Commercial radiant design request form instructional guide

Design stage

Budgetary estimate
This is an Uponor materials list price estimate for radiant applications based on project square footage and/or schedule information.

Design development (DD) phase
The design development (DD) phase of the project relates to the development and layout of the mechanical, electrical, plumbing, structural and architectural details. The Uponor DD stage typically begins when the project construction documents (CD) phase is at 50 percent or greater. At the DD stage, Uponor provides radiant applications details for consideration, including hatched radiant areas, suggested manifold locations, pipe sizing and installation details as well as estimated gallons per minute (gpm) and pressure drop requirements.

Figure 1: Uponor budgetary estimate

Figure 2: Hatched radiant areas
Shop drawings/loop layout
Below is an example of a shop drawing (or loop layout) of a radiant tubing installation. The layout indicates how and where to install the tubing in a given floorplan.

Figure 3: Shop drawing/loop layout
Construction documents (CD) phase

Once the owner and architect are comfortable with the documents produced during the DD phase, they typically proceed with the CD phase. This phase includes drawings with greater detail and typically includes specifications for construction details and materials, including Uponor drawings and bills of material as well as radiant schedules.

Figure 4: Uponor radiant loops drawing
Budget 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 our customers with a budgetary list price number for Uponor materials required for a specific radiant area.

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

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

Permafrost
This is a radiant heating system below a thick layer of insulation, typically installed below industrial freezer structures, to maintain a continuous soil temperature.

Turf conditioning
This consists of PEX tubing installed in the soil beneath the turf to maintain an optimum soil temperature for the root bulb of grass plants.

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
Hot water supply temperature (maximum)
This is the maximum temperature supplied into the radiant heating system. (This can reflect the heat source, heat exchanger and/or radiant panel limitations.)

Chilled water supply (minimum)
This is the minimum temperature supplied into the radiant cooling system. (This can reflect the chiller source, heat exchanger and/or radiant panel limitations.)

Desired Delta T
Heating
This is the temperature differential between the supply and return water to and from a radiant heated space. For example, in a system supplying a radiant floor with 100°F (37.8°C) water and the return water from the floor loops is 80°F (26.7°C), the Delta T would be 20°F (11.1°C).

Cooling
The temperature differential between the supply and return water to and from a radiant cooled space. For example, in a system supplying a radiant floor with 56°F (13.3°C) water and the return water from the floor loops is 64°F (17.8°C), the Delta T would be 8°F (4.5°C).

Desired load density (BTU/SF)
Heating
This is the BTUs required, per square foot, to heat a given area. The engineer on record typically calculates these requirements. They can be found in the mechanical schedules section of the plan set.

Cooling
This is the BTUs required, per square foot, to be removed from a given area. Radiant cooling is tasked exclusively to sensible loads, therefore it requires parallel systems to accommodate latent loads. The engineer on record must calculate these requirements. They can be found in the mechanical schedules section of the plan set.

Glycol percentage
This is the percentage of glycol in the hydronic system’s total fluid. Glycol is added to water in applications where there is potential for freezing water in the system.

Note: 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. It is important to note that as the amount of glycol increases, it reduces the efficiency of the system to transfer BTUs, which will have an impact on system performance.

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 underslab insulation. However, the structural engineer should specify/approve the R-value prior to the installation.

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

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.

- Residential  35 to 38°F (1.6 to 3.3°C)
- Commercial  38 to 42°F (3.3 to 5.5°C)
- Emergency/utility 40 to 45°F (4.4 to 7.2°C)

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 the hydronic system’s total fluid. Glycol is added to water in applications where there is potential for freezing water in the system.

**Note:** 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. It is important to note that as the amount of glycol increases, it reduces the efficiency of the system to transfer BTUs, which will have an impact on system performance.

