

# AquaHeat Installation Guide

## Hydronic Flooring Dry Above

A systems approach integrating established and emerging technologies



[www.ComfortProSystems.com](http://www.ComfortProSystems.com)

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## System Design and Installation

### The Mains

PEX pipe mains are recommended to reduce labor and architectural impact. For a slab-on-grade installation, the mains can be buried below or within the slab. For below slab installation refer to insulated supply and returns like ComfortPro Systems Microflex product range. For a wet or dry on plywood application, the mains can be installed within the joist cavity. Always allow for the expansion and contraction of the mains, as the temperature fluctuates. It is recommended that the pipe be allowed free movement and is not fastened directly to the floor joists.

### Requirements of a hydronic control system

The intent of a hydronic heating control system is to achieve heating comfort, system protection, energy saving and ease of use.

Heating comfort is achieved by:

- keeping proper system temperatures
- directing the right amount of heat when and where you want it

System protection is achieved by:

- protecting the primary heat source (e.g. boiler) from corrosion and thermal shock
- reducing equipment cycling

Energy saving is achieved by:

- running the system at the lowest water temperature possible
- turning off the system when no heat is demanded
- minimizing boiler short cycling.

Ease of use is achieved by:

- running automatic functions in lieu of manual settings
- providing easy and consistent wiring and installation procedures

## AquaHeat Installation Guide Philosophy

A hydronic system can get quiet complicated and with the rapid introduction higher integrated solutions keeping up is challenging more than ever. To keep the basic installation order we have build this series of guides to reflect the typical steps in the implementation of a project.

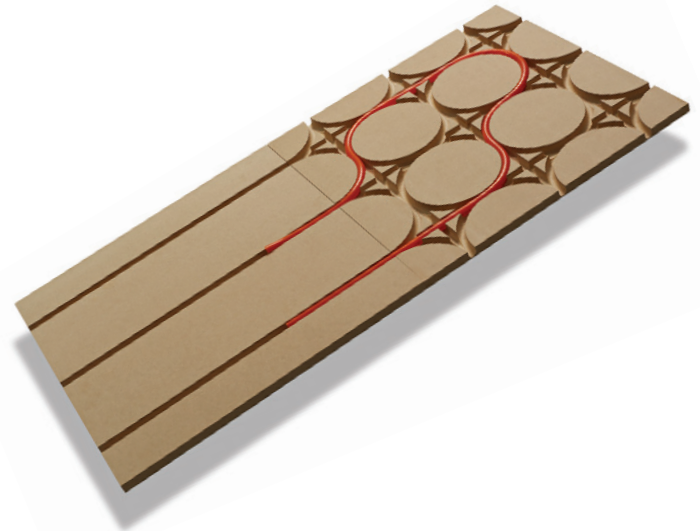
#### AquaHeat Hydronic Floor Installation

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#### Introduction

Outstanding for both new construction and retrofit, AquaHeat ProPanel 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 panel design secures 3/8" or 1/2" 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" for 3/8" pex / 3/4" for 1/2" pex to existing/planned floor height.
- Open channel design leaves tubing fully visible and accessible during 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.

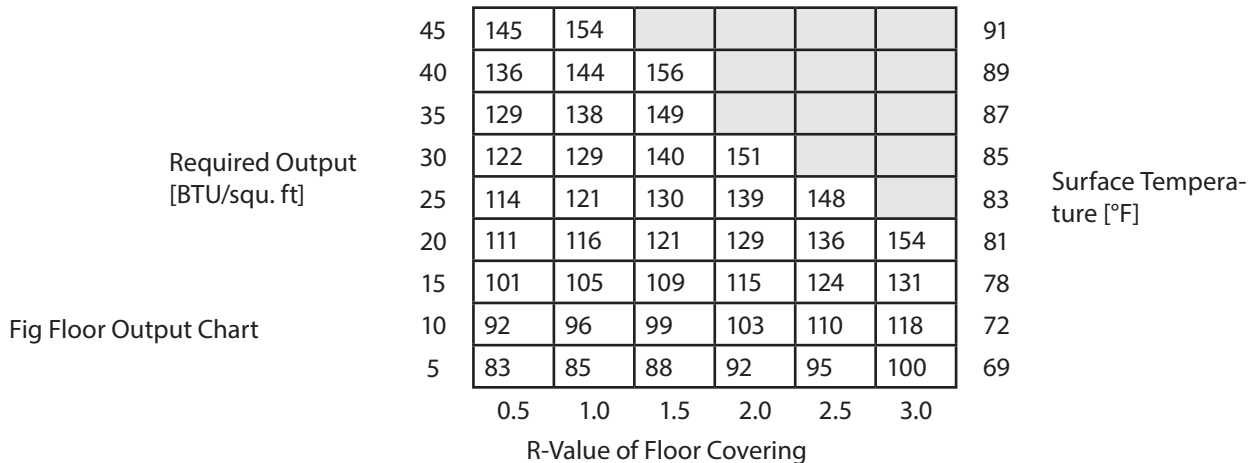
$$\text{Required Heat Output} = \frac{\text{Heat Loss}}{\text{Net Area}}$$

