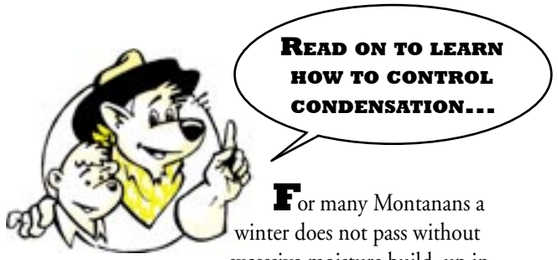

For many Montanans a winter does not pass without excessive moisture build–up in the home. The moisture that forms on the inside of your windows is called condensation. In some cases condensation can be short–term—during a cold spell or localized to humid areas of the home such as the kitchen, bathroom or laundry area. In other cases excessive moisture can condense on walls, the ceiling and other cold surfaces causing paint to peel, wood to rot and mildew to grow.

Condensation Control

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.

1. Indoor Humidity Control.

During the heating season, the indoor humidity level should be kept around 30 to 45 percent. High humidity is often the result of too much moisture generated indoors; however, exterior sources can also contribute to high indoor humidity.

It is possible for an average family of four to add over six 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
Washing Clothes	4.3
Cooking with Electric Range without Exhaust Vent On	2.0
Shower or Bath	2.0
Dishwashing by Hand	1.0
Individual Breathing and Perspiring	16.8
House Plants	1.0
Total Moisture 55.9 lbs/day or 6.7 gallons/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. Also you might want to avoid hanging wet clothes inside your home during cold weather.
- Cover pots and pans while boiling foods.
- If you have a crawl space keep the moisture in the ground by covering it with 6 mil plastic sheeting.

2. Surface Temperature Control.

In order for moisture vapor to condense, it must come in contact with a cold surface like a poorly insulated or uninsulated wall or single–paned window. Warm air holds more moisture than cold air and warm air will naturally move toward a cold surface. If warm moist air comes into contact with a cold surface it will condense forming water, frost or ice on the surface.

To reduce surface condensation here are some simple solutions:

- **Have your walls, ceiling and floor checked for insulation.** This can be done by calling your HRDC, an insulation contractor or your utility. If insulation levels are low or the insulation isn't filling all the nooks and crannies, cold surfaces will result. Insulation resistance "R" values should be at least:

Ceiling/Roof	R 38
Side Walls Above Ground Level	R 19
Below Ground Walls	R 11
Floors Over Unheated Spaces	R 19

- **Add storm windows.** If your windows are single–paned, condensation is probably a common problem. Installing a plastic or glass storm window over the window increases the surface temperature which reduces the condensation. The storm window must be installed with at least a 1/2 inch space between the two windows and sealed on the edges. While it may not be cost–effective, adding a storm window to a double–paned window will allow for a higher relative humidity in the home without condensation taking place.
- **Allow air to circulate around the room—especially across cold surfaces.** Do not cover furnace supply or return registers. Use a ceiling fan to move air. During the day leave drapes open 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.

3. Moisture Migration Control.

Even with properly installed insulation, moisture can migrate into cold walls, attic spaces and crawlspaces to form condensation. Although condensation taking place 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 two remedies are common: (a) block moisture from entering using vapor barriers and sealants, and (b) ventilate to remove moisture.

Vapor barriers have been used with insulation in colder climates for many years. A vapor barrier is a low–permeable material that slows the movement of moisture. Vapor barriers should always be placed near the warm side of a wall, floor and ceiling. Materials near the cold side should let moisture escape from the wall or ceiling to the outside. A vapor barrier placed on both the warm and cold side may trap moisture causing problems.

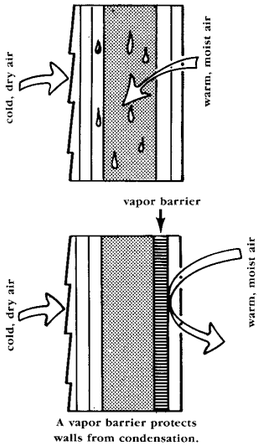

Figure 1
Vapor Barrier

Several materials are effective vapor barriers including polyethylene plastic and aluminum foil. Since it is difficult to add a vapor barrier to existing homes, oil–based paints, foil and vinyl wall–coverings, and specially formulated low–permeability paints can be used to retard moisture vapor.

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

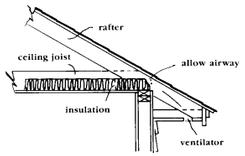

Figure 2
Airway at Eave Must Not Be Blocked by Insulation

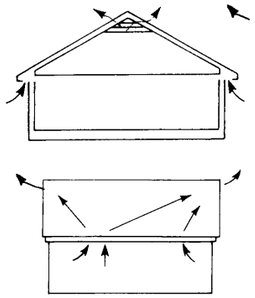

Figure 3
Inlets at Eave, Outlets at Ridge for Good Ventilation

Figure 4
Foundation Vent

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. The most 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 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: one square foot of attic vent should be installed for every 150 square feet of attic space.

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 crawlspace, the total vent area should be at least one square foot for each 150 square feet of floor area.

For the HRDC or tribal weatherization office nearest you, call 1-800-332-2272.

MONTANA
Department of Public Health & Human Services

Montana Weatherization Assistance Program for Low-Income Families

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