

No matter where you live, whether it is in a warm or a cold climate, every home has moisture-laden air within it which can be related to a humidity level or percentage. All building owners, residential or commercial, should understand the humidity levels and make it a priority to control and manage these levels for the longevity of the building and the health and wellness of the occupants.

Humidity by definition is the concentration of water vapor present in the air. When we think of our homes and the humidity within them, we can specifically talk about this as relative humidity. In other words, humidity is relative to the temperature within the home because the air can hold more water vapor at warmer temperatures than at colder temperatures. This is an important point to understand because keeping the home at the optimum humidity level during the summer months is different than maintaining the correct level during the winter months.

Understanding the air temperature inside or outside of the home will help you determine how much water vapor the air can hold. Because heavy moisture-laden air will condense on a cold surface, the topic of humidity and the resulting condensation that will form on cold surfaces during the winter months is the item that we will cover in this bulletin.

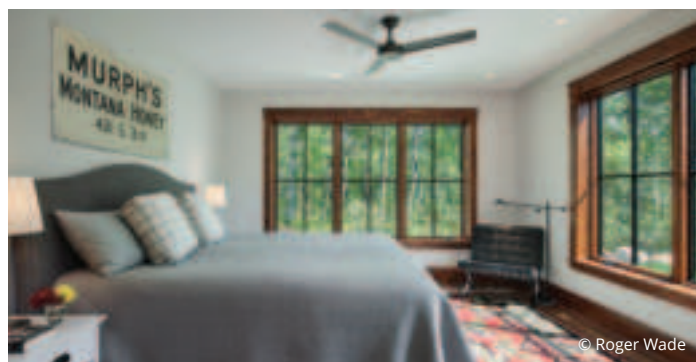
### WHAT CAUSES CONDENSATION ON WINDOWS IN YOUR HOME

When warm moisture laden air comes into contact with a cooler surface such as an exterior wall, concrete surface, or window, the water vapor in the air will begin to condense. This is because the air hitting the colder object is cooled to the point of not being able to hold as much moisture as its warmer surroundings.

At this point you may be asking about the window's quality or performance. Condensation is actually a sign that your windows are performing as they should be by holding the heat within the home. The condensation that forms on a piece of window glass is similar to an example of the effect that is seen on a glass of ice water where the cold-water temperature is transferred through the glass surface and encounters warm moisture laden air. The moisture in the air condenses on the glass in the form of condensation. In essence, condensation can show up under winter (cold) or summer (warm) conditions. If the humidity level inside (during winter months) or outside (during summer months) is at the "correct" level in relationship to glass surface temperature, moisture can and will form on the glass. Often in a wintertime setting, the condensation can be seen as a warning sign that the home's humidity levels are too high, and it could mean that the high levels of indoor humidity may also be doing damage to other parts of your home.

### WHERE DOES MOISTURE COME FROM INSIDE THE HOME

Interestingly enough we sometimes hear that a customer had replaced their old windows with new energy-efficient ones and now find themselves with condensation on the new units where there was none on the previous units. The reason behind this is often simple in nature. The effects of energy efficiency, weatherstripping, caulking, and a tighter installation are all aimed at trapping heated air indoors and reducing the infiltration of cold outside air. The effect is that the warm moist air is now trapped inside, and outside air is not introduced to reduce the humidity level. Remember warm air can carry more moisture.



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In searching for moisture-creating sources within the home, we have listed a number of items that should be considered and investigated.

- Look for leaks and seepage in the home that may be adding additional moisture. Preventative measures here may be as simple as new landscaping or gutters to draw the water away from the foundation.
- Put plastic covers over dirt in crawl spaces to prevent moisture escaping from the ground into the home.
- Seal basement walls. Porous basement walls are another possible moisture source.
- Reduce water vapor generation. Considerable water moisture is expended into the air through:
  - Showers
  - Cooking and dish washing
  - Houseplants
  - Large groups of people
  - Storing firewood inside
  - Humidifiers
  - Carpeting on concrete floors without vapor barriers

# A Homeowner's Guide to Understanding Humidity and Condensation

## HOW TO MEASURE THE RELATIVE HUMIDITY IN YOUR HOME

As we already mentioned, relative humidity is a measurement of the amount of moisture vapor in the home compared to how much moisture the air can hold at a given temperature. When air is at a certain temperature and it contains all the vapor it can hold, it is said to have a relative humidity of 100%. This percentage will then fluctuate as the temperature changes. Based on these facts, most thermostats (for home heating systems) are equipped with humidity settings that can generically regulate the humidity in a home. Additionally, there are numerous low-cost relative humidity gauges that can be purchased and placed throughout the home to help determine the humidity levels in each room.

