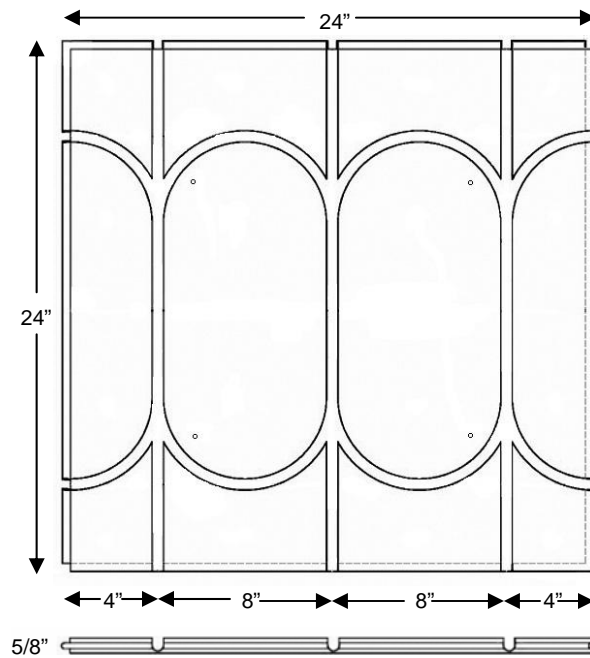


InfloorBoard II™

MODULAR RADIANT HEATING TUBING RETENTION BOARDS

INSTALLATION GUIDE

January, 2007



Technical Data			
Material:	MR-MDF	Channel Spacing (in.)	8
*Moisture Resistant Medium Density Fiberboard		Weight (lbs./board):	10
Width (in.)	24	Mounting Hole Spacing (in.)	12
Length (in.)	24	Edge Design:	Tongue & Groove
Overall Height (in.)	5/8	Packaging:	5 Boards per carton
		PEX Tubing Req.:	3/8" ASTM F876

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Introduction

Outstanding for both new construction and retrofit, InfloorBoard II™ allows for the fast and effective installation of PEX tubing in virtually every application. No longer does one have to deal with expensive or impractical lightweight concrete pours or time consuming between floor joist installations.

- Unique single board design secures 3/8" PEX tubing @ 8" on center spacing in any direction; straight, turns, or both.
- 24" x 24" dimensions allows for straightforward material calculations (sq.ft./4).
- Adds only 5/8" to existing/planned floor height.
- Open channel design leaves tubing fully visible and accessible during installation.
- Tongue and groove edges allows for quick interlocking installation and maximum surface continuity.
- Pre-drilled countersunk mounting holes provide for ease of installation.
- Moisture resistant MDF construction offers protection against high levels of humidity and occasional wetting of the installation area (basements, baths, kitchens,...)
- Lightweight — 5 times lighter than concrete.

RADIANT DESIGN: The following steps are provided as a guide in designing a radiant floor heating system. Please consult with your PEX tubing manufacturer for specific design criteria.

Determining Your Heating Requirements

The room or area heating requirements must be determined using a radiant design calculation or adjusted conventional heat loss calculation. System suppliers, local product representatives, and wholesale distributors can all assist you in determining your heating requirements.

Required Heat Output

The heat loss of any given area must be replaced with the heat output provided by the radiant source (floor). It is important that only "open" floor area (Net Area) be utilized in determining the Required Heat Output. The Net Area is established by subtracting from the total square footage all cabinets, fixtures and other non heat producing areas.

$$\text{Required Heat Output} = \frac{\text{Heat Loss}}{\text{Net Area}}$$

Supply Water & Surface Temperature

Using the *Floor Output Chart* the system Supply Water Temperature and Surface Temperature can be determined.

