

## Water and Masonry Decay

To get right to the point, water is the primary cause of masonry decay!

Whether the water is causing damage by direct intrusion into the masonry surface through the natural pore structure, by water vapor movement through the masonry system or by corroding the anchor and support systems of the masonry, if you remove water from the masonry system, masonry decay is effectively stopped.

Primarily, water damage of masonry systems in the Northwest is caused either by freeze / thaw damage of continually wet masonry or corrosion of ferrous metal elements embedded in the masonry (including hidden brick veneer ties).

Freeze / thaw conditions are blamed for much of the masonry damage but the term is greatly over-used and exaggerated. In order for masonry to be damaged by ice crystals forming inside the pores of the material, the masonry must be approximately 85% saturated. Due to the rapid evaporation rate inherent in semi-porous materials (like most masonry products) constant saturation usually occurs only at or near leaking roof systems, improperly sloped coping caps, and defective scuppers and downspouts. This type of damage is usually very localized and symptoms are usually visible well before masonry damage actually occurs.

Corrosion of embedded ferrous structural elements, cramps, and wall ties is usually more of a concern with more modern masonry veneer systems but hybrid masonry systems suffer similar problems.

It is now apparent that when masonry construction was changing from load bearing walls with arched window openings to masonry veneer and masonry curtain walls, corrosion of the steel structural elements was not well considered.

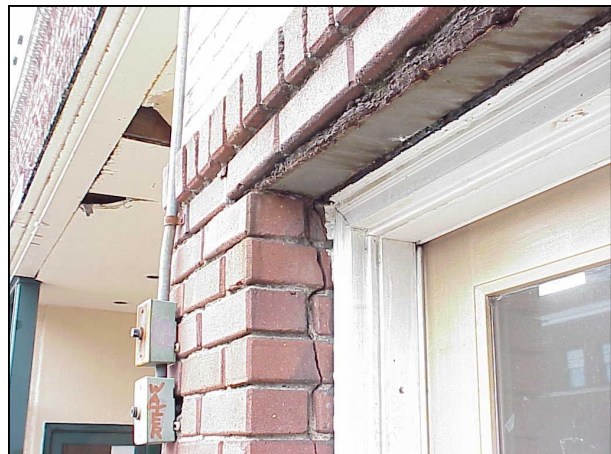
The primary force causing the masonry damage in veneer and hybrid systems (hybrid systems include load bearing masonry with embedded steel or cast iron beams and early high rise construction using masonry curtain walls for exterior cladding) is growth of ferrous oxide scale on the



Water damage from leaking scupper (above)



Oxide Jacking at steel lintel



Restrained side of embedded steel lintel splits brick door jamb. Note: brick are road pavers.

metal. As ferrous metals oxidize they rust, this rust converts the iron or steel surface into an oxide scale that can reportedly grow up to ten times the thickness of the original structural element. In other words, a steel lintel embedded in a masonry wall and supporting the brick above a window or door header can grow in height from .375 (3/8) inches to nearly 3.75 inches. My personal experience is that seven times the original height is more accurate. What this means however, is that a mortar joint that contains a 5/16<sup>th</sup> inch steel angle (typical window lintel) can become more than one and three quarters of an inch taller than original. What is difficult to believe is that the rust scale grows with an incredible amount of force. The upward or outward growth of the ferrous scale can easily move entire veneer sections or if restrained, crush the masonry in contact with it. Veneer anchors (wall ties) are typically designed to keep the masonry from moving laterally. Upward movement of the veneer will often disconnect or break the veneer ties. This disconnection usually causes bulging in the veneer prior to dropping off the building but not always.

We call this movement of the masonry by the structural elements "Oxide Jacking." Once Oxide Jacking has begun, the only way to stop it is to remove the masonry and protect or replace the iron or steel element or keep the metal totally dry. Obviously, keeping the metal totally dry is not an option in the real world!

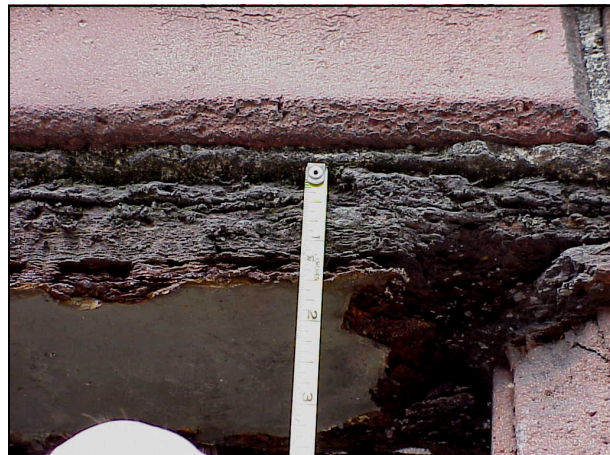
Fortunately, oxide jacking is a long term process that can be spotted well in advance of catastrophic failure of the masonry wall system. Unfortunately, oxide jacking is a long term process that makes ignoring it easy and it is the building owner that has the building farther down the road that suffers from high repair costs.

The accompanying photos are of damage caused by oxide jacking and structural steel corrosion. These photos show the visual clues that are almost always present on masonry buildings suffering from oxide jacking, it is merely a matter of recognizing the symptoms of the problem. All photos were taken by the author.

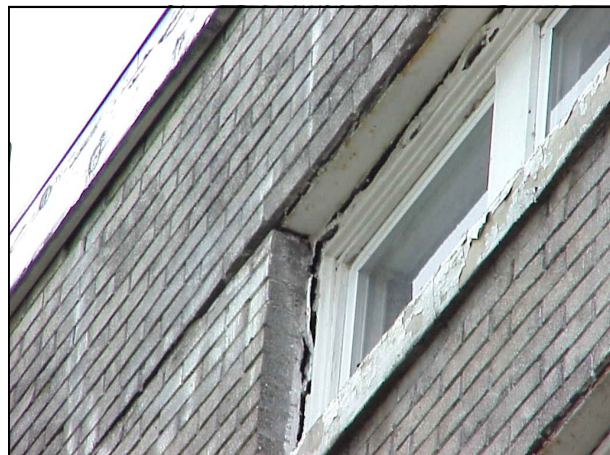
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Oxide growth at unrestrained side of steel lintel is much greater than loaded side



Original 1/4inch thick lintel is now 1-1/2 inches high and has lost most of its structural integrity



Classic example of brick veneer being moved around by Oxide Jacking at steel lintels