

# Surface Temperature

Surface temperature or radiant heat is the infrared energy emitted by surfaces warmer than the surroundings. Many human physiology studies in the past have determined that human comfort results from three fundamental factors:

- Up to 50% radiant heat exchange
- 40% convection/air movement/air temperature
- 10%-20% humidity/perspiration

In order to provide a total comfort system in your ideal home or office, you need some kind of radiant heating and cooling system, an air moving ventilation system and some form of room humidity control system.

(See Thermal Comfort – Relative Humidity and Air Temperature.)

## **Where does radiant heat (or cooling) come from?**

- Surfaces and objects (computers / printers / walls / ceilings / floors / windows)
- Air ventilation systems (inlet and outlet ducts )

## **Why measure surfaces and objects?**

A room occupant's comfort is dependent on temperature, humidity and air movement. (See the "Thermal Comfort (Relative Humidity (RH) and Temperature" section for more information.) An occupant's comfort is also influenced by radiant heat coming from surfaces and objects, which might not be included in the ambient air temperature measurement.

Cold spots on surfaces can also become an area for condensation of moisture. (Think of a cold drink on a hot humid day.) If enough moisture collects in an area, mold may grow.

Looking for hot spots or cold spots on a wall or ceiling may be an indicator of heat source or cooling source that warrant additional investigation. A hot or cold ceiling may indicate the lack of insulation. The addition of insulation may improve the comfort level and decrease the cost of heating and cooling a space.

## **How do I make infrared measurements?**

The infrared thermometer uses a lens to focus the infrared (IR) energy on a detector in the instrument. The detector compensates for ambient temperature variation and displays the surface temperature of the object or surface. The user can quickly obtain the temperature of a surface without coming in contact with the surface. A device that will measure surface temperatures is called an infrared thermometer. (Google "infrared thermometers")

Factors that impact on your measurement are 1) Distance to Spot Ratio, and 2) Emissivity. More expensive infrared thermometers can compensate for differences in emissivity.

Distance to Spot Ratio: You want to be aware of the Distance : Spot ratio of the instrument. The temperature reading you get on the instrument is an average temperature of the detected region. The detected region is dependant on the distance of the instrument from the surface you want to measure.

Emissivity: The instrument is designed to read surface temperatures from most organic or painted surfaces. If the surface is metal or shiny, you will get inaccurate readings. If you need to get a reading from a metal or shiny surface, you can tape a thin black paper to the surface and take a reading from that surface after a couple of hours.

You will want to consider seasonal changes and make measurements during different seasons of the year.

### **What are normal levels that I might find?**

Outside walls and ceilings on top floors will generally be impacted by the temperature outside, depending on insulation in the walls and circulation of air in the room. Objects in the room like computers will give off heat.

### **What are standards or guidelines for infrared thermometer measurements?**

There are no standards or guidelines for infrared thermometer measurements.

With the infrared thermometer you are looking for areas or surfaces with temperatures different from the air temperature (higher or lower). These temperature differences may lead to further investigations that could identify some issues to work on. The differences could also identify some potential problem spots in the future.