Residential radiant heating design request form instructional guide

**Design type: Residential radiant**

**Residential initial design**
- Loop layout
- Full design, consisting of:
  - Full residential heat-load analysis
  - System design criteria, including gallons per minute (gpm) and head pressure requirements
- Uponor materials list

**Note:** The project heat source, pump(s), heat exchanger(s), etc. will need to be provided by an Uponor representative or wholesale distributer, but can be sized in accordance to the Uponor design.
- Shop drawings/loop layout

**Budgetary estimate (based on ft\(^2\) only)**

**Note:** An Uponor budgetary estimate is a list-price estimate based on project square footage and/or schedule information and does not include item quantities (see report below).

**Design stage**

**Define by fee structure**

This will default the design stage to the requested selection as noted on the “Design type: Residential radiant” page.
- Loop layout
- Full design
- Budgetary estimate

**Budgetary estimate square footage**

This is the square-foot area to be filled with radiant loops.

**Project type**

Application for design
- Radiant floor heat
- Snow and ice melt
- Additional project type
  - Use if there is both radiant and snow and ice melt on a given project.

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**Figure 1: Uponor budgetary estimate**
Design development (DD) phase
The design development (DD) phase of a project relates to the development and layout of the mechanical, electrical, plumbing, structural and architectural details. The Uponor DD phase typically begins when the project construction document (CD) phase is at 50 percent or greater. At the DD phase, Uponor provides radiant applications details for consideration, including hatched radiant areas, suggested manifold locations, pipe sizing and installation details as well as estimated gpm and head pressure requirements.

Figure 2: Hatched radiant areas drawing

Shop drawings/loop layout
Uponor’s schematic layout indicates how and where the piping should be installed in accordance to a given floor plan. This is also known as a loop layout in radiant floor heating applications.

Figure 3: Loop layout drawing
Construction documents (CD) phase

Once the owner and architect are comfortable with the documents produced during the DD phase, they typically proceed with the construction documents (CD) phase. This phase includes drawings with greater detail and typically includes specifications for construction details and materials. This selection includes Uponor shop drawings, radiant schedules and Uponor’s materials list.

Figure 4: Shop drawing
Budgetary estimate square footage
Budgetary estimate services are available for qualified radiant, snow melt, permafrost and turf conditioning applications. The intent of this service is to provide customers with a budgetary list price for Uponor materials required for a specific radiant area.

Project type
Radiant design
This is for interior radiant heating applications where PEX tubing is installed in floors, walls and/or ceilings of the interior space to heat the surfaces and provide heat to the interior space.

Snow melt design
This is for exterior radiant heating applications where PEX tubing buried in concrete, asphalt or sand circulates a warm water/glycol solution to heat the surface and melt ice and snow.

Additional project type (if applicable)
Radiant/snow melt design
This option is available to include either radiant or snow melt to an existing primary radiant application.

Load information
Outdoor design temperature (ODT)
Typically referred to as “the coldest day of the year,” the ODT is actually the standard design temperature somewhat warmer than the seasonal lowest temperature for the area. ASHRAE fundamentals recommends selecting a residential design temperature for a given area to be 99 percent of the seasonal lowest temperature.

Desired Delta T
Heating
This is the temperature differential between the supply and return water to and from a radiant-heated space. Typically in residential applications, Uponor designs to a 10°F (5.6°C) Delta T to provide a more evenly heated floor and better thermal comfort. For example, if you are supplying a radiant floor with 100°F (37.8°C) water and the return water from the floor loops is 90°F (32.2°C), the Delta T would be 10°F (5.6°C).

Desired load density (BTU/SF)
Heating
This is the BTU requirement, per square foot, to heat a given area. This requirement is typically calculated by the engineer and can be found in the mechanical schedules section of the plan set.

Glycol percentage
This is the percentage of glycol in a hydronic system’s total fluid. Glycol is a freeze protection solution mixed with water in applications where there is potential for water to freeze in the system. Glycol solutions are typically used in snow melt applications, but some remote dwellings with sporadic use also utilize glycol mixtures to mitigate the possibility of freezing system lines.

