Mark LaLiberte

Mark LaLiberte, partner with Construction Instruction, is a highly regarded green building consultant who helps builders nationwide understand and apply proper building science construction principles to improve their homes. www.construction-instruction.com; www.laliberteonline.com.

Advanced Rainscreens

New research, code requirements, and material assemblies drive strategic changes.

The continuing effort to improve energy efficiency has affected nearly every aspect of buildings—most notably, changes to building enclosure designs driven by new codes, more stringent rating system requirements, higher energy costs, and ongoing research. Results from recent field studies and decades of laboratory research demonstrate that, because of increasing levels of wall and attic insulation, coupled with cladding system changes and complexities, we need to enhance the drying potential of walls in every climate.

Our wall systems have to withstand ongoing variable conditions that change hourly, daily, and seasonally. These fluctuations affect energy use, wetting and drying potential, and therefore the life of the building. To explain this idea, let's define the performance expectation for sheathings.

WHAT WE KNOW

Most sheathing materials we use are moisture sensitive. While providing structural and nail base functions, exterior materials also need to manage rain, possibly contribute to air barrier functions, provide thermal resistance, and have some vapor-tolerant features if the conditions and climate dictate. This explains why the complexity of making good decisions for a building enclosure is critical to its long-term success. After the cladding is installed we have few options to improve missing features.

WHAT WE CAN DO

The complex performance challenges buildings experience are variable enough that we need to begin designing in some "forgiveness" for when material tolerances are exceeded. It is often assumed that sheathing can provide a safe storage capacity for moisture. In almost every case, these materials have little additional storage capacity other than what they store seasonally. It is therefore recommended that drainage planes be enhanced and, in many cases, coupled with rainscreen techniques that accelerate the removal of liquid water and when properly designed use air flow to enhance the drying rate significantly.

Research at the University of Waterloo in Ontario by Dr. John Straube and his team of scientists has shown the benefits of using a ⅜-inch to ¾-inch venting rainscreen. The data show a significant increase in drying potential versus a conventional wall with simple building paper and no ventilation space. Based on this and other research we can conclude that a ventilated rainscreen accelerates evaporation of undrained moisture behind cladding materials nearly three times faster than without ventilation. It is important to note that a majority of the moisture will drain from the wall system when an effective drainage plane is used. This is in combination with the accelerated drying times with vented wall systems. Other studies by Mark F. Williams with Williams Building Diagnostics show that vented rainscreens are the best method we can use to ensure long-term performance and durability.

EFFECTIVE TECHNIQUES

The best practice in rainfall regions with greater than 20 inches per year is creating an intentional airspace between the cladding and sheathing by installing furring strips or drainage mats over the weather resistive barrier (behind the cladding) that create at least ⅜ inch to ¾ inch of airspace. This requires some planning to detail the type of furring strips, cavity depth, possible use of exterior rigid foam or mineral fiber insulation, window installation sequence, penetrations, and trim details. This might sound complex, but planning ahead will make the experience work well.

Figure 1 (page 18) shows a typical wood-framed wall with a draining housewrap installed over the sheathing. The window is installed and flashed at the sheathing interface, and the air barrier is the housewrap. Ventilation behind the cladding is enhanced by the batten system installed over the housewrap. In Figure 2 you can see a well-installed and flashed weather barrier with foam and ⅜-inch wall battens spaced 16 inches on center behind the siding. (See page 18 for information on how to download these animated construction details from Construction Instruction's new mobile app for iPhones and iPads.)

These techniques are effective methods for draining and drying excess water. The best drying performance is achieved by installing ventilation

