AquaHeat Installation Guide

Hydronic Flooring

Design

A systems approach integrating established and emerging technologies

ComfortPro® Systems

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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.

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AquaHeat Hydronic Floor Installation

System Selection

The first determining factor will be the type of system installation.

Wet (poured) systems - (primary heating)

Of primary concern at this stage is the selection of the type of installation you require. When making your decision, take into account the highest efficiency versus the easiest installation method versus the least structural impact. With the use of either concrete or gypsum, the thermal mass of the floor will bring the most fuel efficiency and greatest comfort. While there may be slower recovery times, the high mass ensures a more even heat output, and in turn the floors retain their heat longer. This is caused by the large inertia that is stored in the slab. Other things to bear in mind are:

- concrete versus gypsum pours on plywood subfloor (i.e. main and second floor)
- fastening of pipe for the basement pour utilizing tie-strap mesh versus tracking, and
- the addition of full versus partial cover of insulation, and the requirement for expansion stripping.

Dry (staple-up) or Dry above (staple-down) - primary heating

Radiant heating is often dismissed as an option when there is a concern about the load bearing ability of the structure. However, it is still possible to have radiant heating in these circumstances, by either placing the pipe within the joist cavity (using the staple-up method), or dry above floorpanel system on top of the subfloor. In the staple-up method, you will require the addition of AquaHeat heat transfer plates. These plates aid in the heat transfer process by distributing the heat over a wider area (than the area directly above a narrow pipe), and also increase the heat transfer from pipe to floor as the plate draws heat from the entire circumference of the pipe.

- Dry staple-up
- Dry above Pro-Panel

Partial systems - secondary or supplemental heating

It is becoming more common to see a combination of heating systems used in buildings. In some situations, the radiant portion of a heating system is used as a heating supplement to another system (such as radiant in the basement floor with forced air, and baseboard on the other levels). In other circumstances, a floor-warming supplement might be used to address human comfort issues instead of actually heating the home. An example would be under a tile or slate floor where the purpose is to remove the chill from the surface, with a minimal effect on the room temperature.

Heatloss/Design

Proper plans

Architectural plans, with all dimensions including elevations with window and door specifications, insulation specifications and grade/ below grade information, are required.

Floor coverings

Ascertain that all floor coverings allow for specific heat load calculations, i.e. carpet versus tile or hardwood.

Carpet

Use only brand name products where the manufacturer has confirmed the suitability for floor heating. Choosing products with a minimal thermal resistance will help ensure that feedwater temperatures remain within an acceptable range. In order to maximize the heat transfer characteristics of a product, it is preferable to glue carpet instead of stretching it. All adhesives used must be suitable for floor heating. Under no circumstances should adhesives made of bituminous material be used. Needle-felt carpets and carpets with jute backs have proven to be acceptable.

Quarry tile/Ceramic tile

All tile work should be installed according to industry standards. Expansion joints and control joints in the floor topping should continue through into the tile floor. Under no circumstances are tiles to cross over these joints. The expansion/control joints in the tile floor need to be permanently elastic.
At a joint between a wall tile and a heated floor, ensure that the wall tile terminates at 1/4" (6 mm) above the top surface of the finished floor. This joint may be filled with permanently elastic material.

Vinyl/Plastic flooring

All vinyl/plastic flooring should be installed according to industry standards.
All expansion and control joints should continue through the flooring to reduce damage caused by movement of floor slab. All joints are to be permanently elastic. All adhesives used must be expressly approved for floor heating applications. Adhesives with a bituminous base are not to be used for any purpose.

Hardwood flooring

- All hardwood flooring should be installed according to industry standards and as per manufacturer instructions. Shrinkage can and will occur in most hardwood regardless of the heating system chosen. However, due to the presence of a low temperature heated mass in direct contact with the hardwood, the normal shrinkage that may take place over a 6 to 24 month period can be greatly accelerated with a radiant floor heating system if the proper installation techniques have not been followed.
- There are many types of hardwood flooring available including solid planks as well as laminates. In most regions of North America laminate flooring is gaining acceptance as more types/brands and finishes become available. (Laminate flooring has several advantages over other types of hardwood flooring especially when used in conjunction with a radiant floor heating system. Due to the layers being manufactured at right angles to each other (i.e. similar process as plywood sheathing), shrinkage is nearly eliminated.
- If solid hardwood stripping is desired, and an acceptable laminate flooring cannot be used, it is imperative that the hardwood has been "acclimatized" to the region where it is being installed. Sometimes a flooring supplier will receive a shipment of hardwood from a manufacturer and then send it out to a job site within several days or weeks. This may not be sufficient time for the hardwood to acclimatize to the particular region, especially in a "dry" climate area. Hardwood must not exceed 6% to 8% moisture content at the time of installation. It is our recommendation that all hardwood be placed on site and the floor temperature increased before flooring installation to ensure the proper moisture content is achieved.
- Control selection is especially critical for installations with hardwood to ensure that proper modulation of the supply water temperature is possible. Modulating controls will provide the lowest possible supply water temperature for the given outside temperature. As well, maximum floor surface temperature should not exceed 85°F to 90°F (30°C to 32°C). With the variance in humidity levels through the various seasons in a given year, supplemental humidification may have to be provided to ensure relative humidity can be maintained at 40% to 45%. For further information and clarification for your particular project, please contact your ComfortPro Systems representative.

- In all cases of using nail-down hardwood, the installer must be aware of the potential for pipe damage. Pipe locations must be marked to ensure against nails being hammered into pipes.

Shortages

Where the heatloss has indicated a shortage in a particular room, an alternative heat source should be selected to make up for the shortage. This could be as simple as a towel warmer in the bath, or as complex as a fan with heat coil.