1. Find the Required Output on the left side of the chart and read across to the right to determine the Surface Temperature.
2. Calculate the Total R-Value of the floor covering material and extend a line up from this point to where it intersects the Required Output. The Supply Water Temperature can be read at the point of intersection.
3. If the Water Temperature is above 150°F. or the Surface Temperature is above 85°F.;
 - a. Check the heat loss for accuracy. Has it been determined for radiant heat?
 - b. Choose a floor covering with a lower R-Value.
 - c. Reduce the heat loss of the area (I.E. increased insulation, new windows)
 - d. Include supplemental heating for the area.

Floor Output Chart

		Required Avg. Water Temp.							
		0.5	1.0	1.5	2.0	2.5	3.0		
Req. Output Btu/Sq.Ft.	45	145	159						90
	40	138	150	168					87
	35	130	142	157					85
	30	123	132	144	159				83
	25	114	122	133	145	160			81
	20	107	113	122	131	143	165		78
	15	102	106	111	118	128	143		76
	10	93	97	100	104	112	123		73
	5	87	89	91	93	97	102		70
		R-Value of Floor Covering							

***Outputs provided for 3/8" PEX Tubing at InfloorBoard II™ provided 8" on center spacing with a 20°F. delta T. operating at steady state performance.**

InfloorBoard II™ & PEX Tubing Requirements

InfloorBoard II™: To estimate the number of boards needed, divide the square footage of the area by 4 (each board is 4sq.ft.). Example: A 20ft. X 20ft. room = 400sq.ft., dividing 400 by 4 = 100 boards. For standard room configurations, (square, rectangle) include 5% additional boards to allow for waste. For rooms with angled walls, multiple corners, or bump outs, include 10% additional boards.

Tubing: InfloorBoard II™ is designed to secure 3/8" ASTM F876 PEX tubing. Based upon the InfloorBoard II™ provided 8" on center spacing a tubing factor of 1.5 should be used. To determine the required amount of tubing, multiply the square footage of the area by 1.5. The result is the amount of tubing required to be installed into the boards. In addition, supply/return leader lengths must also be added depending upon the manifold/system connection location.

Where required heat outputs are 25 BtuH/ft² or greater, circuit lengths should be limited to approximately 200ft. (including supply/return leaders). For heat outputs less than 25 BtuH/ft², circuit lengths should be designed around 250ft.

Number of Circuits: To determine the number of individual circuits of tubing required, subtract the supply/return leader length from the desired total circuit length (200ft, 250ft.). Divide the resulting circuit length into the total calculated tubing requirement (sq.ft. x 1.5) to determine the number of circuits for the project. Example: 250ft. circuits minus a 25ft. supply and 25ft. return leader (50ft.) = 200ft. The total calculated tubing requirement is known to be 1200ft. (an 800sq.ft. area x 1.5). Divide 1200 by 200 to determine 6 circuits will be required.

Equipment Required

The following are recommended for the installation of InfloorBoard II™:

- Table or skill saw with a high quality carbide or better blade.
- Drill Gun (electric or cordless) with No. 2 Phillips bit.
- 3/4" drill bit for supply/return leader access locations.
- Screws (min. 1-1/4").
- Rubber or similar soft mallet.
- Chalk line

- Carpenter Square
- Short (aprox. 6") lengths of 3/8" PEX Tubing for board groove alignment.
- Vacuum cleaner for subfloor and groove preparation.

Subfloor Preparation

All subfloors must be structurally sound, level, and free of voids or defects. High and/or low spots must be addressed prior to board installation. Sags and/or creaking may be signs of a larger problem. These, and all, structural deficiencies will need to be repaired in order to assure satisfactory board installation. The entire floor area should be swept and vacuumed prior to installation.

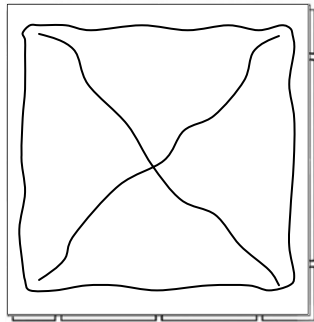
Moisture Content: The moisture resistant properties of InfloorBoard II™ provides greatly increased resilience to the damaging effects of moisture and humidity over standard wood products. However, excessive or continual moisture can cause adverse effects on subfloors, framing, finish flooring and, if left uncorrected, eventually to InfloorBoard II™.