Insulation
Insulation
This is the amount of insulation (expressed in R-value) placed directly below a radiant floor to reduce downward heat loss. Uponor typically recommends insulation for system efficiency.

R-value
This is the measure of a material’s ability to resist the flow of heat. R-value is expressed in BTU/h*ft² (1/U = R). Uponor recommends an R-10 under-slab insulation, but density should be specified/approved by the structural engineer prior to installation.

Water table/bedrock
The presence of a water table will affect the performance of the radiant panel heating system. Typically, insulation should be added below a radiant slab if there is a water table within 6 feet of the slab.

Snow and ice melt
Desired melting temperature
This is the desired surface temperature required for the snow melt system during operation. Temperature typically varies by application.

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<th>Desired Melting Temperature</th>
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<tr>
<td>Residential</td>
<td>35 to 38°F (1.7 to 3.3°C)</td>
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<td>Commercial</td>
<td>38 to 42°F (3.3 to 5.6°C)</td>
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<td>Emergency/utility</td>
<td>40 to 45°F (4.4 to 7.2°C)</td>
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Snow melt outdoor design temperature
This is the coldest outdoor temperature that typically occurs when snow melting is required. Uponor typically designs to 0°F (-17.8°C) at 10 mph wind speeds.

Snow melt glycol percentage
This is the percentage of glycol in a hydronic system’s total fluid. Glycol is a freeze protection solution mixed with water in applications where there is potential for water to freeze in the system. Glycol manufacturers typically have a recommended mixture ratio for a range of outdoor design temperatures. Uponor will design to 30, 40 or 50 percent solutions. As the amount of glycol increases in the mixture, it reduces the efficiency of the system to transfer BTUs which will have an impact on system performance (gpm and head pressure requirements).

Design options
Indoor design temperatures
Heating
This is the desired operative room temperature setpoint for a heated space. Uponor typically designs setpoints between 68 to 72°F (20 to 22.2°C) depending on geographical location and application.

Cooling
This is the desired operative room temperature setpoint for a cooled space. Uponor typically designs setpoints between 74 to 78°F (23.3 to 25.6°C).
Floor construction

Slab on grade/slab below grade (basement/ground floor)

Concrete slab
Uponor tubing
Slab insulation

Pex rail
Base material

Edge insulation

Figure 5: Slab on or below grade with under-slab and edge insulation using staples

Concrete slab
Wire tie
Uponor tubing
Edge insulation
Base material
Wire mesh, rebar or staple to rigid foam

Figure 6: Slab on or below grade with under-slab and edge insulation using wire mesh or rebar and wire ties

Concrete slab
Wire tie
Uponor tubing
Edge insulation
Base material
Wire mesh, rebar or staple to rigid foam

Figure 7: Slab on or below grade with edge insulation only using wire mesh or rebar and wire ties

Concrete overpour
¾” min. over the top of the tubing
Wire tie
Insulation
Upnor tubing
Pre-stressed concrete

Edge insulation

Figure 8: Cap pour over precast plank with under-slab and edge insulation using wire mesh or rebar and wire ties

Concrete topping ¾” min. over the top of the tubing
Wire tie
Upnor tubing
Suspended structural slab (rebar size and location determined by engineer)
Wire mesh, rebar or staple to rigid foam

Figure 9: Cap pour over precast plank with wire mesh or rebar and wire ties
Cap pour over existing slab (basement/ground floors)

Concrete overpour
¼” min. over the top of the tubing

Wire tie

Uponor tubing

Slab insulation

Existing concrete

Figure 10: Cap pour over existing slab with under-slab and edge insulation using wire mesh or rebar and wire ties

Figure 11: Cap pour over existing slab with wire mesh or rebar and wire ties

Concrete overpour

Wire tie

Fast Trak 0.5

Poured underlayment

Uponor tubing

Concrete slab

Base material

Figure 12: Cap pour over existing slab with Fast Trak™ knobbed mats

Poured underlayment on suspended wood subfloor (upper levels)