Site Preparation

Cleanup

Clear the floor of debris whether it is a dry or wet install. In the case of a staple up, this could also mean grinding off any nails that penetrate through the floor into the work area.

Manifolds

Choosing the manifold

Residential and light commercial applications will usually require the Promix #2013, #2015 or ProLock #76000 manifolds, while for heavy commercial and snow melt installations the Promix #2016 manifold is recommended. This selection will be made automatically in the ComfortPro AquaHeat Heatloss calculation and material list.

Location

Select a central location, which will allow for permanent access to the manifold location, (a closet is common), however with the use of custom enclosures it may be possible to use a wall in a hallway or room. The key consideration is to allow for the concentration of the uncontrolled heat from the leader pipes.

Support

The quantity of modules (loops) will determine the width of the wall cavity. ProMix as well as ProLock manifolds can be extended after the product selection if needed. Sufficient space should be allowed for any future extra loops that might be added. While installing, place the manifold high enough to allow for easy access to the pipes. Also, leave 8" of clearance above the top of the manifold for control wiring.

Option 1:
Install a 1/2" plywood strip (notched into the back of a 2×4) in the stud wall.

Option 2:
Install a prefabricated metal rough-in enclosure. There are several sizes available, depending on the required number of loops.

Manifold assembly

- Secure the brackets to the backing support.
- Make sure that the work area is completely clear of dust and debris.

Manifold connection

The end of the PEX pipe must be cut squarely to ensure it seats tightly against the flange of the insert fitting. Disassemble the outlet of the module being connected, then slide the nut, cone ring, and split ring ferrule onto the pipe. Place the insert fitting into the pipe and ensure that it seats correctly. Clean and lubricate the O-ring before inserting it into the manifold.

PEX Pipe Installation

- Install AquaHeat PEX pipe 3/8", 1/2", 5/8", 3/4", and 1" according to the manufacturer's recommendation.
- All pipes should be kept in their original packaging material until installation and must not be exposed to direct sunlight. All pipe is produced with a UV stabilizer but this instruction should still be followed.
- PEX pipe should be installed at temperatures higher than 32°F (0°C). At or below this temperature, construction heating is required.
- Please take care that a minimal bending radius of 6 times the diameter is obtained. For example, at 68°F or 20°C, there should be a:
    - 2-1/4" (57 mm) radius for 3/8" PEX,
    - 3" (77 mm) radius for 1/2" PEX,
    - 3-3/4" (95 mm) radius for 5/8" PEX,
    - 4-1/2" (115 mm) radius for 3/4" PEX, and
    - 6" (153 mm) radius for 1" PEX.
- For under-floor double loop installations where the piping is being run in the joists (through, not underneath), it is important to crossover the piping to ensure it does not kink or collapse (see dry below section).
- Sharp kinks in the pipe wall can be repaired using hot air by heating the pipe to transparency and allowing the thermal memory to return the wall to its original shape and diameter. A flame or torch must never be used to repair kinks.
- Care should be taken during installation not to damage the pipe with sharp objects such as nails or wires. The use of binding wires for tying pipe to rebar or wire mesh in not allowable, only plastic straps should be used.
- Pipes must not be connected directly to a boiler or hot water tank. Allow for a minimum of 12" to 18" (30 to 50 cm) of solid piping before the transition to PEX.

Heating pipe expansion joint crossings

When PEX heating pipes cross expansion joints their flexibility must be ensured by appropriate measures such as, the use of pipe sleeves made of closed cell pipe insulation, polybutylene, PVC or ABS. The sleeve must be approximately 1' (30 cm) long, split open and pushed over the top of the PEX heating pipe. Coverage should extend 6" on either side of the joint.

Entering/Exiting concrete slabs

When entering or exiting a concrete slab the PEX pipe should always be protected by a conduit elbow (AquaHeat 86000 Series), or a pipe sleeve.

Couplings

Should a joint be required in a heating loop, exercise care to ensure the coupling is installed correctly. The end of the PEX pipe must be cut squarely to ensure it seats tightly against the flange of the insert fitting. Disassemble the coupling to be used. Slide a nut and a split ring ferrule onto each pipe end. Place the insert fitting into the pipes and ensure that both pipes are seated correctly. Tighten both nuts. For Wet installations only, wrap all couplings with PVC tape or compatible material before the topping-pour, to prevent any possible corrosion. (See Wet Installation.) Another method of highly reliable coupling comes from using the Pinchlock clamp and tool with either a plastic or brass double sided barb. Place the appropriate size clamp over each piece of PEX, insert either a plastic or brass barb in the PEX. Move clamp to the correct distance from barb and complete with the pinchlock tool. Now do the same on the other side of the PEX covered barb.

Pressure test

For the pressure test, use at least 80-100 psi (550-690 kPa) hydrostatic pressure or 60-80 psi (415-550 kPa) air pressure. This test must be performed for a minimum of 12-24 hours before the placement of the topping. Special care must be taken to check and retighten all joints and connections. During the pouring of the topping, the pipe must be left under pressure so that possible damage to the pipe can be immediately detected. (In cold environments, a hydrostatic test must be properly freeze protected before testing. A test pressure of 80 psi for a minimum of 24 hours before, during and after the enclosure is required.)

DESIGN CHECK LIST

1. Complete room by room heat loss analysis
2. Calculate room by room upward load
3. Determine surface temperature
4. Select tube size and spacing
5. Select temperature differential
6. Determine water supply temperature
7. Complete back losses anaiysis
8. Select tubing layout and pattern
9. Determine manifold (s) location (s)
10. Determine flow rate requirements
11. Determine loop lengths and number of loops required
12. Calculate pressure drop for individual loops
13. Determine pressure drop for entire system
14. Size and select circulating pumps
15. Determine expansion tank requirements
16. Select heat source
17. Select system controls
18. Develop material list

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