

# Thermal Comfort (Relative Humidity (RH) and Air Temperature)

Thermal comfort is determined by the room's temperature, humidity and air speed. There are many additional factors such as activity level, clothing, age, gender and health status that affect your comfort. Radiant heat (hot surfaces) or radiant heat loss (cold surfaces) are also important factors for thermal comfort.

Relative humidity (RH) is a measure of the moisture in the air, compared to the potential saturation level. Warmer air can hold more moisture. When you approach 100% humidity, the air moisture condenses – this is called the dew point.

Air temperature is a measure of the heat. Most thermometers are measuring ambient air heat. However, radiant heat loss or gain is also important. Radiant heat may not be reflected in the air temperature, but is the impact of cold or hot objects in the area. Radiant heat can be measured with a surface thermometer, which will be discussed separately.

(See also ventilation or air movement and surface temperature.)

## **Where does relative humidity and temperature come from?**

The temperature in a building is based on the outside temperature and sun loading plus whatever heating or cooling is added by the HVAC or other heating and cooling sources. Room occupants also add heat to the room since the normal body temperature is much higher than the room temperature.

The relative humidity is based on the outside humidity plus whatever heating or cooling is added by the HVAC or other heating or cooling sources. Room occupants also add considerable moisture to the room through exhaled air which is at 100% relative humidity.

Since relative humidity depends on temperature. Relative humidity of cold air from the outside decreases as it is warmed up. Refrigerated air conditioning often removes moisture from the air as it is cooled. Evaporative air conditioning adds moisture to the air.

## **Why measure relative humidity (RH) and temperature?**

Thermal discomfort is a common complaint of building occupants. There are individual differences in preferences for thermal comfort, so it may not be possible to achieve an acceptable comfort level for all occupants. At higher temperatures increased evaporation rates of chemicals and water in the room will increase chemical gases and water vapor in the air.

At higher relative humidity (RH) levels (more than 60%) can encourage the growth of mold and mildew. Dust mites, bacteria, and fungi all thrive under moist, humid conditions. At lower relative humidity (RH) (less than 30%), occupants might experience eye irritation or a stuffy nose. For some individuals low relative humidity (RH) may aggravate allergies. Low relative humidity can also lead to increased survival of some viruses, thereby increasing the spread of viral infections.

### **How do I measure relative humidity and temperature ?**

There are a variety of meters for measuring relative humidity and temperature. (Google “temperature and relative humidity measurements”) Meters can also usually be found in a department store or a hardware store.

You may want to consider recommending a “Wall Plate Thermometer Model 22101” for bathrooms and kitchens. This Wall Plate Thermometer gives the resident a constant RH reading.

The temperature and relative humidity can vary considerably around the room. If you make one measurements at one location in a room, be aware that this measurement is just a “sample” for the room. Occupants sitting near a heat source may be experiencing considerably different conditions. The temperature and relative humidity can vary considerably throughout the day, so you might consider taking measurements over a 24 hour or even a one-week period.

### **What are some normal levels of relative humidity (RH) and temperature for indoor air?**

The normal levels of relative humidity and temperature for indoor air will vary widely from region (climate) to region (climate). Individuals can also vary widely as to what they find acceptable.

### **What standards are there for relative humidity (RH) and temperature?**

There are no EPA standards.

The American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc (ASHRAE) provides guidelines that are intended to satisfy the majority of building occupants wearing a normal amount of clothing while working at a desk. The ASHRAE guidelines recommend 68 F to 74 F in the winter and 72 F to 80 F in the summer. The ASHRAE guidelines recommend a relative humidity (RH) of 30 to 60 percent.