure to follow all instructions in the Ecowarm™ Installation Manual on protecting the board from prolonged moisture contact.

C. PEX tubing before and after installation shall be protected from prolonged exposure to UV light, according to the tubing manufacturer's requirements.

1.05 Site Conditions Required for Installation of Ecowarm™ Radiant Board

A. Ecowarm shall only be installed on a subfloor, indoors, in enclosed dry structures.

B. The surface of the subfloor must be flat: The requirement for flatness is defined as the maximum difference between two adjacent high points and the intermediate low point. The maximum acceptable difference in level is 3/16 of an inch in a 10-ft. radius.

C. Wood subfloors must have a stable moisture content, between 6 – 10%. Creaking subfloors must be repaired before installation.

D. When installing Ecowarm™ Radiant Board over concrete, it is the contractor's – as well as the installer's – responsibility to test all concrete substrates, both new and old, for mois ture content to determine whether they are sufficiently dry to install Ecowarm Radiant Board™. Moisture in the concrete should be tested according to ASTM F 1869 (Calcium Chloride Moisture Test using the Quantitative Method). With a calcium chloride test, the maximum acceptable reading is 3 lbs. / 4 hours / 1,000 sq.ft. New concrete slabs and basements must be cured for a minimum of 60 days prior to installation.

1.06 Limited Warranty

Ecowarm warrants that its non-structural modular board products are free from defects in material and workmanship in the manufacturing process when shipped from the factory. For the life of the original subfloor, any boards determined to have been defective when they left the factory will be replaced by a like number of boards as the exclusive remedy. To qualify for warranty, goods must be inspected upon receipt by customer for defects, stored and installed according to the then most current Ecowarm Installation Manual, and used in conformity with the written specifications in the Manual. Assertions of defect must be presented to Ecowarm in the form of return of goods or other documentation acceptable to Ecowarm. If Ecowarm agrees that the defect is covered by the Ecowarm warranty, then Ecowarm shall, at its expense, ship replacement boards as the sole remedy. Ecowarm specifically disclaims any incidental, consequential or other claims of damage beyond the replacement of defective product. In no event shall damages exceed the cost of the goods provided. Ecowarm is a construction board product, and many aspects of its storage, transport and installation are beyond the control of Ecowarm. Damage from the following are specifically excluded from warranty coverage: improper storage, improper installation, moisture intrusion, improper environmental and system control, abuse, damage from pests, fire, damage from removal of flooring products, and/or reinstallation and acts of God such as earthquakes and floods.

PART 2 - ORIGINATING MANUFACTURER AND RELATED PRODUCTS

2.01 Approved Board Manufacturer

A. Ecowarm™ Radiant Board shall be manufactured solely by Ecowarm™ or by Ecowarm's approved manufacturer. No other modular radiant boards may be substituted.

2.02 Tubing

A. Tubing Installed in Ecowarm™ Radiant Board non structural modular boards shall be third party certified to and manufactured to ASTM F-876 and F-877.

B. The PEX tubing shall have PPI issued design and pressure ratings of 200°F @ 80 PSI, 180°F @100 PSI and 73.4°F at 160 PSI.

C. The PEX tubing shall be nominal 1/2" ID in accordance with ASTM F-876 and F-877, and shall never have loops longer than 350'.

2.02 Glues

See page 47 for current recommended products or www.ecowarmradiantheat.com

PART 3 – JOB EXECUTION AND SEQUENCING

3.01 Preparation

A. Ecowarm™ non structural modular board shall be installed according to the contract documents and to the current Ecowarm Installation Manual.

3.02 Modular Board Installation

A. Using a layout plan, install the Ecowarm boards to the subfloor as required by the contract documents and the then current Ecowarm Installation Manual. Follow recommended floor assemblies, gluing and attachment patterns contained in Ecowarm Installation Manual.

B. Reference the planned direction of any wood flooring before installation, and align straight boards at 90° from the direction of the wood flooring. If this is a change from the submitted and approved plan, the plan should be re-done.