**Floor construction**

_Slab on grade/slab below grade (basement/ground floor)_

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

_Figure 5: Slab on or below grade with under-slab and edge insulation and PEX rails_

**Cap pour over precast plank (upper levels)**

- Concrete overpour ¾” min. over the top of the tubing
- Wire tie
- Insulation
- Edge insulation
- Uponor tubing
- Pre-stressed concrete
- Wire mesh, rebar or staple to rigid foam

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

**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).
Cap pour over existing slab (basement/ground floors)

Concrete overpour

1/4” min. over the top of the tubing

Wire tie

Uponor tubing

Edge insulation

Wire mesh, rebar or staple to rigid foam

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

Other (upper levels)

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 1/4” min. over the top of the tubing

Floor joist

Subfloor

Uponor tubing

Insulation

Staple tubing to subfloor

Figure 13: Poured underlayment with staples

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

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
Uponor tubing
Wire mesh, rebar

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
Quik Trak® panel
screwed to wood subfloor
Suitable subfloor material
¼ to ¾” plywood or cement board
Floor joist
Suitable insulation
5/8” Uponor tubing

Figure 18: Suspended wood floor with Quik Trak® panels

Finished floor
wood, tile, vinyl or carpet
Subfloor
Uponor PEX clip
Uponor tubing
6”
16”
Suitable insulation
Floor joist

Figure 19: Suspended wood floor with PEX clips
Attachment methods

Basement/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 ½” PEX Rail, 6.5 ft.
A5700625 ¾” 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)

Figure 23: Fast Trak 0.5

A5090500 Fast Trak 1.3i (12.1 sq. ft./panel)

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 1¼” Metal Staples, 10,000/pkg.

Figure 26: Metal staples

Overpour ¾” 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, ½” heat transfer panel (20 pkg. qty.)

Figure 28: Joist Trak™ plates between joists

F7060375 ⅜” PEX Clip, 100/pkg.
F7051258 ½” PEX Clip, 100/pkg.

Figure 29: Suspended pipe with PEX clips
### Wirsbo hePEX™

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### Uponor AquaPEX®

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### Multi-layer composite (MLC)

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### Pipe size

- ⅛"
- ⅛"
- ½"
- ⅜"
- ⅝"
- ¾"

### On-centering 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"
- 12"
- 24"
- 9"
- 18"

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**Figure 30:** Wirsbo hePEX coil

**Figure 31:** Uponor AquaPEX coils

**Figure 32:** Multi-layer composite (MLC) coil
### Radiant Rollout™ Mat

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### In-slab header
- Wirsbo hePEX (oxygen-barrier PEX)
- Uponor AquaPEX (no oxygen barrier)

#### Pipe size
- ½"
- ⅝"

#### On-centering distance
- 6"
- 9"
- 12"

- ¾" reverse-return manifold for in-slab balancing
- Wire mesh, rebar, or staple to rigid foam

![Figure 33: Left-hand and right-hand reverse-return headers](image1)

- Return Supply
- Acetal polymer support braces
- 7" O.C.

![Figure 34: Radiant Rollout Mat installation](image2)

- Concrete slab
- Base material
- Radiant Rollout™ Mat
Snow and ice melt

Slab construction

Figure 35: Slab on grade with under-slab and edge insulation using staples

Figure 36: Slab on grade with edge insulation only using wire mesh or rebar with wire ties

Figure 37: Slab on grade with a stair pattern

Figure 38: Slab on grade with brick pavers

Figure 39: Slab on grade with asphalt

Figure 40: Insulated slab over prestressed concrete

Figure 41: Slab over insulated steel decking
Snow melt tubing
- Wirsbo hePEX (oxygen barrier PEX)
- Uponor AquaPEX (no oxygen barrier)
- MLC (PEX-aluminum-PEX)

Pipe size
- ¼"
- ⅜"

On-centering distance
- 6"
- 9"