Wood subfloors should have a stable moisture content below 10% before board installation. Due to environmental, shipping, and storage conditions, InfloorBoard II™ should be placed in the room that it is to be installed and allowed to acclimate to the environment (48-72 hrs.). It should be maintained at the same temperature (>50°F) and have a moisture content within 4% of that of the subfloor. This also holds true for any finish wood flooring that is to be installed over InfloorBoard II™.

Concrete slabs will require special consideration. All slabs will release moisture regardless of their location (below, above, or on grade). In most cases, for new slabs, it will take 60 days or more before the slab is dry enough (cured) to proceed. After fully curing, moisture levels should be checked. Due to the specific procedures for properly testing concrete moisture content, and that slab moisture conditions can change as environmental conditions change, testing should be done by an experienced professional. If using a calcium chloride moisture test, the allowable amount of moisture emission is 3.0 pounds per 1000sq.ft. per 24 hours. If moisture conditions are questionable or inconsistent, slabs should be sealed with an appropriate moisture barrier.

Securing Boards

Four pre-drilled countersunk mounting holes are provided in each board. In the event that it is necessary to field cut boards, 12" on center screw spacing should be maintained. Construction adhesive should be applied to each board. Using an 1/8" bead, apply the adhesive around the perimeter of the board approximately 1" from the edge. Complete the adhesive coverage by applying an "X" from corner to corner. ***Take care to ensure that adhesive does not come into contact with PEX tubing.**



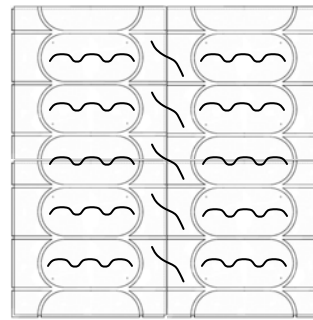
Adhesive Layout

Floating Board Installation

InfloorBoard II™ may also be installed without physically attaching it to the subfloor. This application is typically used for installation over a concrete slab or where subfloor penetrations are not desired. A floating board installation is not recommended for tile or stone finish floors. Note: It is important in a floating board installation to stagger the seams between rows of boards. This will provide for a more stable floor. At the start of the second row, cut 8" off of the first board. Continue to cut the first board on every other row making sure that the surface grooves line up with previous rows.

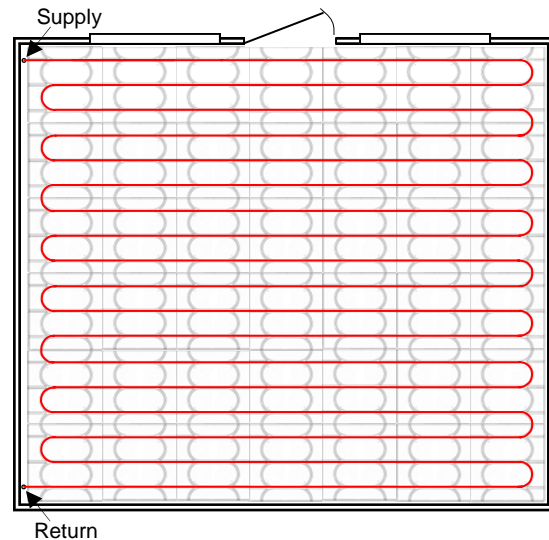
There are two methods for installing "floating" boards. First, boards may be edge glued similar to laminate flooring installation. Use a quality construction adhesive and follow the manufacturer's instructions. Wipe all excess adhesive from the grooves and joints taking care to ensure that adhesive will not be in contact with the PEX tubing. The second method is to apply a plywood cover sheet otop of a "dry" fit (not edge glued) InfloorBoard II™ installation. After the PEX tubing has been installed (see **Install PEX Tubing**), the cover sheet should be glued and screwed to the boards. Apply construction adhesive to the boards maintaining at least a 2"

clearance from all surface grooves. After gluing, screw the cover sheet to the InfloorBoard II™ using 12" on center screw spacing.