Overpour ¼” min. over the top of the tubing

Floor joist

Subfloor

Uponor tubing

Insulation

Staple tubing to subfloor

Figure 13: Poured underlayment with staples

Fast Trak 0.5

Poured underlayment

Uponor tubing

Concrete slab

Base material

Figure 14: Poured underlayment with Fast Trak knobbed mats
Poured-in-place slab over steel decking (upper levels)

Concrete topping ¾” min. over the top of the tubing
Wire tie
Metal deck
Wire mesh, rebar
Uponor tubing
Insulation

Figure 15: Poured-in-place slab over steel decking with wire mesh or rebar and wire ties over insulation

Concrete topping ¾” min. over the top of the tubing
Wire tie
Metal deck
Wire mesh, rebar
Uponor tubing

Figure 16: Poured-in-place slab over steel decking with wire mesh or rebar and wire ties

Concrete slab
PEX chairs
Metal decking
Insulation

Figure 17: Poured-in-place slab over steel decking with PEX chairs

Suspended wood floor (upper levels)

Finished floor
tile or linoleum

Figure 18: Suspended wood floor with Quik Trak® panels

Quik Trak® panel
screwed to wood subfloor
Suitable subfloor material
¼ to ¾” plywood or cement board
½ to ¾” Uponor tubing

Figure 19: Suspended wood floor with PEX clips
Attachment methods

Baseline/ground floor and upper levels

Wire ties
A7031000 Fixing Wire, 1,000/bundle

Figure 20: Wire ties

PEX foam staples
A7012000 2” Blue Foam Staples, 300/pkg.

Figure 21: PEX foam staples

PEX rails
A5700500 ⅜” PEX Rail, 6.5 ft.
A5700625 ⅝” PEX Rail, 6.5 ft.
A5700750 ¾” PEX Rail, 6.5 ft.

Figure 22: PEX rails

Fast Trak knobbled mats
A5090313 Fast Trak 0.5 (8.3 sq. ft./panel)
A5090500 Fast Trak 1.3i (12.1 sq. ft./panel)

Figure 23: Fast Trak 0.5
Figure 24: Fast Trak 1.3i

Quik Trak panels
A5060701 Quik Trak 7” x 48” Panels
A5060761 Quik Trak 7” x 48” Panels (fully assembled)

Figure 25: Quik Trak over plywood underlayment

Metal staples
A7011250 ¼” Metal Staples, 10,000/pkg.

Figure 26: Metal staples

Overpour ¼” min. over the top of the tubing

Figure 27: Metal staples over plywood underlayment

Joist heating
A5080375 Joist Trak, ⅜” heat transfer panel (20 pkg. qty.)
A5080500 Joist Trak, ⅝” heat transfer panel (20 pkg. qty.)

Figure 28: Joist Trak™ plates between joists

F7060375 ⅜” PEX Clip, 100/pkg.
F7051258 ⅝” PEX Clip, 100/pkg.

Figure 29: Suspended pipe with PEX clips
### Wirsbo hePEX™ (oxygen barrier)

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### Uponor AquaPEX® (no oxygen barrier)

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### Multi-layer composite (MLC)

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**Pipe size**
- 5/16"  
- 3/8"  
- 1/2"  
- 3/4"  

**On-centering (o.c.) distance**
This refers to the distance between supply and return loops within the radiant floor. Quik Trak applications are fixed to 7" on center (o.c.), but other installation methods can vary depending on the specific requirements of the space.
- 6"  
- 9"  
- 12"  

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*Figure 30: Wirsbo hePEX coil*

*Figure 31: Uponor AquaPEX coils*

*Figure 32: Multi-layer composite (MLC) coil*
Snow and ice melt

Slab construction

Figure 33: Slab on grade with under-slab and edge insulation with staples

Figure 34: Slab on grade with edge insulation only and wire mesh or rebar with wire ties

Figure 35: Slab on grade with a stair pattern

Figure 36: Slab on grade with asphalt

Figure 37: Slab on grade with brick pavers
Snow melt controls

**Fully automatic (pavement snow sensor)**
System will run the snow and ice melt system to a preset temperature automatically upon sensing moisture from a sensor mounted within the slab surface.

