“Fast radiant” demystified

Understanding high mass radiant, low mass radiant, and the importance of conductivity.

Warmboard is a simple concept which maximizes the speed at which heat is delivered under all circumstances. One of the most significant benefits of Warmboard is its ability to adjust to temperature changes quickly and keep a conditioned space at the desired temperature. We call this “fast radiant”, because unlike competing radiant solutions, Warmboard reacts faster. This unique benefit is a result of Warmboard’s low mass and superior conductivity.

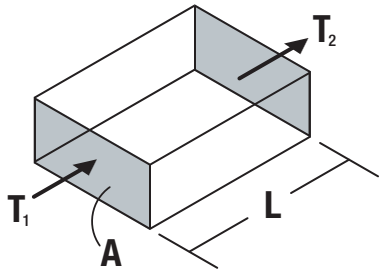
A radiant panel has a very simple function to perform; to conduct heat from warm water in a tube to the surface of your floor. Warmboard performs this simple function so well because:

- Our unique aluminum lined channels make excellent contact with the tubing
- That same aluminum is highly conductive and covers the entire floor surface
- Finish floors are in direct contact with the aluminium
- The total mass of the floor assembly is very low

How It Works

Warmboard-S weighs 3.1 lbs per square foot. Because it’s the structural subfloor, there’s no additional mass added in framing or construction. A thin-pour of $1^{1}/_{2}$" weighs 14.5 lbs, and because this is installed above a subfloor, we add 2.5 lbs per square foot for a $^{3}/_{4}$" plywood subfloor. Assuming the same finished flooring materials are used, Warmboard-S is 3.1 lbs per square foot and has 5.5x less mass than thin-pour’s 17 lb assembly. Heating less mass takes less time and with all things being equal, Warmboard-S will react 5.5x faster.

But, things are not equal. Warmboard’s conductivity also contributes to our fast delivery of heat. To understand this, let’s look at the basic equation for heat flow:



$$F = \frac{\triangle TKA}{L}$$

Heat flow (F) equals the difference in temperature, or delta T (ΔT) multiplied by the Coefficient of Conductivity (K) multiplied by the cross sectional area (A) divided by the length (L) over which heat must flow.

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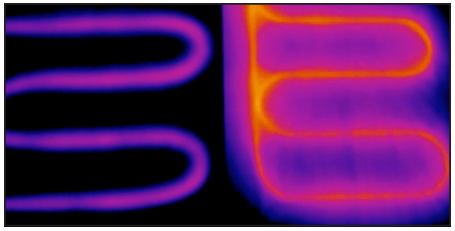
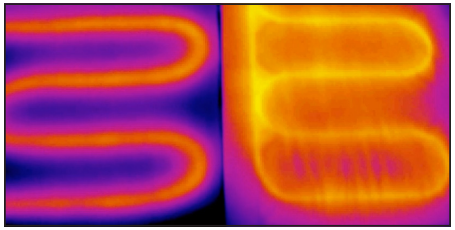
Comparing thin-pour to Warmboard-S in this equation, ΔT remains constant and L (tube spacing) is 12". K is 360 times greater for Warmboard (aluminum compared to a gypsum-based thin pour) and A is 60 times lower for Warmboard-S (.025" of aluminum to $1^{1}/_{2}$" of gypsum based thin pour.) Based on these facts, Warmboard-S will have heat flow 6 times faster than traditional thin pour systems. If you were to change the thin pour tubing spacing to a very tight 6", our heat flow is still 3 times greater. Greater heat flow equates to faster radiant heat.

A structure's heat loss, starting point temperature, system water temperature, occupancy rate, and much more, significantly affect any heating system's ability to respond. But when these two floor assemblies are compared side-by-side, Warmboard's superiority for heat transfer is clearly evident. Based on the science, Warmboard can deliver at a rate 5-10x faster than traditional thin-pour systems.

For the homeowner, this means floors become noticeably warm within minutes. Ambient air temperature in most cases can increase from 2-5°F per hour when the need arises. The important features of low mass and high conductivity combine to make Warmboard-S, and Warmboard-R, among the fastest radiant systems available.



After 30 minutes, gypsum concrete is producing zero BTUs/sf, while Warmboard is already producing 10 BTUs/sf.



After 2.5 hours, gypsum concrete is producing 10 BTUs/sf, while Warmboard is producing 18 BTUs/sf, with more even surface temperatures. The variation in temperature across the surface of Warmboard is only 2+°F while gypsum concrete has 6°F of variation.