C. Perform any custom routing and drilling before installation of the tubing.

3.03 Tubing Installation

A. Channels shall be dry, clean and free of any debris before tubing is installed.

B. The tubing shall be pressed into the channels until it is flush with the top of the board.

C. Installation shall follow construction documents and an approved plan for tubing layout, manifolds, controls and mechanical room.

D. Tubing shall be pressurized with air or water, in accordance with codes, or to a minimum of 60PSI, and maintained through completion of any and all stages of construction that might damage tubing.

E. Contractor must follow all manufacturer requirements for the care and handling of the tubing.

3.04 Subsequent to Tubing Installation

A. Care shall be taken to protect tubing from damage, debris and prolonged exposure to UV light until covered by flooring goods. Tubing shall be vacuumed before cover.

B. Flooring goods shall be installed with care to avoid damaging tubing. Particular care must be taken where tubing goes under sills, door jams or radius into walls for manifolds. Inform the other trades of the location of tubing, and protect tubing from damage, with metal plates if necessary.

C. Pressure test tubing: Check tubing pressure frequently, and keep it under test during any stages of installation and construction that might damage the tubing.

D. Finish installation and connect to mechanical components as required by construction documents, all codes and good practices.

3.05 Avoid Tubing When Screwing Backboard or Underlayment Plywood to Ecowarm™

Take a photograph as a reference, snap chalklines where the tubing runs are, and avoid screwing to those areas. Remember, tubing runs are 11.75" apart. Take a thick clear sheet of plastic, cut it to size, and lay it out over the Ecowarm™ once tubing has been installed, then mark wiah permanent marking pen the location of the tubing. This may be rolled up and later unrolled and used as a reference to avoid tubing when screwing other products to Ecowarm.

3.06 Recommended Tubing for use with Ecowarm Radiant Board As of 3/20/2021

1.1 Tubing Installed in Ecowarm™ Radiant Board non structural modular boards shall be third party certified to and manufactured to ASTM F-876 and F-877.

1.2 The PEX tubing shall have PPI issued design and pressure ratings of 200°F @ 80 PSI, 180°F @100 PSI and 73.4°F at 160 PSI

1.3 The PEX tubing shall be nominal 1/2" ID in accordance with ASTM F-876 and F-877, and shall never have loops longer than 350' and shorter loops shall be used in circumstances as recommended in this Manual.

1.4 ***DO NOT use PEXALPEX*** (Pex Aluminum Pex). Ecowarm™ Radiant Board has a slightly undercut groove. Regular PEX will oval then rebound into the undercut, and be retained, whereas PEX-ALPEX will oval and will not expand into the slight undercut. The result is that PEXALPEX will not be as well retained as regular PEX in the groove – it may stand tall of the board.

1.5 We recommend these brands of regular ½" PEX: ***Uponor, Zurn, Watts, Mr. PEX, Rehau.***

1.6 Use of Barrier Pex is recommended in most systems to reduce any potential corrosion of metallic components.

3.70 Recommended Glues for use with Ecowarm™ Radiant Board

Note: There are 3 major categories of glue for use with Ecowarm Radiant Board depending on purpose.

3.71 Glues for adhering wood flooring, backer-board or underlayment wood material onto Ecowarm Radiant Board. (Be sure to reference the instructions of both the glue manufacturer and any products being adhered.)

