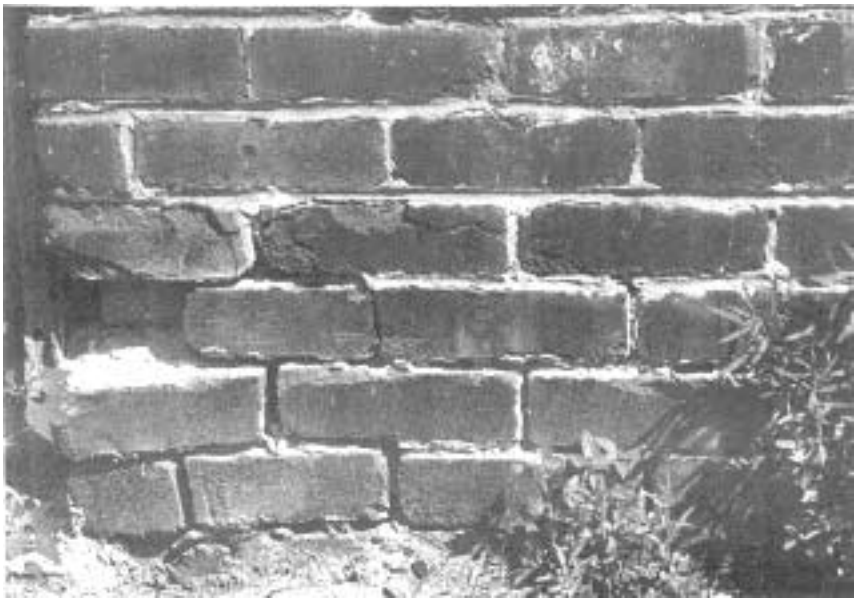
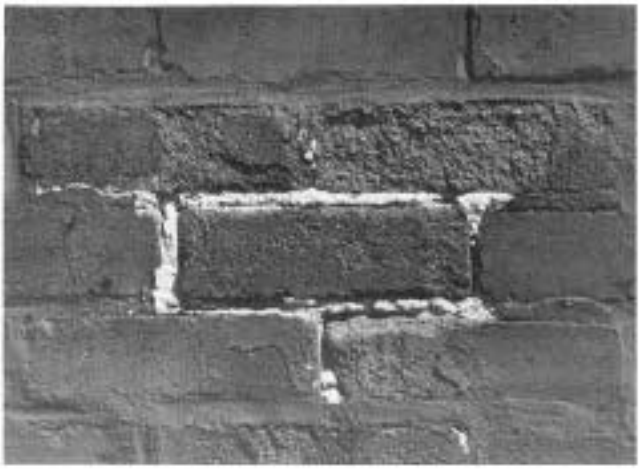
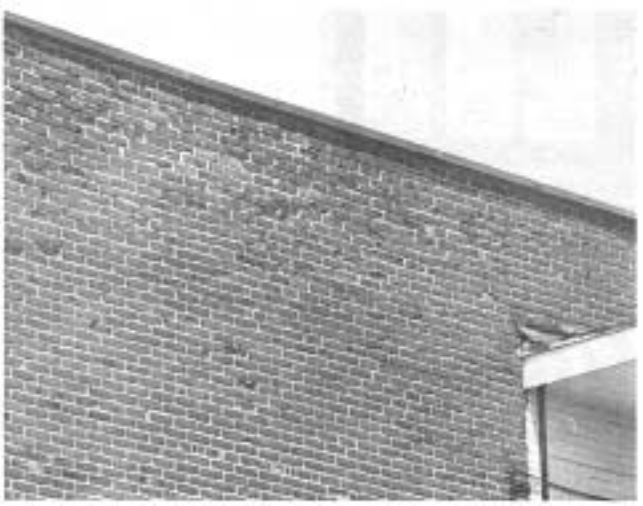


photos courtesy Jon Eakes

Water wicking up from the ground can rapidly deteriorate the first couple of feet of brick wall that's insulated on the interior—all for the lack of a capillary break in the brick.



This wall was painted to protect it, but the paint made it worse. The problem was not solved until gaskets were installed around the indoor electrical outlets.



It's very common nowadays to see a band of deteriorated brick on the top of a house—usually about six inches above the newly insulated ceiling.

How Retrofitting Can Hurt Bricks

If you can't stop the moisture, don't insulate

by Jon Eakes

Brick is a sturdy, good-looking exterior finish. But it also is easily destroyed and can look very run-down. All too often we work on a house without realizing the effect it can have on exterior brick, or we attempt to maintain it and unintentionally make things worse.

First, how does a brick wall work when it is working well? Brick and the mortar between the bricks form a mechanically strong but quite porous skin around the house. Rain will soak into the surface of brick and mortar quite easily, but even driving wind will not force water through the brick if there is a properly vented air space behind the brick. The water cannot penetrate because the wind pressure that drives the rain also penetrates the air space by way of the weep holes, creating the same pressure on both sides of the brick.

As a result, the rain will wet the brick only slightly. Most of the rain simply will run down the face. The brick itself acts only as a rain screen; the black building paper is supposed to stop the wind from penetrating the house. When the storm stops, the brick quickly evaporates its water to the outside, and all remains solid and beautiful.

...Or at least that's the theory. We constantly see cases of deteriorated brick and/or mortar. What goes wrong?

Salt Damage

When brick is thoroughly saturated with water, two things can go wrong. First, water will migrate through bricks from the water source to the point of evaporation. In some cases, the water source is the soil, and some soils have a lot of salt—which means that dissolved salt is moving through the brick wall. In addition, many antifreeze treatments used in mortar and concrete contain salt.

