EDITOR'S NOTE: Bill Robinson, an accomplished contractor, is filling in this month for Gary Katz.

Why Water Runs Uphill

Understanding water will help your customers stay high and dry.

For a builder to fully understand how to install a particular flashing or sealant product, they must first know at least the basics about why the product is necessary. That means building product professionals must be informed, too. After all, the more you know about why you stock specific products on your shelves, the better you'll be able to sell them.

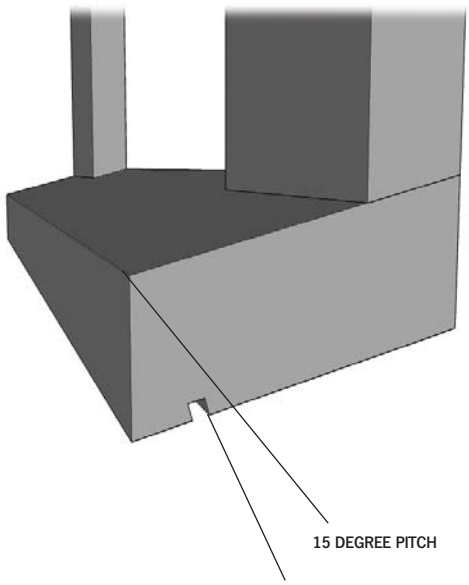
Water management products, from flashings to sealants to housewraps, are designed to protect building materials from water damage. The proper use of those products is dependent upon a fundamental understanding of the forces behind water movement.

Understanding Water

One of the primary problems that builders face with water is surface tension. The molecules in a drop of water are slightly more attracted to themselves than they are to other molecules outside the drop of water, which is why water forms into drops. Water molecules want to stick together; they like to be in a ball like a bunch of small magnets.

While water molecules are attracted to themselves, they're also attracted to other molecules. Water is actually pretty sticky stuff. Water molecules 'adhere' to molecules unlike themselves, and that's why water drops hang from plants. Adhesion is the reason water droplets form and run across the bottom edge of trim, siding, and fascia.

Surface tension, the force that allows a dime to "float" on water, is caused by the attraction of water molecules to themselves, which creates a kind of skin on the surface of the water.



Surface tension and adhesion will allow water to bridge a 1/8 in. gap and run uphill.

Surface Tension and Adhesion

Surface tension and adhesion cause water drops to hang on housewrap without draining or dripping down. Surface tension and adhesion, working together, enable water to travel uphill, too, on the bottom of a sloped window sill or water table. In fact, surface tension and adhesion, working together, allow water to bridge gaps up to 1/8 in. wide, which explains why drip kerfs cut in the bottoms of window sills, newel post caps, and other exterior trim should be 3/16 in. wide—so they'll prevent water from bridging the gap.

Create enough pitch on a sill, and a wide enough drip kerf, and water will not travel back under a sill or drip behind the siding.

Capillary Action

Capillary action is the secret behind sponges. The best sponges are peppered with small air spaces—capillaries. Dip a sponge into water and those capillaries draw water up into the sponge. Surface tension, adhesion, and capillary action often work together and can cause huge problems in buildings. These three forces will suck water up hundreds of feet in a tree or a concrete wall, which is why ground water must be drained away from foundations and trim boards must be kept high and dry.

Negative Pressure

After the first laws of thermodynamics were developed during the mid-19th century (the laws of thermodynamics define how heat and energy interact), scientists in the early 20th century discovered the need for a new law, one that formed the fundamental basis of thermodynamics. They already had a First Law, so they named the new one the Zeroth law—for Zero.

Most builders eventually learn the Zeroth law of thermodynamics the hard way: "If two thermodynamic systems are in thermal equilibrium with a third, they are also in thermal equilibrium with each other."

For builders, this is the law that explains why heat always goes to cold; why wet always goes to dry, and why positive pressure always moves towards areas of negative or lower pressure. If this sounds confusing, think of a bathroom fan.

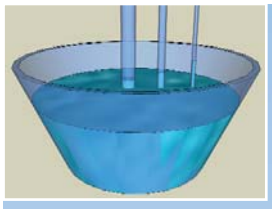
Of course, warm air and moisture are also drawn out of the bathroom—so the mirror won't fog and the towels will dry. Sometimes, as in the case of a bathroom fan, the laws of thermodynamics work to our advantage.

Surface tension, capillary action, and negative pressure work together with beneficial results in trees, too. On their own, surface tension, adhesion, and capillary action wouldn't be strong enough to raise water to the top of a 300 ft. Sequoia. Negative pressure makes the system work. Water evaporates or transpirates through the leaves and needles at the top of a tree. That loss of water creates suction or negative pressure in the cell structure of the tree, which draws additional water up through the xylem of the tree.

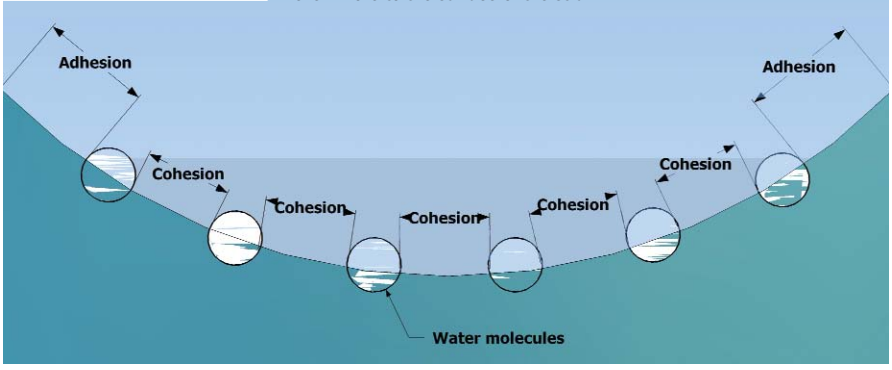
Close a bathroom door, turn on the exhaust fan, and air is drawn out of the bathroom, creating negative pressure. Seeking balance, the air on the opposite side of the door (now being positive pressure) is drawn into the bathroom under the door.

For builders, surface tension, capillary action, and negative pressure work together with devastating results, which is why understanding the science behind water management is so important.

After all, if you don't know what's best for your customer, someone else will. ■



Stick a straw into a cup of water and the water level in the straw will rise higher than the water level in the cup. The smaller the straw (capillary tube), the higher the water will rise. Water also clings to the side of the straw, and is slightly higher than the water in the center. That's surface tension, adhesion, and cohesion working together: the water molecules are attracted to each other, but they're attracted even more to the surface of the straw.



BILL ROBINSON has more than 30 years of construction experience, and is a licensed contractor in California. He offers presentations focusing on practical moisture management and building envelope details; is a member of ICBO, a certified AAMA Installation Masters trainer, and a regular presenter at JLC Live, the IBS show, and the Remolding show.