Adhesive Layout

InfloorBoard II™ Layout

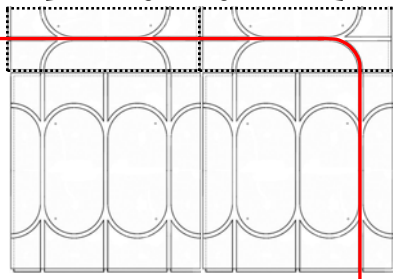


It is best to utilize a floor plan to determine the optimum board layout. Using a carpenter's square, determine if the room itself is square. If necessary, snap a chalk line to follow. In general, the first board should be placed in a far exterior corner of the room so that the straight runs of tubing will be parallel to the exterior wall of highest heat loss. This and all other boards should be maintained approx. 3/8" from the walls. ***Place temporary 3/8" spacers between the wall and InfloorBoard II™. These will be removed after installation is complete.** The two "tongue" edges should be facing the two walls. This leaves the recessed "groove" edges exposed towards the room. As you continue to place down the boards, the grooved edges will now remain exposed for easier tapping of the boards (using a rubber or other

other soft mallet into final alignment. Care should be taken to not tap or otherwise hit the tongue of the boards as they can be easily damaged. If a tongue does happen to become damaged, and will no longer interlock with a groove, simply snap or cut off the damaged section.

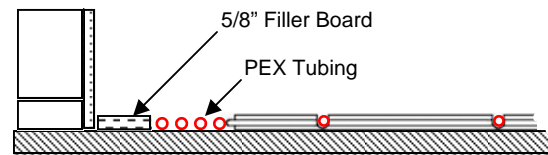
Short (6") lengths of 3/8" PEX tubing can be very useful in aligning adjoining boards. Simply place the tubing into the grooves between two boards to assure groove alignment. Slight variations in either subfloor or boards may result in board edges not always being perfectly aligned. ***Do not assume that board edge alignment will guarantee groove alignment.**

In almost all installations it will be necessary to cut a small number of boards to finish out a room. In addition, if the final board in a row will place the PEX tubing within 2" of the finished wall, make an adjustment by cutting off an inch or two from the first board in the row. Always make sure that the surface grooves line up with all previous rows. Boards can also be cut in order to change direction of the tubing. This may be necessary if there is limited access in where tubing may enter or exit an area.



Boards may be cut with either a table or skill saw with a high quality carbide blade. ***Cutting should be done with adequate ventilation and while wearing a protective mask.** Cuts should be made so that the tongue edges continue to match up with the grooved edges. If two tongue edges do end up facing each other, you may simply cut off the tongue edges (not applicable for floating board installations). Cut boards may also be used as filler boards, with no tubing installed, to create a uniform floor height in an area.

During board layout it will also be necessary to determine the location where the PEX tubing will enter the first board and exit the last board in a circuit. This tubing is called the supply and return leaders and will run from the boards to a manifold or main piping location. Holes (typically 3/4") should be drilled in the floor, or base of the wall, to accommodate the leaders. PEX bend supports are available to provide a tight 90° turn into the floor or up a wall. In areas that require several circuits of tubing (see **InfloorBoard II™ & PEX Tubing Requirements**) it will be necessary to drill holes for each supply and return leader. Leaders may also be run along the subfloor to a common entry/exit location without being installed into boards. If necessary, a leveling compound, or 5/8" sleepers (filler



boards), may be installed between or along the tubing to provide a sound base for floor coverings.

Install PEX Tubing

Vacuum the surface and grooves of all boards to assure that there is nothing present that may damage the PEX tubing and to provide for a satisfactory fit into the grooves.