#### 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.



### AquaHeat ProPanel & PEX Tubing Requirements

**ProPanel:** To estimate the number of panels needed, divide the square footage of the area by 2 (each panel is 4 sq.ft.). Example: A 20ft. X 20ft. room = 400sq.ft., dividing 400 by 4 = 100 panels. For standard room configurations, (square, rectangle) include 5% additional panels to allow for waste. For rooms with angled walls, multiple corners, or bump outs, include 10% additional panels.

**Tubing:** ProPanel is designed to secure 3/8" and 1/2" ASTM F876 PEX tubing. Based upon the ProPanel 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 panels. In addition, supply/return leader lengths must also be added depending upon the manifold/system connection location.

Where required heat outputs are 25 BtuH/ft<sup>2</sup> or greater, circuit lengths should be limited to approximately 200ft. (including supply/return leaders). For heat outputs less than 25 BtuH/ft<sup>2</sup>, 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 (200 ft, 250 ft.). 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:**

250 ft. circuits minus a 25 ft. supply and 25 ft. return leader (50 ft.) = 200 ft. The total calculated tubing requirement is known to be 1200 ft. (an 800 sq.ft. area x 1.5). Divide 1200 by 200 to determine 6 circuits will be required.

### Required Installation Equipment

The following are recommended for the installation of ProPanel products:

- 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 panel groove alignment.
- Vacuum cleaner for subfloor and groove preparation.

### Subfloor Preparation

#### Securing Panels

In the event that it is necessary to field cut panels, 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 panel 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.

#### Floating Panel Installation

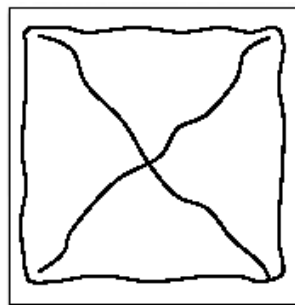
ProPanel may also be installed without physically attaching it to the subfloor. This application is typically used for installation over a concrete slab or where subfloor penetrations are not desired. A floating panel installation is not recommended for tile or stone finish floors. Note: It is important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

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

In almost all installations it will be necessary to cut a small number of panels to finish out a room. In addition, if the final panel 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 panel in the row. Always make sure that the surface grooves line up with all previous rows. Panels 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.

Panels 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 panel

Fig. Adhesive Layout



Check with USGBC and/or LEED for Sub-floor adhesives outgassing criteria to achieve max. credits

Radiant floor heat is the most comfortable and efficient way to heat your home or building with unsurpassed temperature control and flexibility in zoning. For many years, typical applications for radiant systems involved embedding tubing in concrete slabs or pouring concrete over tubing stapled to sub-floors. Radiant heat provides a superior alternative to concrete with numerous advantages:

ProPanel Radiant Heat Panels are designed for simple, efficient installation over a variety of construction types. ProPanel Panels are ideal in new construction; it is particularly advantageous in the renovation market. Adding only 3/4" or 5/8" for 1/2" and 3/8" Pex® tubing to the existing floor height, panels provide a superior performing radiant heating system.

- Even distribution of heat
- Easy layout and installation
- Lightweight - 5 times lighter than concrete
- No need for structural upgrades

- Compatible with most floor coverings
- Pex tubing 8" on center
- 5/8" thick moisture resistant particle board for standard 3/8" Pex tubing
- 3/4" thick moisture resistant particle board for standard 1/2" Pex tubing
- Superior heat response time
- .007 thick aluminum

#### How It Works

ProPanel Panels are made of top-quality engineered furniture-grade plywood, grooved and laminated with a highly conductive aluminum to efficiently transfer heat from the radiant panel to the floor surface, creating a nice warm floor.

Old radiant heat systems in concrete or under subfloor work, but very inefficiently. They must first warm a large thermal mass before heating the floor and space. These systems transfer heat very slowly and can be difficult to control. Our pex panels are installed directly under the finished floor for greatly improved response time with minimal "thermal lag" to overcome.

