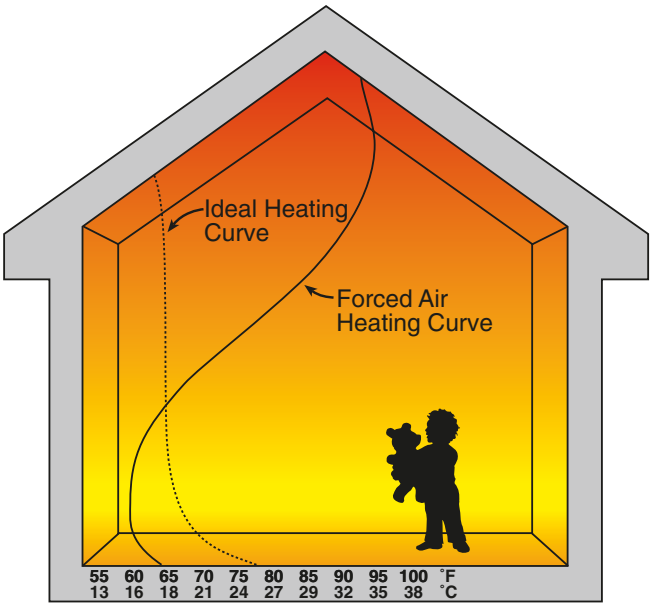
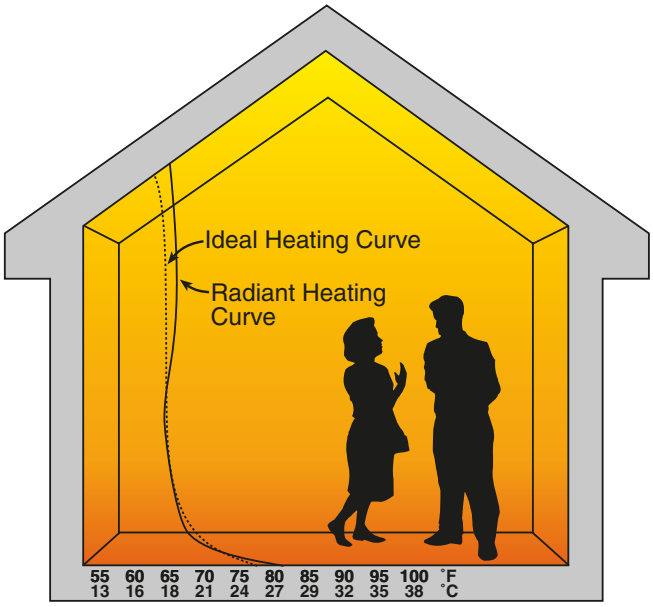
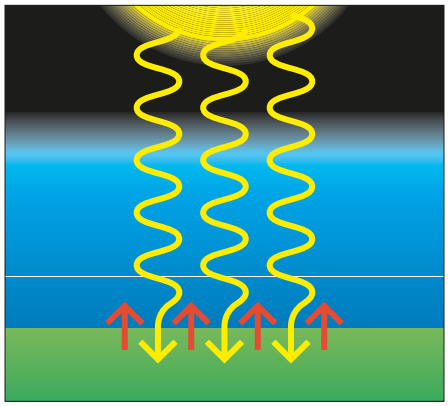
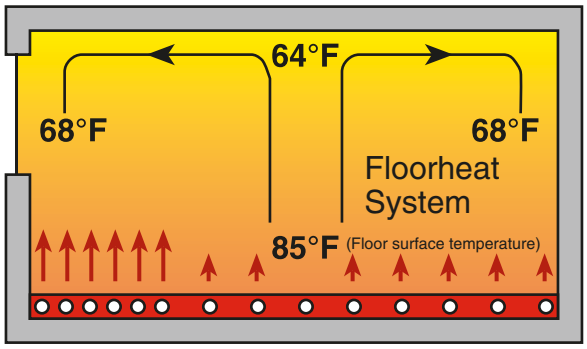




Radiant heat is a type of energy wave that travels through space from a warmer object to a cooler one until the temperature of both objects reaches equilibrium. Yet radiant energy waves do not directly heat up the space they travel through. This is similar to how the sun, at approximately 3 x 106 °F, heats up the earth at an average 60°F, while leaving the space in between at approximately 450°F below zero.