Starting with the first board (supply leader hole location), leave sufficient excess tubing to reach the manifold location. Next, begin rolling the tubing out from the coil and "snap" it into the grooves. A rubber or other soft mallet is recommended to assist with this step. The grooves are designed to provide a tight fit for the PEX tubing in order to hold it firmly in place. Please note, due to tolerances in both the tubing and the boards, it is normal for varying degrees of force to be required to fully seat the tubing into the grooves. Continually check the length of tubing remaining in the coil to ensure sufficient length for the return leader to reach the manifold location. After completing the installation of each circuit of tubing, confirm that the entire

Insulation

Insulation should be installed below all Infloor-Board II™ installations. Failure to provide insulation will decrease the heating efficiency of the PEX tubing and may not allow for sufficient heat output. Local Building Codes will specify the minimum required floor insulation over an unheated space. For other applications, a minimum R-19 insulation is recommended.

Finish Floor Covering Applications

Care should be taken wherever tubing may be at risk from nails or other penetrations associated with the finish floor installation (saddles, carpet tack strips, molding, ect.) Always be sure to maintain adequate clearance from the tubing. Nail guards, such as those used to protect electrical wiring, should be installed as necessary. If an adhesive is to be used to secure the finish flooring (I.E. carpet or vinyl) a backer board (1/4" luan plywood) and high temperature latex adhesive must be utilized. Do not allow adhesive to come into contact with the PEX tubing.

Carpet

1/4" luan plywood should be applied over the boards prior to pad and/or carpet installation. However, if carpet is installed directly over InfloorBoard II™, a leveling compound should be used to fill all unused surface grooves and level all areas. It is important to know the R-value of the pad and carpet that will be used and its effects on the obtainable heat output of the radiant system. A thin high density rubber pad and short high density carpet will provide lesser resistance to heat transfer than other pad/carpet combinations.

Hardwood

Conventional nailed hardwood flooring may be installed directly over the boards. The primary direction of the tubing runs in the boards should be perpendicular to the direction of the hardwood flooring strips. Red rosin paper (do not use asphalt felt) should be placed over the boards. Chalk lines showing the tubing runs may then be snapped on top of the rosin paper and used as a guide to avoid the tubing. The nails selected should be of sufficient length to penetrate through the boards and into the sub-floor below. If installing a clip style floating floor systems, care must be taken so that the clips do not come into contact with the PEX tubing.

All wood floors will expand and contract as temperature and humidity levels change. This can result in gaps between flooring strips that may be present at certain times of the year and not others. A properly designed and operated radiant floor heating system should not increase these natural occurrences. Be sure to allow the flooring to acclimate to the area and follow the wood floor manufactures instructions for installation over radiant heat. Do not design or operate a system with a floor surface temperature in excess of 85° F. In general, narrow (<3" wide) hardwood flooring will provide the least expansion and contraction. Softer woods (pine, fir), higher moisture levels, and wide plank style floors will increase the potential for expansion and contraction both with and without a radiant floor heating system. Because of its dimensional stability, laminated flooring is an excellent choice.

Tile/Stone/Vinyl

For ceramic tile and stone, a tile backer board should be used over the boards. Care should be taken to avoid all tubing runs when screwing down the backer boards. A crack isolation membrane is recommended on top of the backer board. Conventional mortar bed or thinset installations may then be used.

For vinyl floors, a minimum 1/4" plywood backer board is required and the flooring and adhesive material checked for temperature limitations.

IMPORTANT: READ BEFORE USE

This product must ONLY be used indoors and ONLY in residential applications. The product must be installed properly by a competent installer in accordance with the latest Installation Guide and good construction practice. All product information must be reviewed by the installer to assure suitability of application, including compliance with applicable building codes.

This product is intended to provide a secure means of retaining 3/8" ASTM F876 tubing. Any information on radiant heating design is provided as a general overview only. A complete heat loss analysis and system design by an experienced hydronic heating professional is required. Heating system operation and heat output provided are the responsibility of the system designer and installer.