#### R-Value of Floor Coverings

Flooring covering choices are also very important since they impact the system design and performance. While our radiant panels will work with most floor coverings, it is important to realize that all floor coverings offer a resistance to heat transfer as measured by their R-Value. The higher the R-Value of the floor covering, the higher water temperature it takes to overcome this resistance for a given heat output requirement. (Please contact us for more information about your floor covering.)

### ProPanel Panel Requirements

Tubing Requirements: Our radiant pex panel utilizes 3/8" or 1/2" Pex® Tubing. Loop lengths should be designed around 200 feet including supply/return leaders.

- A. Because the panels are based on 8" on center spacing a tubing factor of 1.5 is used. To determine the required amount of pipe multiply the net square footage of the room by 1.5. The result is the total amount of pipe for the panels only. Supply/return leader lengths must also be added.
- B. Number of loops/manifold size: To determine the total number of loops required, subtract the supply/return leader length from the desired total loop length (200 ft., 250 ft.). Divide the resulting loop length into the calculated total tubing requirement to determine the number of loops/manifold size for the area. Example: 250ft. loops minus 25 ft. supply and 25 ft. return leader (50 ft.) = 200 ft. IF the total tubing requirement is 1000 ft., 1000 ft. divided by 200 ft. = 5 loops.

ProPanel products are laminated with Aluminum layer and Sunpaper slit at channels. The Sunpaper replaces the rosin paper when installed with hardwood floor. This reduces the noise created when Pex tubing expands and contracts, as well as eliminating noise created between the Sunboard and the hardwood floor planks

ProPanel Pex panel tubing - 8" on-centers

### ProPanel Pex Panels – Installation Procedure

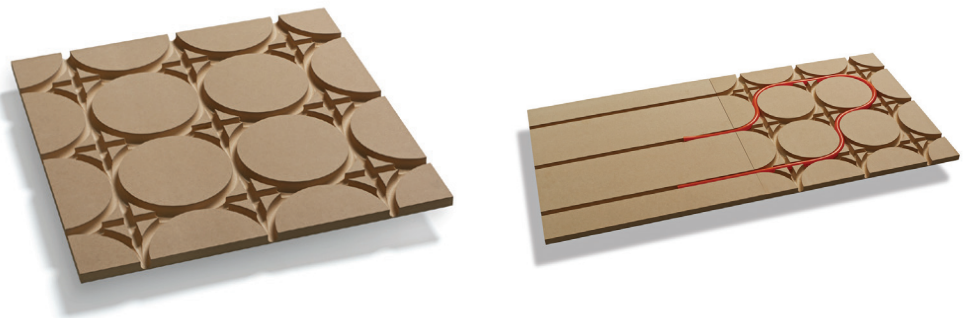
Substrate - Plywood Subfloor Boards – Propanel Gold (3/8" & 1/2")

1. Subfloor to be cleaned – Broom swept and vacuumed. Subfloor is to be vacant from any debris
2. Subfloor should be dry. If any wetting signs, Leaks are to be checked and fixed prior panel installation
3. Subfloor should be inspected to confirm it is rigid and well-secured. Any areas that are squeaky/not properly secured, are to be re-secured with Wood screws
4. The boards are to be installed on Flat surfaces. When subfloors are uneven or sloped to a certain direction , the ProPanel panels will follow, so when reaching a threshold or adjacent area with different top surface flooring , the floors may not match well (height and angle wise)
5. Study the loop layout provided by North East Hydronic Radiant or others
6. For the whole tubing layout area as well as each separate loop area, define the following:
  - A. Manifold/s location
  - B. Loop supply entry point & Loop return exit point
  - C. Leaders' path to & from the manifold (Above floor, Below floor, thru walls etc.)
  - D. Make sure that once the boards are installed, all loops can be run to/from the manifold
  - E. Cut 4" short stubs of tubing (1/2" or 3/8" Pex pipe) that will be used to align the boards. Usually, one needs 2 short stubs per board
7. Once the overall job details are clear and defined, it is recommended to take a room/area that is connected to a specific manifold, and work on this area. Once done, one can do the same for the next manifold on the job. installations). Cut panels may also be used as filler boards, with no tubing installed, to create a uniform floor height in an area.