**Fully automatic (air snow sensor)**
System will run the snow and ice melt system to a preset temperature automatically upon sensing moisture from a sensor mounted externally from the slab. Slab temperature sensors will still be required for slab temperature control.

**Setpoint 150 (slab temperature only control)**
System will operate the system to maintain a slab temperature based on slab sensing only.

Snow melt tubing

- Wirsbo hePEX (oxygen barrier)
- Uponor AquaPEX (no oxygen barrier)
- MLC (PEX-aluminum-PEX)

Pipe size
- $\frac{5}{8}"$
- $\frac{3}{4}"

O.C. distance
- 6"
- 9"

Manifolds

**Figure 40: 1" Stainless-steel manifold**

**Figure 41: 1\(\frac{1}{4}"\) Stainless-steel manifold**

**Figure 42: Engineered polymer (EP) manifold**
### Manifolds (continued)

**Figure 43: TruFLOW™ Jr. manifold**

**Figure 44: TruFLOW Classic manifold**

**Figure 45: 2” copper manifold**

**Figure 46: Manifold supply and return ball valves with temperature gauge (A2631251)**

**Figure 47: Manifold supply and return ball valves with filter and temperature gauge (A2631250)**

**Figure 48: Manifold wall cabinets**

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<td>A2640027</td>
<td>TruFLOW Visual Flow Meter, 0.25 to 2.0 gpm</td>
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### Zoning Preferences

#### Zoning Controls

- **Pump** (separate pump for each zone that provides flow to the radiant zone)
- **Valve** (inline valve that opens and closes to provide flow to individual loops of a radiant zone requiring flow)

#### Thermostats

- **SetPoint 501s controller**

### Figures

- **Figure 49**: Loop flow meters
- **Figure 50**: ProPEX® manifold adapters
- **Figure 51**: Pressure test kits
- **Figure 52**: Pump (separate pump for each zone that provides flow to the radiant zone)
- **Figure 53**: Valve (inline valve that opens and closes to provide flow to a radiant zone requiring flow)
- **Figure 54**: Loop actuator (inline valve that opens and closes to provide flow to individual loops of a radiant zone requiring flow)
- **Figure 55**: SetPoint 501s controller
### Tempering controls

#### 1” Thermal Mixing Valve with Union (A5402112)

This valve is set to a desired supply temperature and does not modulate or require any type of control.

![Thermal mixing valve](image1)

#### Three-way Mixing Valve (A3040075, A3040100)

This valve includes an outdoor air temperature sensor which is used to modulate the supply water temperature to the radiant system based on the outdoor temperature.

![Three-way mixing valve](image2)

### Radiant Ready 30E™

Preassembled radiant panel with the following components:

- Boiler
- Manifold
- Pump
- Expansion tank
- Pressure-relief valve
- Isolation valves

- Thermostat
- Air vent

Simply connect the tubing, thermostat and electrical power and you’re done.

- 240V/50 Amps
- 30,000 BTU/h
- Electric boiler
- Hard-wired
- Up to 12 loops

![Radiant Ready 30E](image3)
Other accessories

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
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<tbody>
<tr>
<td>E6062000</td>
<td>Select Uncoiler</td>
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<tr>
<td>E6081125</td>
<td>Tube Cutter (metal) for up to 1” PEX</td>
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<td>E6081128</td>
<td>Tube Cutter (plastic) for up to 1” PEX and ¾” MLC Tubing</td>
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<td>E6090005</td>
<td>Fixing Wire Twister</td>
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<td>E6050000</td>
<td>Quik Trak Installation Tool Kit</td>
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<td>E6025000</td>
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<td>1⅛” Service Wrench</td>
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</table>

Figure 63: Select uncoiler
Figure 64: Tube cutter
Figure 65: Fixing wire twister
Figure 66: Quik Trak installation tool kit
Figure 67: PEX foam stapler
Figure 68: Pneumatic stapler kit
Figure 69: Service wrench