PHOTO: RAY NG

FIGURE 1: WINDOW INSTALLED TO SHEATHING

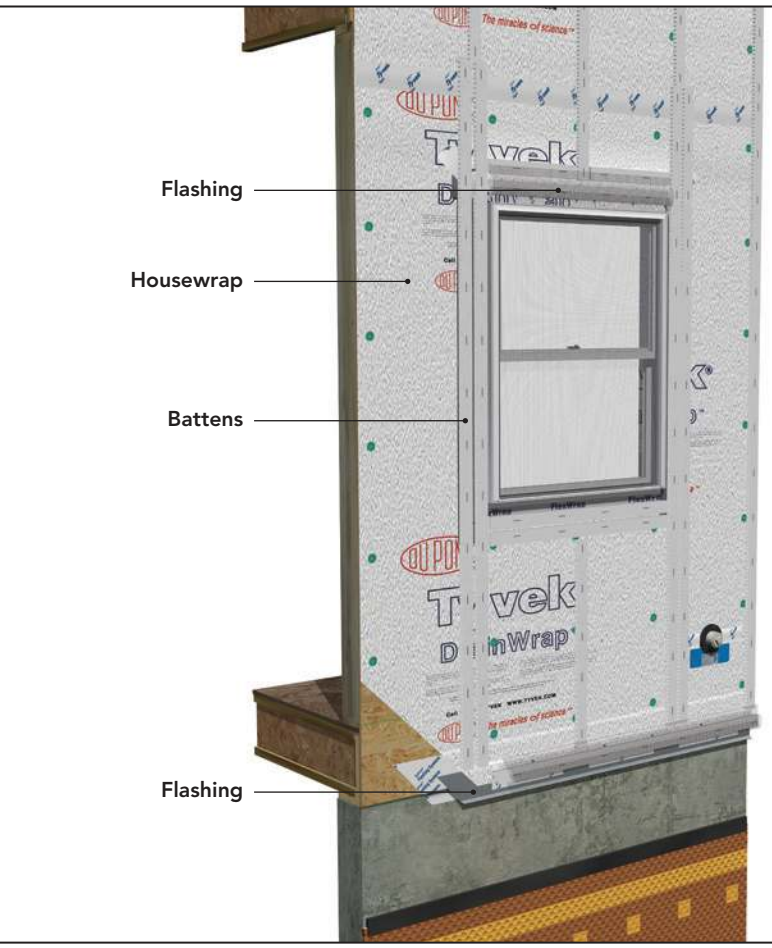
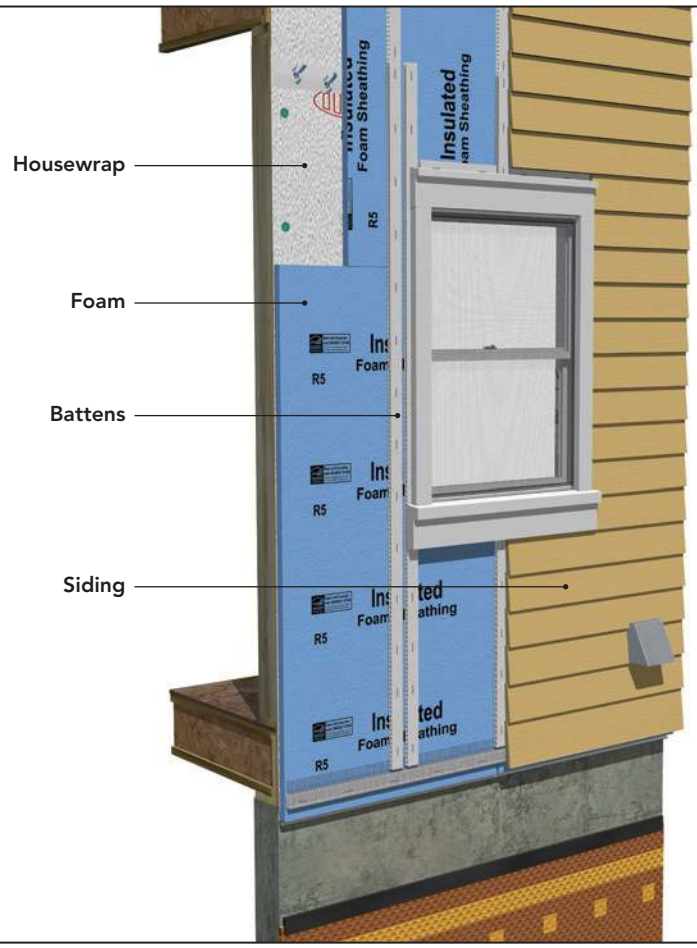


FIGURE 2: WINDOW INSTALLED TO FOAM



These illustrations show how to create vented airspaces behind exterior cladding over different exterior sheathings. Figure 1 details battens installed over housewrap. Figure 2 shows how to adapt the details and sequence when rigid foam is installed.

These details are available free to EcoHome readers in action-sequenced animation using Construction Instruction's new mobile app for iPhones and iPads. Visit ecohomemagazine.com to download the apps.

openings at both the bottom and top of the wall. There also needs to be an insect screen at the base and at the top to protect the space. The battens shown in Figure 2 are called Eldorado battens, and they allow airflow both vertically and horizontally. They are shown at ½ inch deep and 2 inches wide. Other methods include Benjamin Obdyke's Home Slicker and Cosella-Dörken's Delta Dry, among others.

It's a great idea to build a mock-up of the method you will be using to work out the cladding and trim details before you put it on the house. Once you create the best approach, you'll find it works very well, extends the paint film life, and allows all cladding systems like stucco, manufactured stone, cement siding, and wood to perform as they should and experience fewer callbacks.

LOOKING AHEAD

We know that reductions in energy use in buildings have been targeted by both codes and rating systems, citing a net-zero goal for new homes by 2030 (California hopes to achieve this by 2020). The new requirements for Energy Star Version 3 are taking a step-down approach improving the requirements as codes catch up. This will help builders reach these national goals in a strategic approach.

Regulations will always lag behind a best-practice approach. In January 2010, Oregon, with the assistance of the Oregon Home Builders Association and using information from the Waterloo research and Williams study, passed a code requiring a ⅛-inch minimum draining space unless an effective draining housewrap was used. Most of the building science community hopes it doesn't take laws to inspire good building techniques. Detailing buildings with proper flashing, rainscreens, and improved thermal performance is where our industry needs to head now.

Justin Wilson with Construction Instruction contributed to this article.

ILLUSTRATIONS: COURTESY CONSTRUCTION INSTRUCTION