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HEADLINE: ACHIEVING MOISTURE MANAGEMENT IN AN AIR TIGHT BUILDING

One of the "buzz-words" in the building and renovation industry these days is, "How do we create a low cost, air tight envelope?" The second most common discussion is, "How do we justify the cost to the client?" In order to attain the higher levels of energy performance, buildings have to optimize the effectiveness of every portion of the assembly, insulation, window and door openings and overall air seal around the entire project, as well as one other consideration, we are now realizing - water/moisture management.

Everyone must buy into the importance of sealing up the envelope; it's not just the carpenter's job any more. Plans must be drawn up by the designers and engineers detailing these issues. The trades must all realize the importance of every hole or opening they create in the external walls, ceilings and basement areas. In our contracts, we mention this so that anyone we bring in is made aware of what we are trying to achieve. The term "tool box talks" is becoming a common gathering discussion call for the trades.

As we make homes more energy efficient, the importance of air movement comes to the forefront. Any air, vapour or moisture leakage can lead to significant problems like mold, for example. When the early R2000 homes were introduced, they lacked air exchange and this quickly became a health issue. Today, a properly sealed home exceeds those early standards by some considerable degree.

Let's move outside of a new home or major renovation and look at insulating the foundation. I have recommended, as have many others, the need for a "complete, waterproof cladding" for every basement or below grade foundation. If insulation is part of the foundation package, then effective moisture and a proper drainage system are paramount. If the foundation is insulated on the interior only, then some method of effective management of air flow, spell that condensation, is recommended.

There is a growing use of rigid insulation over the conventional wood frame wall system. This method of bridging the thermal break is working. What is not working is attaching the siding directly over this insulated sheathing. Right now, from what we know, I would not use any insulated sheathing thicker than 1.5 inches over any OSB covered framework. Installing furring strips to separate the exterior cladding from the wall is the tried and true method to allow back ventilation and drainage, not unlike the space that must be present between bricks and the structure to allow air movement.

If the home or addition is built with structural insulated panels (SIPs) or insulated concrete forms (ICFs), the same applies; there must be a separation from the structure to the exterior cladding. For a SIP roof panel, again, the same applies; there must be strapping installed before the roofing. For a SIP roof assembled building, I now only recommend metal roofing. A recent article in the US by their home builders association, found that double wall framing in cold climates is questionable given the inability to find the dew point outside the wall. Wall systems using advanced frame and rigid insulation, SIP's and ICF walls, are proving to be the best, most affordable, wall systems we have right now.

The vast majority of homes have an attic and proper ventilation is primary here. The 'code minimum' is just that, minimum. Better builders recognize the need to increase the attic ventilation to balance the air flow and attic temperature to the outside temperature. Unless they are fully separated from the attic space, installing multiple port ventilation fans in an attic is not recommended.

How does a builder or renovator find the air gaps in their project? Quite simply, with a thermal imaging camera and a skilled, trained technician behind the camera screen, who can interpret what the camera is showing. Thermal Imaging has been around for years, used originally by the military to find the "bad guys" at night. It is also used in many medical fields. The other method is to bring in an experienced energy auditor and have them do a blower door test on the home. Using the 50 Pascal scale, this test will establish the ACH (air changes per hour) that will occur in one hour of the 50 Pascal negative air pressure created by the blower door. All external openings are closed for this test, which is a world recognized benchmark for efficiency of a home. In Ontario, all new homes must meet the EnergyStar 80 level, which is established by a blower door test.

The other criteria is the use of a mechanical ventilation system. If your home meets the EnergyStar 80, it should have an HRV or and ERV system installed. Preferably, this will be an independent system or "whole house" system that operates outside the HVAC system. With any home that tests anywhere near the 1.5 ACH mark, in my opinion, a venting system is a must. To give you some idea of a comparison, an older home with limited energy upgrades will have an ACH of 4-9, while a home built in the 80's or early 90's will likely come in around 2.5-3.5.

A German study that crossed my desk a while ago showed that, even with modern direct venting for gas hot water heaters and fireplaces and independent make up air for heating systems, the levels of carbon dioxide in over 100 modern German homes rose over 1000 PPM (parts per million) overnight. Some homes had levels near the 4000 PPM mark by morning, causing the occupants to wake up feeling tired.

There is an argument that a home can be "too tight" or too insulated" and, as well, there are some strong arguments over the levels of insulation. I agree that two

feet of cellulose in an attic is over kill. The bottom line, though, is that any new home or major renovation where the ACH levels are confirmed must have a balanced air exchange system, along with an air tight envelope. They go hand in hand.

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