Condensation control

For many Missouri residents, a winter does not pass without some moisture buildup in the house. The moisture that forms on the inside of windows is called condensation. In some cases, condensation can be short-term, such as during a cold spell where condensation is localized to humid areas of the home such as the kitchen, bathroom and laundry area. In other cases, excessive moisture can condense on walls, windows and other cold surfaces causing paint to peel, wood to rot and mold to grow.

To limit condensation and its damaging effects, you must control three elements: indoor humidity, surface temperatures and moisture migration into walls, attics and crawl spaces.

Indoor humidity control

During the heating season in cold climates, the indoor humidity level should be kept around 35 to 50 percent. High humidity is often the result of too much moisture generated indoors, but exterior sources can also contribute to high indoor humidity. It is possible for an average family of four to add more than 6 gallons of moisture to the air each day. Some of these activities include:

- Mopping floors = 2.4 pounds of moisture per day
- Drying clothes (dryer unvented into house) = 26.4 pounds of moisture per day
- Washing clothes = 4.3 pounds of moisture per day
- Cooking on electric range without exhaust vent = 2 pounds of moisture per day
- Shower or bath = 2.0 pounds of moisture per day
- Dishwashing by hand = 1.0 pounds of moisture per day
- Individual breathing and perspiring = 16.8 pounds of moisture per day
- House plants = 1.0 pounds of moisture per day
- **Total moisture = 55.9 pounds per day or 6.7 gallons per day**

To reduce indoor humidity, follow these simple tips:

- While cooking, bathing and laundering, use an exhaust vent. Make sure the exhaust is vented to the outside and not into the attic or crawl space.
- Never run your clothes dryer with the exhaust vented to the inside, and avoid hanging wet clothes inside your home during cold weather.
- Cover pots and pans while boiling foods.
- If you have a crawl space, keep moisture in the ground by covering it with 6 mil plastic sheeting, overlapped and taped at the seams.

Surface temperature control

For vapor to condense, it must come in contact with a cold surface such as a poorly insulated or uninsulated wall, ceiling, floor or single-paned window. Warm air holds more moisture than cold air, and it will naturally move toward a cold surface. If warm, moist air comes into contact with a cold surface, it will condense to form water, frost or ice on the surface.

Here are some simple solutions for reducing surface condensation:

- Allow air to circulate around the room, especially across cold surfaces.
- Do not cover furnace supply or return registers with furniture or household furnishings.
- Use a ceiling fan to move air.
- Leave drapes open during the day to allow air to circulate freely over the windows.
- During the night, close drapes to prevent warm moist air from reaching the cold window surface.

- Have your walls, ceiling and floor checked for insulation. Contact an insulation contractor, your utility or, if you qualify, your local weatherization agency. If insulation levels are low or the insulation doesn't fill all the nooks and crannies, cold surfaces will result. Follow these R-value recommendations when insulating different areas of your home:
  - **Ceiling or roof —** R-49
  - **Side walls above ground level —** R-19
  - **Basement walls —** R-11
  - **Floors over unheated spaces —** R-19

It may be impossible to achieve these levels in an existing home, but an insulation contractor will be better able to assess your options.

Add storm windows

If your windows are single-paned, condensation is probably a common problem. Installing a plastic or glass storm window increases the surface temperature, which reduces the incidence of condensation. The storm window must be installed with at least a ½ inch of space between the two windows and sealed on the edges. Although it might not be as cost-effective, adding a storm window to a double-paned window will allow for a higher relative humidity in the home without condensation forming.

Moisture migration control

Even with properly installed insulation, moisture can migrate into cold walls, attic spaces and crawl spaces to form condensation. Although condensation forming in these areas is less obvious, it is where moisture can do the most harm — rot the framing, degrade insulation and corrode fasteners. Moisture can sneak into these cold areas through cracks or diffuse through building materials.

To control condensation in walls, attics and crawl spaces, block moisture from entering using vapor barriers and sealants, and ventilate to remove moisture.

Although difficult to install in existing homes, vapor barriers have been used with insulation in colder winter climates like Missouri's for many years in new construction. A vapor barrier is a low-permeable material that slows the movement of moisture. Vapor barriers should always be placed near the warm (in winter) side of a wall, floor and ceiling. Materials near the cold side should let moisture escape to the outside. Placing vapor barriers on both the warm and cold sides might trap moisture and cause problems.

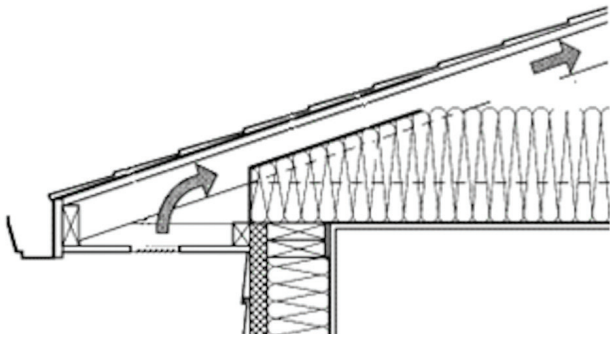
There are several materials that make effective vapor barriers, including polyethylene plastic and aluminum foil attached to insulation. Because it is difficult to add a vapor barrier to existing homes, oil-based and specially formulated low-permeability paints, foil and vinyl wall-coverings can be used to retard moisture vapor.

Keep in mind that where a hole or a crack exists, warm air and moisture can get through. All openings should be sealed with a long-lasting caulk, sealant or gasket material.

Ventilation is effective in removing moisture that has migrated into an attic or crawl space. To be effective, ventilation must provide air movement through the entire area. Effective attic ventilation should have inlet vents along the eave and outlet vents near the ridge. Eave vents must not be blocked by ceiling insulation.

The necessary amount of attic ventilation depends on the type of vent, roof and vapor barrier used. As a rule of thumb for attics without a vapor barrier, 1 square foot of attic vent should be installed for every 150 square feet of attic space.

During mild and summer seasons, crawl spaces should be vented to the outdoors. If the vents are near a corner, they will permit good air movement through the crawl space. In a typical crawl space, the total vent area should be at least 1 square foot for each 150 square feet of floor area. Have an energy auditor or contractor check to ensure that you have adequate ventilation.



The airway at an eave vent should be kept clear of insulation to allow airflow into the attic.

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