Relative Humidity Defined

Aprilaire explains how relative humidity affects indoor comfort.

Humidity is one of the most important aspects of total indoor comfort, yet it's one of the least understood.

Maybe this is because we associate humidity with hot, muggy summer days, when we cool and dehumidify our homes to achieve comfort. Rarely do we think about how humidity affects our comfort during the winter.

Humidifying your indoor air—to increase relative humidity levels—is as beneficial to your family's comfort and health as heating your home.

Relative Humidity Defined.

Relative humidity (RH) indicates the amount of water vapor (percent) that's actually in the air compared to the maximum amount that the air could hold under the same conditions. The warmer the air, the more moisture it can hold.

> *Example: Air in a home heated to 70°F can hold about eight grains of moisture per cubic foot. That's 100% RH. If there are only two grains per cubic foot in the home, this is 1/4 of the air's capacity to hold moisture. Therefore, the RH is 25%. The air could hold four times as much water.*

How Relative Humidity Relates to Indoor Comfort.

The importance of RH as it relates to your indoor comfort comes into play when your air is heated. During the cold winter months, outdoor air is brought into your home and heated. The outdoor to indoor RH levels can drop dramatically if your home is un-humidified or under-humidified.

> *Example: If the outdoor RH is 70% and outdoor temperature is 10°F, when this air is brought into the home and heated to 70°F, the indoor RH drops to 6%. To put this in perspective, the Sahara Desert averages 23% humidity!*

The chart below further illustrates what happens to air when it's heated.

OUTDOOR-INDOOR RELATIVE HUMIDITY CONVERSION CHART

(Figures in chart are percentages)

Outdoor Relative Humidity	-20°	-10°	-5°	0°	+5°	+10°	+15°	+20°	+25°	+30°	+35°	+40°	+45°	+50°
100%	2	4	5	6	7	9	12	17	19	23	29	36	43	52
95%	2	3	4	6	7	9	12	16	17	22	28	34	41	50
90%	2	3	4	5	6	8	11	15	16	21	26	31	39	48
85%	2	3	4	5	6	8	11	14	15	20	24	29	37	45
80%	2	3	4	5	6	7	10	13	15	19	23	27	35	42
75%	2	3	4	4	5	7	10	12	14	18	22	26	33	39
70%	1	2	3	4	5	**6**	9	11	13	17	20	24	31	36
65%	1	2	3	4	4	5	8	10	12	15	19	23	29	34
60%	1	2	3	3	4	5	7	9	11	14	17	21	26	31
55%	1	1	3	3	4	4	7	8	10	13	16	19	24	29
50%	1	1	2	3	3	4	6	8	9	12	14	18	22	26
45%	1	1	2	3	3	4	6	7	8	11	13	16	20	24
40%	1	1	2	2	3	4	5	7	7	10	12	14	18	21
35%	1	1	2	2	2	4	5	6	6	9	10	12	15	18
30%	0	1	2	2	2	3	4	5	6	7	9	11	13	15
25%	0	1	1	1	2	3	3	4	5	5	7	9	11	13
20%	0	1	1	1	2	2	3	3	4	5	5	7	9	10
15%	0	0	1	1	1	1	2	3	3	4	4	5	6	8
10%	0	0	0	1	1	1	2	2	2	3	3	3	4	6
5%	0	0	0	0	0	0	1	1	1	2	2	2	3	3
0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Outdoor Temperature

Example: (See shaded figures.) Outdoor RH is 70%; outdoor temperature is +10°F; when this air is brought into the home and heated to 70°F, the indoor RH drops to 6%.

When RH levels fall below recommended levels, the resulting dry air can lead to problems for you and your family, including:

- **Health problems:** Dry air can aggravate asthma and allergies, promote sinus infections and speed the progression and transmission of cold and flu viruses in the air.
- **Discomfort:** Dry air can make you feel too cool at normal temperature settings. Because of the air's low RH level, it can hold more water. So, it absorbs moisture from everything else, including your skin. As the dry air evaporates this moisture from your skin, you feel cooler.

  Dry air also causes painful, and sometimes damaging, static shocks.
- **Home damage:** The addition or reduction of moisture in the air drastically affects the qualities, dimensions and weights of many materials, especially wood. As the RH changes with the weather, wood absorbs and releases water. If optimum RH isn't maintained, damage to wood floors, trim and furniture can occur.
- **Energy inefficiency:** As dry air evaporates moisture from your skin, you feel cooler and you turn up the heat. This increases your energy bills. Dry air also shrinks the framing around doors and windows, resulting in gaps that let in cold air from the outside. This makes your home less energy efficient.

Maintaining proper indoor RH levels can help you prevent these problems.

What Indoor Relative Humidity Level is Correct?

Some humidity conditions may be ideal for comfort but less than ideal for other reasons. For example, an indoor RH of 60% may be comfortable for your family, but it can result in damage to your home's structure and your belongings. Fogging of windows usually indicates RH is too high.

The table below shows the recommended indoor RH, based on outdoor temperature, that will help you achieve maximum comfort without causing damage to your home.

Recommended Indoor Humidity Levels

Outdoor Temperature (Degrees Fahrenheit)	Recommended Humidity (%)
+40°	45%
+30°	40%
+20°	35%
+10°	30%
0°	25%
-10°	20%
-20°	15%

As outdoor temperature constantly changes, maintaining proper RH can be challenging with a manual humidifier control.

Only Aprilaire Offers Fully Automatic Digital Humidifier Control.

The Aprilaire Automatic Digital Humidifier Control takes the guesswork out of maintaining the correct RH. This revolutionary system monitors the outdoor temperature and automatically adjusts the humidifier to ensure you always have optimum indoor relative humidity.

Aprilaire offers both evaporative and steam Whole-Home Humidifiers that meet your family's needs and are suitable for your home. Locate a dealer at Aprilaire.com to learn how you can achieve Total Comfort in your home today.

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