Sikabond T-35
Product Data Sheet Link
https://usa.sika.com/content/dam/dms/us01/s/SikaBond-T35-PDS.pdf

Sikabond T-55
Product Data Sheet Link
https://usa.sika.com/content/dam/dms/us01/0/sikabond_-t55.pdf

Mapei Ultrabond Eco-980
Brochure
https://cdnmedia.mapei.com/docs/librariesprovider10/products-documents/3000286-ultrabond-eco980-en_467140da4d0c4d8bb81bf63c5880011e.pdf?sfvrsn=cf27b617_0

Mapei Ultrabond Eco-975
Brochure
https://cdnmedia.mapei.com/docs/librariesprovider10/products-documents/3000075-ultrabond-eco-975-en.pdf?sfvrsn=f642b8eb_0

Bostik Greenforce
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/greenforce_united_states_en2/technical-data-sheet/t4105greenforce_tds_061819.pdf

Bostik Best
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/bostiks-best_united_states_en/technical-data-sheet/t2070_bostiks-best-tds_lowres_081718.pdf

Bostik BST
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/bst_united_states_en/technical-data-sheet/bostik-bst_tds_t1948_011020.pdf

Bostik EFA
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/efa_united_states_en/technical-data-sheet/bostik-efa-tds_t1506_082119.pdf

AVAILABLE AT LOWES Bostik Green Grip
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/greengrip_united_states_en/technical-data-sheet/t4142_greengrip-tds_051719.pdf

AVAILABLE AT LOWES Bostik Wood Grip Plus
Product Data Sheet Link
https://www.bostik.com/files/live/sites/shared_bostik/files/import-united-states/globalassets/tdsdocuments/wood-grip-plus_united_states_en/technical-data-sheet/bostik-wood-grip-plus-tds

AVAILABLE AT Lumber Liquidators: Bostik Best, Mapei Eco 980

3.72 Glues for adhering Ecowarm Radiant Board to a Wood Sub-Floor

Note: Ecowarm has made a major effort to make a green product so we recommend using green low VOC adhesives for gluing Ecowarm Radiant board to a wood subfloor. Unfortunately manufacturers use many different methods for stating the amount of VOCs in a glue so it is hard to compare brands. Be sure to also, in addition, screw or cross staple the boards to the sub-floor as shown in the manual. There are 2 related reason for using low VOC adhesives; indoor air quality and the contribution of VOCs in the atmosphere. Below are some construction adhesive products marketed as low VOC:

OSI SF450 Heavy Duty Construction Adhesive *can be used from 0°F to 140°F*
Bostik Heavy Duty Construction Adhesive *can be used from 40°F to 100°F*
Bostik 975 Construction Adhesive *can be used from 40°F to 100°F*
SikaBond Pro Select Construction Adhesive *can be used from 40°F to 100°F*
Titebond Greenchoice Construction Adhesive *can be used from 20°F to 120°F*
Titebond Provantage Construction Adhesive *can be used from 0°F to 120°F*
Locktite PL 375 Heavy Duty Construction Adhesive *can be used from 40°F to 100°F*

Coveradge Math use approx 25 lineal feet a board, Use a minimum 1/8" bead on a very smooth floor, more on an ueven floor. A 28 fluid ounce tube with a 1/8' bead will extrude approx. 340 ft. and a 1/4' bead approx. 86 ft.

3.73 Comments on Other Glues for Adhering Ecowarm Radiant Board to a Wood Sub-Floor

There are many other construction adhesives that will work for bonding Ecowarm Radiant Board to a wood subfloor and since the boards should also be screwed or cross stapled as described in the Installation Manual, the glues help bond the board and prevent squeaking. There is no uniformity in the adhesives industry regarding which method and units are used to describe VOC content so it becomes difficult to evaluate. In general, the lower the VOC content, the better.

3.74 Adhering Ecowarm Radiant Board to Concrete

When gluing Ecowarm Radiant Boards to a slab read and follow the glue manufacturer's installation instructions as well as limitations on the moisture content and moisture testing of the slab. Do not install on a slab that has a seasonal history of being wet or exceeds the recommended moisture content when testing. The following glues function as a vapor retarder and an adhesive:

Sikabond T-35

Mapei Ultrabond Eco-980

Bostik Greenforce

Use a notched trowel and apply with full coverage of concrete and with 100% transfer to back of Ecowarm Radiant Board. Any Boards that are not flat, weigh down until they are flat and the glue has dried.