

Avoiding Moisture Problems



Technical Update

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Introduction

The purpose of this article is to increase awareness among Weatherization practitioners about the potential for moisture problems and how to avoid them.

The winter of 2002-03 is being hailed by many as an especially brutal season. Unless we've forgotten, this is probably closer to what a normal winter in Pennsylvania is really like. Sustained cold snaps have likely brought on numerous crisis calls from Weatherization clients related to no-heat or other emergencies. As the chill deepened, isolated cases of interior moisture problems also reared their ugly head.



Saturated, warped and molded roof sheathing is often a result of warm, moist house air coming into contact with cold roof surfaces.

The state office and WTC has recently received a number of calls from agencies requesting technical assistance regarding post Weatherization complaints about heavy window condensation, water stained ceilings, and saturated wood surfaces in attics.

Associated microbial (mold) growth has understandably caused clients to become alarmed out of concern for their health and safety. These days the public tends to be much better informed by the

recent media attention given to the hazards of mold (any mold) in the living space.

Here's a classic scenario. A client's home is weatherized during late Spring 2002. Some of the usual measures, including air sealing, attic insulation, hot water conservation and furnace testing were provided. This is the second heating season that the family has lived in the home. There are six occupants in the home, which has a fairly small footprint of around 1,000 square feet of living space. The house is fairly tight to begin with and building shell measures have resulted in a post weatherization air leakage rate at close to the blower door based minimum ventilation guideline of 1500 cfm50. In January, 2003 the agency takes the call. For a period of several weeks the client has been witnessing severe moisture problems where they had never occurred before. The client is quick to blame the new attic insulation as the root cause. They are angry and are not open to ideas the agency may have to mitigate the problem. They want the insulation removed and they want restitution.

Sound familiar? Lets take a closer look.

What's Going On?

Upon visiting the home a team of investigators invited by the agency verifies that a worst-case scenario has developed. All wood surfaces in the attic are saturated including the first couple of inches of the newly installed blanket of insulation. Significant condensation is occurring on all glazing surfaces and mold has become well established on the wooden window sashes. Water stains are evident on the ceiling.

There were no major external or internal moisture sources other than what is normally generated by a family of six through respiration, cooking and cleaning. Besides the extenuating circumstances of a tight home combined with high occupancy, the likely contributing factors in this sample were as follows:

- Insufficient or nonfunctioning mechanical ventilation
- Non-ducted bathroom exhaust fan, dumping moisture into attic
- Significant pressure imbalances between adjacent rooms, caused by an operating furnace fan. This forced warm moist air into unconditioned attic and onto glazing surfaces where it condensed.
- Unsealed attic air leaks, which acted as conduits for air transported moisture movement into cold attic cavity.
- Very cold weather during period

What To Look For

Each year thousands of homes are weatherized in Pennsylvania with clients receiving the benefit of increased comfort and affordability. A very small percentage of those completions result in problems. A moisture problem that surfaces after Weatherization is likely the result of a combination of variables. A house may have either had a moisture problem to begin with or is right on the border. The act of air sealing combined with new mechanical interaction on a tighter building shell may push that home over the edge.

To avoid moisture problems and the associated liability storm, here are some major things to look for:

- ✓ Tight home with a high occupancy rate
- ✓ Significant foundation moisture or plumbing leaks
- ✓ Mechanical humidification
- ✓ Fan induced pressure differences
- ✓ Un-vented fossil fuel space heaters
- ✓ Non existent, disconnected or non functioning dryer vents and exhaust fans
- ✓ Evidence of past moisture problems (water stains, mold, peeling paint or condensation)
- ✓ Backdrafting fossil fuel appliances
- ✓ High moisture sources, such as drying wood, or hang drying clothes

Don't Blame the Insulation

Auditors need to apply their knowledge of building science and use diagnostic tools to anticipate problems. Field technicians need to be empowered to apply the proper materials correctly. Since many of the moisture problems in the Northeastern US tend to appear in attics during the winter, it is vital that insulation is combined with meticulous attic air sealing. The insulation is not the problem and attic ventilation is not necessarily the solution. While a certain amount of attic ventilation is required, additional venting may make a moisture problem worse. Dense cold air may enter the vents and cool the attic surfaces below the dew point of the indoor air. If the thermal boundary between attic and living space is not adequately sealed, roof vents may even contribute to greater stack effect.

If a forced air system is present, use a manometer to check for pressure differences between spaces in the home and provide solutions if necessary. Agencies have the ability and health and safety funds to provide continuous mechanical ventilation and to a reasonable extent manage bulk water problems.

Above all, an agency needs to know when to walk away. They may not necessarily avoid liability simply through a verbal agreement or sign off. As building professionals, auditors and field technicians should never encourage or allow a client to waive health and safety in exchange for an energy conservation measure. If a client refuses a recommended health and safety measure, such as continuous mechanical ventilation, shell measures should not be performed.

Weatherization practitioners should never perform shell measures on a home if they have prior knowledge of a moisture problem or have good reason to think that one may develop. The homeowner must also play an active role in prevention. An important part of any education package should be to make clients aware of potential problems that may occur if they introduce high moisture sources into their newly retrofitted home. Having an understanding of moisture dynamics in houses, solid documentation, and a strong education package will demonstrate responsible behavior on the part of the agency and assure health and safety for our clients.