Investigation and Repair of Leaky Residential Walls

Introduction

Determining the cause of water leakage can be tricky, even for the seasoned professional. This is largely due to water's tendency to meander through a wall system until it shows up in an area that is far from its point of entry. However, there are certain telltale signs that might lead you to the source of the water leak. This *Engineering and Research Digest* will discuss why residential masonry walls leak, how to determine the origin of the leak and outline repair options.

Why Brick Walls Leak

Most brick walls are designed as drainage wall systems. These drainage walls anticipate small amounts of water will penetrate the veneer. The water drips down the back of the brick until it hits flashing. The flashing stops the water and then directs the water to weep holes where it is channeled to the outside.

There are many ways that water can get behind the brickwork. Normally it penetrates at:

- Defective sealant (caulking) around windows, doors, and other masonry openings
- junctions between roofs and walls
- partially filled head and bed joints
- cracks in walls
- improperly tooled mortar joints

Chimneys can be another source of water entry. Please refer to *Engineering and Research Digest*, "Flashing Chimneys" and "Proper Chimney Crowns" for more information on that subject.

The most common reason for leakage into the house is the lack of flashing and weep holes. When correctly installed, flashing and weep holes will stop water that has penetrated the wall, and channel it out of the wall system. This is why flashing and weep holes are crucial element in preventing water leaks.

Most current residential building codes state that flashing should be located below the first course of masonry above ground level and at shelf angles, lintels, and tops and sides of windows and doors.

Weep holes are required to be located immediately above the flashing at 32 inches on center, though 24 inches on center is recommended.

See *Engineering and Research Digest*, "Stepped Flashing" and *Technical Notes* 28 for more information on proper flashing.

How to Determine Where the Leak is Coming From

It is time to become a detective and to solve the problem by the process of elimination. First, check and see if the masonry wall has weep holes. They are normally located close to ground level and are openings in the wall such as open head joints, pieces of rope, or tubes. These weep holes should be located every three to four brick.

If you do not have weep holes, you have just discovered the most likely reason water is entering the wall. This is not the source of the leak, but it is why the drainage wall system has failed.

If weep holes are present, the next step is to check for flashing. Flashing is normally a plastic or metal material that runs from the back of the wall to the front of the brick. This is what actually gets the water out of the wall. Flashing can be located at the weep holes.

The best weep holes are open head joints that are formed by leaving a vertical joint (head joint) out.

If you have open head joints for weep holes, check a few around the house. If you can see the top of the brick in the course below the weep hole all the way

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to the back, then you do not have flashing.

If you don't have open head joints and the weep holes are either rope or plastic tubes, dig out a bed joint with a chisel or a drill around the bottom of the weep hole. If you come across plastic or metal you have flashing in the wall.

Weep holes without flashing are essentially ineffective. The flashing directs the water to the weep holes. Without flashing water will migrate wherever it wants to, which is generally not to a weep hole.

Next, check the sealant around windows and doors. Make sure that the sealant is still in good working order. It should be elastic and should not have cracks in or around it. Also, check for cracks in the wall, especially at the mortar joints. These are other sources of water leakage.

Partially filled bed and head joints can be detected by examining the inside face of the brickwork. This entails removing drywall, insulation and sheathing from the inside of the exterior wall. Select a location that is easily repaired and accessible from the outside. Water applied to the outside face may show up on the inside face of the brickwork.

To find exactly where the leak is occurring, take a garden hose and start saturating the wall in segments with water. Start on the outside at the location where the leak shows up on the inside where the leak is located. Slowly move the water up the wall in two-foot segments. Make sure each segment is thoroughly saturated before proceeding to the next segment. Keep doing this until the leak occurs.

Remember that water may take a while to show up inside, so be patient. If it never occurs, then the leak is probably not located in your wall. The leak likely stems from another source, such as a leaky roof.

Now that the basic information has been obtained, look for patterns. If the water is coming in at the top of a bay window, there are probably cracks allowing the water to enter. Since it is coming in the house, it is safe to assume that flashing and weep holes are not present, or they are not properly installed.

How to Fix the Leak

Most of the time water enters a wall system through deteriorated sealant around window and door frames or through cracks in the wall. Start by reapplying sealant to seal the cracks. (Though make sure that you don't seal the weep holes.) This is the easiest and least expensive fix.

If the sealant is fine, and there are no cracks in the wall, a clear water repellent might do the trick. Most of the time water repellents will slow water penetration down, but will not stop the problem. There are drawbacks in applying a water repellent, so don't rush into this as a sure fix.

A water repellent, if used, should be a penetrating type such as a siloxane or a silane. These water repellents will allow water vapor transmission to occur. Basically, they will let water out, but won't let it in. The life span of water repellents is about three to ten years.

Always avoid film-forming water repellents such as silicone. These water repellents do an excellent job keeping the water out, but they also do an excellent job keeping the water in. This may well increase the possibility for future problems.

If the mortar has cracks or has deteriorated and is the cause of the leaks, repointing may be the answer. Repointing involves raking out the old mortar and installing new mortar. Normally, this only has to be done for certain sections and not the whole wall.

The last repair option, and the best long term solution to the problem, is to install flashing and weep holes where the leak is occurring. This can be expensive because sections of the wall have to be removed.

Flashing and weep holes are a permanent fix. If water gets in, this will get it back out and not allow damage to occur.