



## Maintaining a Moisture Balance in Homes in Winter

In cold climates it is important to maintain a healthy moisture balance in homes. A good goal is **70 °F and an RH of 30-40%**. Risks of mold and moisture problems start to accelerate when RH levels are greater than **60%**. Window condensation varies depending on the outdoor and indoor temperatures. There is also a concern about moisture loading of the building if the RH% levels are too high in winter months; so, there needs to be a balance based on climate and enclosure design.

In a 2400 sf, two-story, slab-on-grade home, the difference between a healthy 30% RH and a risky 40+% RH is only about an extra **6-8 pints** of water in the air.

To achieve a healthy moisture balance, it is important to know the range of **potential moisture sources** as well as the **potential moisture removal opportunities**.

**Potential Moisture Sources** (winter time for a typical 2400 sf home):

Potential Moisture Source	Potential Quantity per Day
1. Moisture created by occupants and their activities	<b>+15 to 25 pints per day</b> for an average family of 4, peaking at 50 pints for a heavy wash day
2. Reduction from dry outdoor air via natural air leakage **	<b>-40 to -45 pints per day</b> in a tight home (<3 ACH <sub>50</sub> ) <b>-60 to -80 pints per day</b> in a loose home (>5 ACH <sub>50</sub> )
3. Reduction from dry outdoor air via mechanical ventilation **	<b>-30 to -40 pints per day</b> at 60 CFM of ventilation <b>-60 to -80 pints per day</b> at 120 CFM ventilation
4. Moisture coming inside via vapor diffusion through the building enclosure **	<b>0/negligible pints per day</b> for typical wood frame construction
5. Moisture contained in new building materials	<b>+10 to 20 pints per day</b> , but highly variable depending on time of year of construction. Only of impact in the first year of after construction

\*\* NOTE: the pints per day listed can be considered *worst case conditions* projected over a 24-hour period. The lower number of the range is from the

“design heating day”, or coldest days of the winter; the higher number is from the “design humidity day”, the most humid days of the summer.

The actual amount of moisture flow will vary day-to-day and even hour-by-hour as the outside weather changes. Again, the numbers shown are worst case.

**Moisture Retention/Addition Opportunities** (winter time for a typical 2400 sf home):

Potential Removal Strategies	Potential increase per Day
1. Build tighter homes	<b>+20 to 35 pints per day</b> from 5 to 3 ACH <sub>50</sub> <b>+50 to 70 pints per day</b> from 5 to 1 ACH <sub>50</sub>
2. Use an ERV with proper ventilation rate Power use: 17 pints / kWh	<b>+15 to 20 pints per day</b> at 60 CFM ventilation rate ERVs retain approx. 50% of the moisture difference between inside and outside air. They can reduce the humidification required caused by dry ventilation air
3. Use a properly sized Humidifier	<b>+80 pints per day</b> , if properly sized

**In short:**

- There is a wide variation in the moisture sources in homes each day
- Air leakage and ventilation rates have a large impact on indoor RH% levels
- The difference between healthy and risky is just 6-8 extra pints in the air

**Effective strategies from lower cost to higher cost include:**

1. Don't over-ventilate: measure and adjust flow rates to match required rates.
2. Tight construction provides a control valve on the largest variable – air leakage. There is also a significant energy penalty in leaky homes
3. Educate homeowners about proper operation of HVAC equipment and controlling their own moisture sources.
4. Select humidification equipment with indoor and outdoor sensing to minimize over-humidification and the potential for window condensation
5. Use ERVs for ventilation to reduce energy use and also help maintain a humidity balance in winter-time
6. Recall that it is still important to remove moisture and pollutant sources in kitchens and bathrooms