Radiant energy travels in all directions. Only when the radiant energy wave hits a solid surface will it transform to heat to warm up the surface. Air within a radiant heated space warms up because it comes in contact with the surfaces in the space. The larger the surface area and the closer an object to it, the greater effect the temperature of that surface has on the object. The combined effect of surface temperatures within that radiant heated space on an object, or perhaps a person, is quantified by its mean radiant temperature or MRT. MRT is a measure of the surface areas and their temperatures acting on an object located in the space confined by these surfaces. As per ASHRAE literature (Figure 12 on page 8.17 of the ASHARE Fundamental Handbook), comfort is achieved by raising either the ambient temperature or the MRT of an environment. A high MRT means that we feel comfortable in a space of low ambient temperature and vise versa.



A large area at a mild surface temperature, such as a warm floor, is capable of emitting as much heat as a small surface area at high surface temperature, such as a baseboard radiator. Following these principles, a properly designed radiant floor heating system provides this invisible radiant heat effectively.

The transfer of radiant heat energy is dependent on two factors:

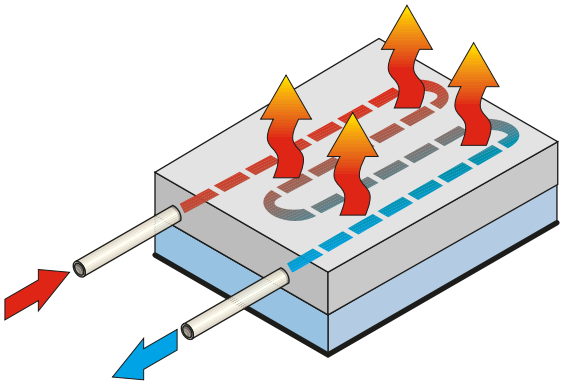
1. the temperature differential between surfaces, and
2. the area of these surfaces.

Radiant Floor Heating Primer

Radiant floor heating is not new; the Romans were using radiant floor heating in 670 A.D. The principle was simple— warm water, circulated in tubes embedded in the floor, conducts heat to the floor surface from which radiant energy waves are emitted. That principle remains unchanged nearly 2000 years later. Today, radiant floor heating is the most popular form of heating for comfort in Europe. People in North America and the rest of the world are coming to appreciate its many benefits.

Most radiant floor heating systems use water which is preferably treated to improve its resistance to freezing or corrosion of ferrous system components. When used with other antifreeze agents, such as propylene glycol and ethylene glycol, the radiant floor heating system provides an effective solution to ice and snow melting applications.

Independent radiant heat zones are best achieved by the use of thermostats and distribution manifolds with zone control valves distributing a controlled quantity of warm fluid to each individual circuit of piping within each zone. A zone is a floor area controlled by one thermostat and served by a manifold that distributes the controlled flow of warm fluid, via a signaled mechanism, to the individual circuits of piping within a zone. A more advanced system would have injection mixing valves or loops to better regulate temperature in each zone, and outdoor resets to cater for sudden variations in weather.



A radiant floor heating system is a closed loop system since the same fluid is heated, circulated and reheated through a piping loop, as opposed to open loop system to which fresh fluid with all of its associated gas and dissolved solids is constantly introduced. A domestic water application is an obvious example of an open loop system.

Temperature Recommendations

Floor surface temperatures be limited to:

- 85°F for prolonged foot contact areas
- 90°F for less traffic areas

Supply fluid temperatures to piping be limited to:

- 140°F embedded in a concrete or gypsum based thermal mass
- 160°F mounted underside of a wood subfloor
- 180°F suspended beneath a wood subfloor; a minimum of 1" spacing should be kept between the piping and the wood subfloor or joists.

Heat Link® Canada
Manufactured & Distributed by HeatLink Group Inc.
Head Office:
4603E - 13th Street NE
Calgary, AB, T2E 6M3
Toll Free: 1-800-661-5332 Phone: (403) 250-3432
Fax: 1-866-450-1155
Mississauga Office:
1555 Bonhill Road, Unit #7
Mississauga, ON, L5T 1Y5
Toll Free: 1-800-661-5332 Phone: (905) 795-8289
Fax: 1-866-450-1155

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