Manifolds

Figure 42: 1” Stainless-steel manifold

Figure 43: 1¼” Stainless-steel manifold

Figure 44: Engineered polymer (EP) manifold

Figure 45: TruFLOW™ Jr. manifold

Figure 46: TruFLOW Classic manifold

Figure 47: 2” copper manifold

Snow melt controls
Snow and ice melt control
Fully automatic (pavement snow sensor)
The 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.
### Manifold accessories

**Figure 48:** Manifold supply and return ball valves with temperature gauge (A2631251)

**Figure 49:** Manifold supply and return ball valves with filter and temperature gauge (A2631250)

**Figure 50:** Manifold wall cabinets

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<td>x</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 to 7 loops</td>
<td></td>
<td></td>
<td>x</td>
</tr>
<tr>
<td>8 to 12 loops</td>
<td></td>
<td></td>
<td>x</td>
</tr>
</tbody>
</table>
### Zoning preferences

**Zoning controls**

- **Figure 54:** Pump (separate pump for each zone that provides flow to the radiant zone)
- **Figure 55:** Valve (inline valve that opens and closes to provide flow to a radiant zone requiring flow)

### Thermostats

**Figure 57:** SetPoint 501s controller

- **Part no.** | **Part description** | **Pkg. qty.**
  - A3041501 | SetPoint 501s, Single-stage SetPoint Controller with floor sensor | 1
  - A3040007 | Cover plate for 500 series controllers | 10
<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3040521</td>
<td>SetPoint 521, programmable thermostat with floor sensor</td>
<td>1</td>
</tr>
<tr>
<td>A3040012</td>
<td>Cover plate for SetPoint 521 programmable thermostat</td>
<td>1</td>
</tr>
<tr>
<td>A3040079</td>
<td>Floor sensor, replacement part</td>
<td>1</td>
</tr>
<tr>
<td>A3040007</td>
<td>Cover plate for 500 series controllers</td>
<td>10</td>
</tr>
<tr>
<td>A3040012</td>
<td>SetPoint 521, programmable thermostat with floor sensor</td>
<td>1</td>
</tr>
<tr>
<td>A3040012</td>
<td>Cover plate for SetPoint 521 programmable thermostat</td>
<td>1</td>
</tr>
<tr>
<td>A3040079</td>
<td>Floor sensor, replacement part</td>
<td>1</td>
</tr>
<tr>
<td>A3040007</td>
<td>Cover plate for 500 series controllers</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 58: SetPoint 521 thermostat

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3100101</td>
<td>Heat-only thermostat with touchscreen</td>
<td>1</td>
</tr>
<tr>
<td>A9010599</td>
<td>Slab sensor, 10k</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 59: Heat-only thermostat with touchscreen

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3030102</td>
<td>Heat and cool thermostat</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 60: Heat and cool thermostat

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A3040150</td>
<td>SetPoint 150 controller</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 61: SetPoint 150 controller

**Other accessories**

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6062000</td>
<td>Select Uncoiler</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 62: Select uncoiler

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6081125</td>
<td>Tube Cutter (metal) for up to 1&quot; PEX</td>
<td>1</td>
</tr>
<tr>
<td>E6081128</td>
<td>Tube Cutter (plastic) for up to 1&quot; PEX and ¾&quot; MLC Tubing</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 63: Tube cutter

<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6090005</td>
<td>Fixing Wire Twister</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 64: Fixing wire twister
<table>
<thead>
<tr>
<th>Part no.</th>
<th>Part description</th>
<th>Pkg. qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>E6025000</td>
<td>Quik Trak Installation Tool Kit</td>
<td>1</td>
</tr>
<tr>
<td>E6021638</td>
<td>Pneumatic Stapler Kit</td>
<td>1</td>
</tr>
<tr>
<td>E6111188</td>
<td>1¼&quot; Service Wrench</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 65: Quik Trak installation tool kit

Figure 66: PEX foam stapler

Figure 67: Pneumatic stapler kit

Figure 68: Service wrench