Subject: AirFloor™ Downward Losses in an Unconditioned, Well-Ventilated Space

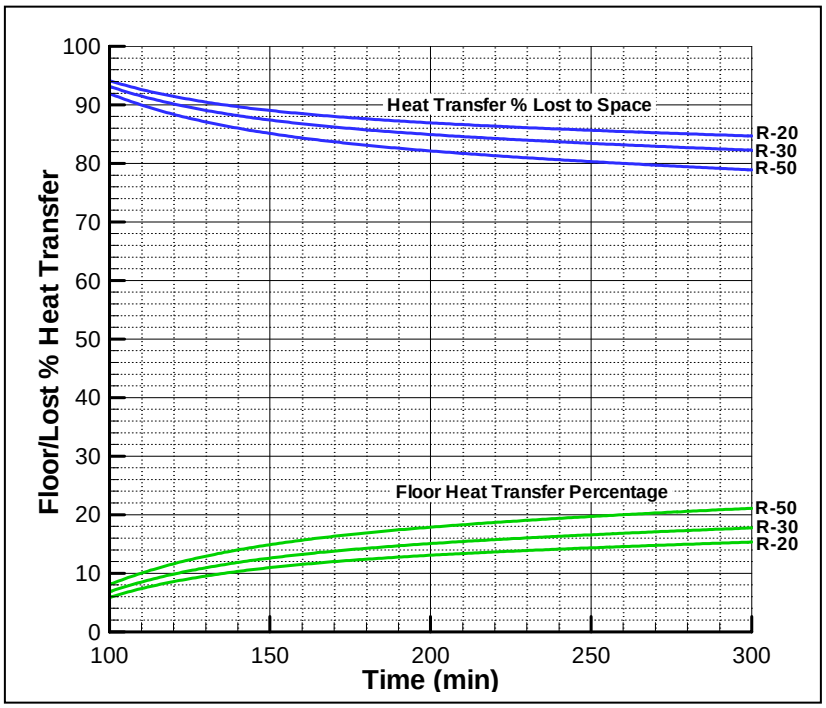
Jerry:

Following is a graph that I developed for the case with the parking lot below the airfloor system. I modeled the parking lot as cold (-20°F), and the structure as concrete with *R*-30 insulation between the concrete and the AirFloor™ system.

This took a little longer than I thought it would since the results are significantly different than I thought they would. Hence, I completed the calculations in several ways, but always came up with the same result (not to worry, you aren't getting charged because my intuition was so far off on this one).

I completed the calculations for three different *R*-values. These were *R*-20, 30, and 50. The top set of curves in the figure shows the percentage of the heat energy that is lost to the parking area below the AirFloor™ system. As you can see, these percentages are significantly higher than I estimated last week. Even with *R*-50 insulation, about 80% of the heat energy is lost to the ambient below the system!

Why is this? First, the temperature differential between the system and the ambient is substantially larger than the temperature differential between the system and the room. Hence, there is a larger "driving force" for heat to transfer to the ambient than to the room. The second, and probably more important point, is that the space below the system cannot "charge" as the ground would charge throughout the heating season. Hence, the system must always continue to heat very cold air.



The downward loss amounts to 8.4 Btu/hr-ft^2. You may want to add a little safety factor into the size of the heating system if the area below the AirFloor™ system is very well ventilated. If it is not as well ventilated (i.e., is somewhat enclosed such that it can trap some of the heat energy, then the 8.4 Btu/hr-ft^2 is probably a safe number for sizing purposes.

In my opinion, any type of floor heating system would experience the same magnitude of loss. In the case of the AirFloor™ system, the losses are somewhat overcome by the warm air exiting the register into the room.

Take care,
Kirby Chapman
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