

Humidity and the Indoor Environment

Humidity

Humidity is simply vaporized water in the air. Your breath contains hundreds of droplets of invisible water vapor. You can see them when you breathe on a pair of cold glasses.

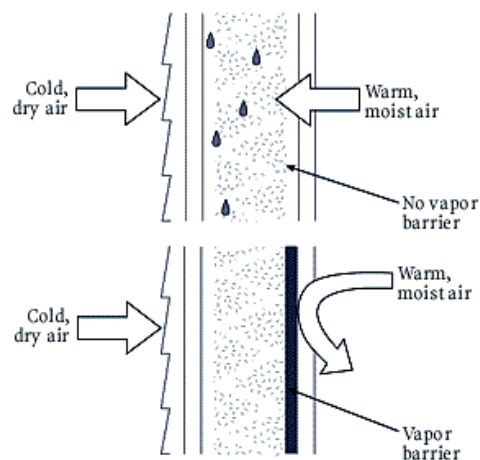
The term most often used to define the amount of water vapor in the air is "relative humidity." Relative humidity is the percentage of water vapor in the air at a specific temperature, compared to the amount of water vapor the air is capable of holding at that temperature. Warm air holds more water vapor than cold air. When air at a certain temperature contains all the water vapor it can hold at that temperature, its relative humidity is 100 percent. If it contains only half the water vapor it is capable of holding at that temperature, the relative humidity is 50 percent.

When air is saturated with water vapor, it has reached the dew point; at this point, water vapor condenses and produces visible water or "condensation." In winter it usually occurs first on windows. When warm, moist air comes in contact with a cold window, air temperature drops and it can no longer hold the water vapor; condensation results.

Desirable Humidity Levels

The human body is comfortable when relative humidity ranges between 20 and 60 percent. In your home, an average relative humidity of 35 to 40 percent is appropriate when the outside temperature is 20°F or above. As outdoor temperatures fall, condensation problems inside may develop.

The construction of a home also influences how much humidity is desirable. Tightly constructed buildings with properly installed vapor barriers and tight fitting doors and windows retain more heat and moisture. This is where mechanical ventilation becomes important.



A vapor barrier protects walls from condensation.

The following table shows recommended indoor humidity levels in relation to outdoor temperatures.

Outside temperature (0°F)	Recommended relative humidity
+20° and above	35% to 40%
+10°	30%
0°	25%
-10°	20%
-20°	15%

How to Gauge Indoor Humidity

- Drop three ice cubes into a glass, add water and stir. Wait three minutes. If moisture does not form on the outside of the glass, the air is too dry; you may need a humidifier. (Do not perform this test in the kitchen, because cooking vapors may produce inaccurate results.)
- Frequent fogging of windows may indicate too much humidity. The appropriate relative humidity will allow only slight condensation along the lower edges or corners of windows. More condensation could be damaging.
- Moisture buildup or mold on closet walls or room ceilings and walls indicates high humidity.

High humidity

High humidity levels produce constantly fogged windows, musty odor and/or a clammy feel to the air. During cold weather, condensation in the lower corners and edges on prime (inside) windows is common.

If you maintain high humidity, expect to have more window condensation. Excessive humidity can be temporary. During summer, outdoor humidity is high; your house and its furnishings naturally absorb some water vapor. In fall, when temperatures drop and the air becomes drier, this water vapor is released into the living space and condensation on windows may occur. The situation normally subsides within a short time.

Often the principal source of higher humidity in a home is your family's living habits.

- One person's breathing produces 1/4 cup of water per hour.
- Cooking for a family of four produces approximately five pints of water in 24 hours.
- Showering puts 1/2 pint of water into the air.
- Bathing puts 1/8 pint of water into the air.

Adding only four to six pints of water to the air raises the relative humidity in a 1,000 square foot home from 15 to 60 percent, assuming the temperature is constant.

Try these steps to lower humidity in your home

- Turn down or stop using humidifier.
- Use range and bathroom exhaust fans while cooking and bathing or open a window for a few minutes to bring in cool, drier air.
- Cook with pans covered.
- Take shorter showers with cooler water.
- Install a fresh air intake duct. Outside air introduced into the home lowers the humidity level.
- Reduce the number of plants in your home or water them less; they release water vapor into the environment.
- Vent clothes dryer to the outside.
- In tightly insulated homes, consider installing an air-to-air heat exchanger.

Air changes

Air infiltration rates for homes vary with the amount of weatherization, construction materials, workmanship, temperature, wind, and activities of the occupants. Infiltration rates are measured in air changes per hour (ACH), the number of times each hour that indoor air is replaced by outside air. Rates differ from house to house and from day to day. Generally, older homes have an average of one to two ACH. Tight, new homes which are sealed may replace air only once every two hours or more (or .5 ACH).

Be aware of these signals which may indicate poor indoor air quality:

- "stuffiness"
- mold or mildew
- heavy condensation or frost on windows
- frequent head or chest colds
- a musty smell or lingering odors

How to Improve the Indoor Environment

There are many ways to add ventilation or filter the air to improve the indoor environment.

- **Windows**
When heating and cooling requirements are low, open windows to provide ventilation and reduce moisture and odors caused by cooking and bathing.
- **Spot ventilation**
Local or spot ventilation helps reduce the amount of pollutants emitted and prevents their movement to the rest of your house. For example, a range hood directs steam and cooking vapors to the outside.
- **Air-to-air heat exchanger**
An air-to-air heat exchanger mechanically ventilates and dehumidifies homes in colder climates. During the winter it transfers heat from the air being exhausted, to the fresh, outside air entering the home. Fifty to eighty percent of the heat normally lost in exhausted air is returned to the house. Air-to-air heat exchangers can be installed as part of a central heating and cooling system and should be checked to determine if they are properly working.

