Ten things to know about radiant cooling systems

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Key Concerns in Radiant Cooling

- Reduce the cooling loads first.
- Concentrate on the building envelope to reduce the effect of outdoor climate fluctuations
- The key space temperature design concept used in radiant cooling is resultant temperature at which the human body would feel—a combination of ambient radiant temperatures, air temperature and relative humidity.

Editor's Note: *Geoff McDonell is the author of a three-part series, "Selecting radiant ceiling cooling and heating systems," appearing online at www.csemag.com in the "Green" community. We asked McDonell to provide us, based on his article, with a quick list of ten things to know about radiant cooling systems. Readers are encouraged to read the complete article, the first part of which has already been posted with two more parts to come.*

Here is my list of the ten most important points to remember when specifying ceiling radiant cooling systems.

1. Reduce cooling loads first. One must reduce or eliminate solar load transients depending on the radiant system being used (high mass/medium mass/low mass).

2. Insure the design team buys into the system. A building HVAC system engineer's job must start by working with the building design team to minimize thermal loads in the occupied space first, in order to minimize the building climate control requirements.

3. Radiant ceilings are efficient. Radiant systems can essentially separate the space sensible temperature control function from the ventilation function to arrive at an energy efficient system. Once the space sensible temperature is taken care of by the radiant cooling system, the air system only needs to be a fresh air (100% outdoor air) delivery system, with latent (humidity) control, with no specific room temperature control function.

4. Use high thermal performance windows to reduce mean radiant asymmetry.

5. Maximize the radiant surface to maximize the radiant cooling fluid temperature. Radiant systems are based on providing surface areas (radiant emitters) that are controlled to a certain surface temperature to provide radiant heat exchange to our bodies. The more radiant surface area to work with, the less extreme the radiant surface temperatures have to be, to provide the necessary heat exchange for comfort control.

The concept is to maximize the radiant surface area of the room to use the whole ceiling, wall, or both, to provide a large radiant surface operating at very small temperature differences to the occupied space.

6. Design and select a control system appropriate for the thermal mass and response time of the radiant system used.

7. Control the ambient humidity. This means that in humid climates, the indoor ambient relative humidity must be controlled, and in dryer climates, more radiant cooling capacity may be found by using lower radiant cooling water temperatures.

Radiant systems can separate spaces sensible temperature control function from ventilation function for energy efficiency.

8. Don't forget the ventilation component of human comfort and to provide make-up air. The key to finding energy efficiency in any HVAC system is to first concentrate on the building envelope to reduce the outdoor climate fluctuations, and then find the most energy efficient methods of transporting heating and cooling energy around a building for human comfort.

9. Insure the building operator knows how to operate the radiant cooling system.

10. Insure the architect commissions the building envelope with a blower door test.