Please be aware that the temperature and relative humidity can vary considerably around or within the room. If you take only one measurement 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.

By having independent humidity gauges throughout the home, you may be able to determine where you are experiencing less air flow to move moisture laden air thereby allowing the air to accumulate higher moisture levels based on its static environment.

## WAYS TO CONTROL MOISTURE IN YOUR HOME

Concentrating on the sources of moisture is the best way to help manage the moisture in the home. As outdoor temperatures rise and fall, you must be aware of how this can affect the daily levels of moisture in the home.

- Ensure that your home and especially large expanses of glass, bay, or bow windows are well ventilated. Air flow throughout the home or areas where condensation is most likely to form is very important and needed. A wash of air movement across these surfaces will help prevent the accumulation of moisture vapor on the cooler surfaces.
- Use exhaust fans in bathrooms and kitchens to vent moisture to the exterior of the home. Use this same thought to make sure your cloths dryer is vented to the exterior of the home. This includes using ceiling fans as a great source for the potential benefit of air movement.
- If you have casement style windows, the removal of the screens during the winter months will help add additional air flow across the surface of the glass.
- Open curtains and blinds. Keeping these closed will prevent air flow and increase the likely hood of trapping moisture between them and the glass surface which could result in unneeded condensation.
- Adjust the output of your furnace or separate humidification system. This should be reviewed continuously as the outdoor temperature changes. A lower in-home humidity level is required as the temperature on the exterior of the home drops.
- If you have a forced air heating system, make sure your system is installed with a fresh air intake. Optionally, an air-to-air heat exchanger system can produce the same desired results.
- If you have just had the home built, building materials like concrete, wood, drywall, and plaster will have their moisture drawn out as you activate the heating or air conditioning system in the home. These materials are a significant source of moisture in newly constructed homes. All efforts should be taken to decrease this moisture during the building process by bringing the cooling or heating system online as soon as possible. These products will automatically increase the moisture vapor in the home and will likely last through the first heating season in the home. After this point, and at the beginning of a heating season a certain amount of temporary condensation may be seen as your home rids itself of the humidity that it absorbed during humid summer months.

## RECOMMENDED RELATIVE HUMIDITY

The following chart recommends the in-home relative humidity percentage based on the listed outside temperatures and an inside temperature of seventy (70) degrees.

| RECOMMENDED INDOOR RELATIVE HUMIDITY |                                 |
|--------------------------------------|---------------------------------|
| Outdoor Air Temperature              | Indoor Relative Humidity (% RH) |
| +20° F                               | 35%                             |
| 10° F                                | 30%                             |
| 0° F                                 | 25%                             |
| -10° F                               | 20%                             |
| -20° F                               | 15%                             |

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### CLEANING CONDENSATION FROM YOUR WINDOWS

The occurrence of window condensation for a prolonged period can cause problems for both your home and the people living in it. For example, excess water can cause window seals to warp and loosen, while the excess dampness can lead to the appearance of mold.

Because of this, we recommend that you make a habit of removing window condensation the first thing every morning. This is usually the point in time where the window or door has been exposed to a length of time of lower attention and outside temperatures have generally had the chance to drop to their lowest levels, thereby lowering the surface temperature of the glass. Use an absorbent paper towel or microfiber cloth to gently scoop and wipe the water off the surface of your windows. Use a fresh towel to dry the pane thoroughly afterwards. Keeping the perimeter of the sash dry will prevent damage to the sash, its finish, and the wood.

### TIMELINESS OF PAINTING OR STAINING THE INTERIOR OF YOUR PRODUCTS

The timeliness of the painting and or staining (finishing) of wood is very important. After a unit is installed and has been exposed to the weather and/or interior humidity, it can be difficult to dry the wood sufficiently for good finish adhesion or damage may have already taken place. Unfinished wood surfaces may discolor, deteriorate, swell, and may bow and split. Kolbe recommends that exposed interior or exterior wood be finish-coated immediately but no more than 90 days after receipt to control moisture gain and movement which can cause aesthetic and operational problems.



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### Sources

In creating this bulletin, and to provide you with accurate information, we have based our information on the following sources:

Article: *Do you have too much moisture in your home?*  
University of Minnesota Extension

Article: *Dealing with and preventing mold in your home.*  
University of Minnesota Extension

Article: *Understanding Indoor Condensation in Your Home.*  
FGIA – Fenestration & Glazing Industry Alliance

Article: *What are the main ways to control moisture in your home?*  
Reference to relative humidity chart.  
Environmental Protection Agency (EPA) [www.epa.gov](http://www.epa.gov)

Relative Humidity Chart:  
The American Society of Heating and Air Conditioning Engineers (ASHRAE)