At the point of evaporation, salt is left behind as the water evaporates, creating a whitish stain called *efflorescence*, which often can be seen about 12 to 18 inches above the basement floor. Efflorescence is merely a cosmetic problem unless the salts happen to collect just under the baked, outer surface of exterior brick. There they form crystalline structures that *spall*, or rupture, the face of the brick. Once the face of a brick is gone, it's not worth much because the softer core will no longer hold up to the elements.

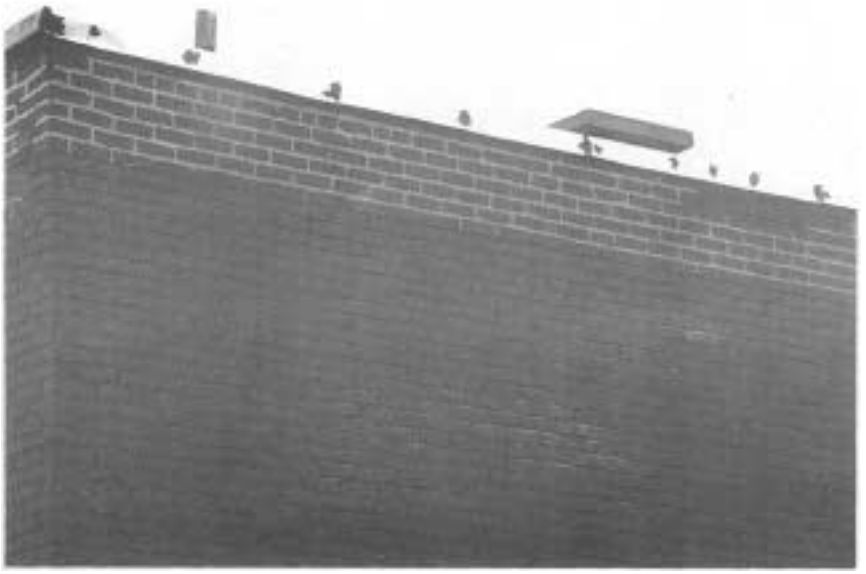
Ice Damage

The second thing that can happen with water-saturated brick is that ice crystals can form behind the hard, brick face, causing the same spalling of the surface.

People who go around decorating houses by painting bricks are making this problem worse. An oil-based paint will prevent the water from evaporating, keeping the bricks saturated longer. A latex paint isn't as bad, and silicone sealers cause less damage, too. Still, historical societies across Canada are urging that no treatment whatsoever be put on brick exteriors. Treatments stop the water from evaporating *out*; what we really want to do is stop the water from getting *in*.

How Bricks Get Waterlogged

So how does enough water get in to saturate the brick? It's not from direct rain on the brick face. It can, however, leak in through large cracks in the mortar—particularly if



Another common sight: freshly repaired brick at the top of an exterior wall, again usually about six inches above the insulated ceiling.

the wall is not properly vented behind the bricks to neutralize the wind pressure. So re-pointing is important not only for looks.

Water also can rise up from the ground, especially if the bricks are in direct contact with the soil. Polyethylene brick flashing, embedded directly in the mortar, is recommended in these cases. That's one tough retrofit job, but it can be done and can put an end to annual re-pointing jobs.

Another culprit is faulty window and roof flashings. Don't wait for water to leak into the living room before repairing flashings. Tend to them as soon as you see that water is leaking into the brick structure.

Indoor vapor is another major source of water. If it is concentrated—for example, if it enters the brick through an electrical outlet on an outside wall at the downwind side of a house—it causes mysterious spot deterioration right in the middle of a wall (see photo).

about 18 inches from the driveway a long line of concrete was popping off where the basement moisture was trying to evaporate to the outdoors.

Brick foundations that are heavily insulated on the inside can cause similar problems. Under the new thermal conditions posed by the insulation, the bricks tend to wick more water to the top of the wall than previously. The water freezes and breaks up the brick, or it saturates the wood at the sill area and promotes decay. In these cases, we either insulate from the outside, letting the brick continuously dry to the inside of the house, or we insulate the wall only partially, leaving the header area open and airy on purpose.

When all is said and done, the best way to keep brick healthy and happy is to properly flash the wall at the top and bottom, provide good protection from household vapor (in other words, use vapor barriers), have open weep holes to neutralize the wind, re-point when necessary to keep the cracks sealed, and do nothing at all to the exterior surface. If you can't keep the water out, just be sure you don't let it freeze. ■

It may sound strange, but in old brick and stone structures, we often have to follow the rule that if you can't stop the water vapor, don't stop the heat. The last thing you want to happen is for the water to freeze.

Actually, it is only recently that water vapor from a house has caused serious problems—that is, only since we began to partially insulate old brick houses. It is common now to see a band of deteriorated or freshly repaired brick on the top of a house, usually about six inches above the ceiling of the uppermost story (see photos). In most cases, the problems arose not from the flashing, but from a combination of excessive water vapor and freezing temperatures.

The water vapor had passed through that wall for 50 years—but so had the heat, so it rarely froze inside the brick and caused serious problems. But then someone came along and shot the roof space full of insulation. This stopped the heat from keeping the upper band of bricks warm, but it did nothing to reduce the flow of water vapor into the bricks. For the first time in 50 years, the water vapor in the upper portion of the wall began to freeze regularly, form ice and break up the bricks.

Other Guidelines

It may sound strange, but in old brick and stone structures we often have to follow the rule that if you can't stop the water vapor, don't stop the heat.

I've seen the same problem with concrete foundation walls after heavy insulation was added—without air or vapor barriers—to the inside of the basement. In one case,

Jon Eakes is a home renovator, author and instructor specializing in energy and Canadian construction practices. He also hosts the Canadian television series "Renovation Zone."