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Eagle's Eye on Housing:
Dew Point and Humidity

Building sciences as presented in the Better Builders Series help explain these terms but don't answer all of the questions posed to us. For example, how much moisture is in the air?

First, the warmer the air, the more moisture it can hold
Second, the dew point is the temperature at which the air is fully saturated and begins to condense
Finally, relative humidity is a measure of the amount of moisture in the air compared to the amount of moisture it could theoretically hold.

Using American Standards, which measure the amount of moisture in the air by weight, the amount of water air can hold at various temperatures is as follows (you'll see why later):

30° C: 30 grams per cubic metre of air
20° C: 17 grams per cubic metre of air
10° C: 9 grams per cubic metre of air

These numbers, which apply to air at sea-level pressure, are the basic physical facts needed to calculate how much moisture is in the air.

Now, let's use these building science principles together.
Imagine a hot humid summer day. At 3 p.m., you measure the air's temperature at 30° C and measure its humidity at 9 grams per cubic metre of air. What would happen as this air cools to 10 ° C, with the water vapor in the air remaining the same? As it cools to 10 degrees, the air becomes saturated (100% relative humidity); that is, it can't hold any more water vapor than 9 grams per cubic metre. Cool the air even a tiny bit more and its water vapor will begin condensing to form clouds, leaving fog or dew on cool surfaces such as windows, grass or your vehicle. Back at 3 p.m., when we made the measurements, we could say that the air's dew point was 10° C. That is, if this particular air were cooled to 10° C degrees at ground level, its humidity would begin condensing to form dew.

Now for the Relative Humidity Connection: Remember that measurement we took at 3? The air had 9 grams of moisture. We divide that by 30 and multiply by 100 to get a relative humidity percentage of 30 percent. The air is holding 30 percent of its capacity. In other words, the air actually has 30 percent of the water vapor it could hold at its current temperature.

At 9 p.m., the air has cooled to 20° C. We now divide 9 grams by 17 grams (the water the air can hold at 20° C), and multiply by 100 to get a relative humidity of 53 percent. The air is holding 53 percent of its capacity.

At 3 a.m., the air has cooled to 10° C. We divide 9 by 9 and get a relative humidity reading of 100 percent. The air now has all the moisture it can hold! Cool the air any more, as can happen in late summer, and we get fog and dew.

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Using these numbers, we discover that there are 67 pounds of water in a 1000 sq. foot bungalow on a full basement , 100 percent RH at 20° C. 8.34 pounds of water to a gallon means there are 8 gallons of water in the air (about a jug and a half). Assuming your house has five air changes per minute, it means that 40 gallons of water are moving in and out of the building envelope every hour.

Does this reinforce the need to control air flows in our house?

Another fun fact: If we took all the airborne moisture from a room measuring 10' x 10' x 10' (1000 cubic feet), we could fill a 12-ounce glass! (50 percent RH at 26° C).