8. Please follow the steps as below for a selected area
  - A. Get familiarized with ProPanel panel dimensions (Schematic # 1)
  - B. Based on the tube layout, room/area dimensions, and supply/return entry/exit points, select a wall/corner where one can start laying the boards down. Select the area where one can lay complete 2' x 4' boards where leave the areas that one needs to cut boards to size for later on.
  - C. Place the boards down and align board channels with 4" Pex short stubs. This is the easiest way to line up the boards. It is much harder to line up the boards after placing them on substrate.
  - D. For all specific areas, that cannot fit complete boards, one is required to cut board to size so board pieces can fit room geometry as well comply with tube layout.
  - E. Once the room/selected area is covered with aligned board materials, please review and verify to make sure that this area will be able to accommodate tubing as per layout.
  - F. Pay attention and confirm that entry/exit points of the loop/s, are accessible and well-comply with board array
  - G. Make sure that once this area is covered with boards, it will not interfere with adjacent areas (for example, Manifold # 1 area is covered with boards, however it will not allow running leaders to/from manifold # 2).
  - H. Inspect all boards and make sure boards are well-seated on the subfloor/substrate.
  - I. Now, one can start running loops from the manifold to the floor area and back to manifold.
  - J. Tuning layout should specify manifold locations, # of loops per manifold, Loop # and Loop length (from/to manifold). When you run the tubing and snap it into the boards, Make sure to review the Footage # on the tube ( usually every 3-5 ft.) to make sure that the overall length will be within specified in the tubing layout.
  - K. Once all loops are being run to/from floor area, make sure all loops are connected to related manifolds, where a pressure test is performed. If manifold does not hold pressure, one has to look for a leak either at some area of the tubing in the boards, leader area or manifold connections.
  - L. The leak should be found and fixed while a second pressure test is to be performed to assure the manifold system and related loops are holding the pressure , i.e. no leaks.
  - M. Fasten ProPanel panels to plywood subfloor with screws or staples (construction approved)
  - N. Please see attached schematic showing recommended points of fastening (Schematic # 1).

Return bend panels →



installations). Cut panels may also be used as filler boards, with no tubing installed, to create a uniform floor height in an area.

During panel layout it will also be necessary to determine the location where the PEX tubing will enter the first panel and exit the last panel in a circuit. This tubing is called the supply and return leaders and will run from the panels 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 AquaHeat Floor-Panel & 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 panels. 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 panels 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 panel (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



Fig. Adhesive Layout

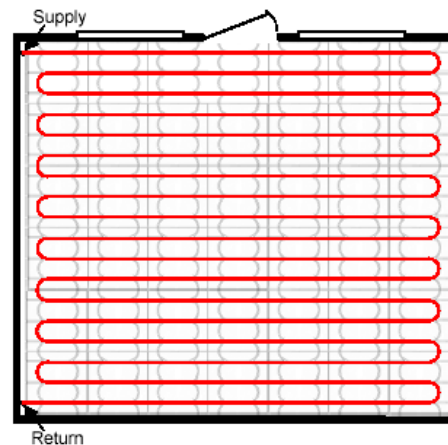


Fig. ProPanel Layout

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 panels, 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 length is fully seated into the grooves. The tubing **MUST** sit below the surface of the panels in order to provide a sound base for the finished floor.

#### Insulation

Insulation should be installed below all FloorPanel 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.

#### Carpet

1/4" luan plywood should be applied over the panels prior to pad and/or carpet installation. However, if carpet is installed directly over FloorPanel, 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.

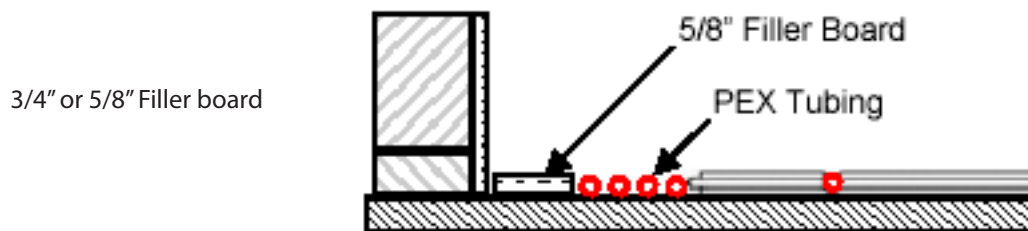
#### Finish Floor Covering Applications

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.

Custom cut Panels can be used to change tubing direction

#### Hardwood

Conventional nailed hardwood flooring may be installed directly over the panels. The primary direction of the tubing runs in the panels should be perpendicular to the direction of the hardwood flooring strips. Red rosin paper (do not use asphalt felt) should be placed over the panels. 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 panels and into the subfloor 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

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For ceramic tile and stone, a tile backer board should be used over the panels. 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.



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