



Winter condensation: Water damage without precipitation and how you can prevent it

December 14, 2010 - Design / Build

Community associations, building owners, engineers, contractors and property managers deal with the constant battle of keeping water out of the building envelope, but sometimes the water that causes stains, mold and decay actually originates from within the building envelope. The cold temperatures of the winter months combined with specific interior conditions can result in excessive condensation. Deficiencies in both the original construction and recent reconstruction of exterior wall cavities, basements, crawl spaces and/or roofs/attics can exacerbate these conditions, resulting in excessive condensation conditions, increasing the potential for water damage and mold development. Sometimes, these conditions are visible to the naked eye. Other times, these conditions and the subsequent damages caused by these conditions may be hidden from view, potentially worsening with each passing winter season and, as a result, escalating repair costs.

Aside from both proper construction methods and materials, the most essential aspect of preventing moisture damage caused by condensation to a building involves maintaining indoor relative humidity at effective levels during the winter season. Humidity levels consistently below 30% may cause respiratory problems and shrinking of wood furniture, flooring or trim. While humidity readings of 30% or higher appear to prevent or certainly reduce these problems, higher humidity levels begin to increase the potential for condensation to occur as a result.

Condensation is the process of water vapor present in the air turning to liquid water. Condensation of water vapor occurs when the temperature of the air is lowered to a point at which the air cannot hold any more moisture (the Dew Point). At this critical temperature, the water vapor will turn to liquid water. In general terms, the interior warm air contains moisture that will migrate, by diffusion, to the lower pressure or colder air (exterior).

Normal household activities such as cooking, showering/bathing, washing clothes and dishes, drying clothes and merely breathing and perspiring can raise the humidity level in a home. A typical family of four converts three gallons of water into water vapor every day. It takes only about six pints of water to raise the relative humidity of a 1,000 s/f home from 15 to 60 percent, so engaging excessively in the activities listed above can elevate the moisture in the air significantly.

Solutions

In general terms, the following information typically applies to Northeast construction:

Walls: As the most basic and general rule, a vapor retarder should be installed on the warm side of the insulation during new construction or significant rehab projects. This vapor retarder will limit the amount of interior water vapor passing into the wall cavity. This is typically accomplished by installing paper faced insulation at the time of original construction. The paper backing on typical blanket insulation is technically a vapor retarder, but the ends must overlap each other over the edge of the studs in order for it to be completely effective. It is also difficult to provide coverage of

wall framing, window and door framing with this type of vapor retarder. More effective vapor coverage may involve the installation of wide sheets of polyethylene inside the wall with precise cutouts for windows and outlets.

The designer should analyze the wall cavity to determine whether the assembly is susceptible to condensation. There are many variables that can affect potential susceptibility to condensation, such as the type of materials and their respective R- value, permeability rating, thickness and even location within the cavity. The size, type and layout of the interior environment are also factors that should be considered.

A change in any of these variables can affect the potential for condensation dramatically. For example, a change in a building façade from a vinyl siding system to a stucco system may create future condensation problems if the above discussed variables are not analyzed.

Attics: Attics should be properly vented and insulated. The temperature of the attic space should be consistent with the exterior temperature. Flat roofs may require an analysis similar to the analysis of walls as discussed above.

Crawl spaces: Crawl spaces should be properly vented including as-needed exhaust fans and/or sump pump systems that reduce moisture and protect framing.

Basements: Dehumidifiers and proper wall cavity construction are necessary if finished space is desired.

The construction, use and maintenance of a building can have a significant impact on the humidity levels and condensation issues that may occur. Condensation was not much of a problem in pre-WWII construction, as the "loose" or energy inefficient construction allowed for the flow of air and humidity in and out of the building. With new, more energy efficient construction methods, an increase in household appliances and living habits that release water vapor into the home, condensation has become more prevalent and the damages and mold growth that go along with continued wetting have become an issue.

When constructing or reconstructing a building, it is important to properly evaluate an existing condensation problem and consider the use of different materials.

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