[FIREPLACE SMOKE TEST]

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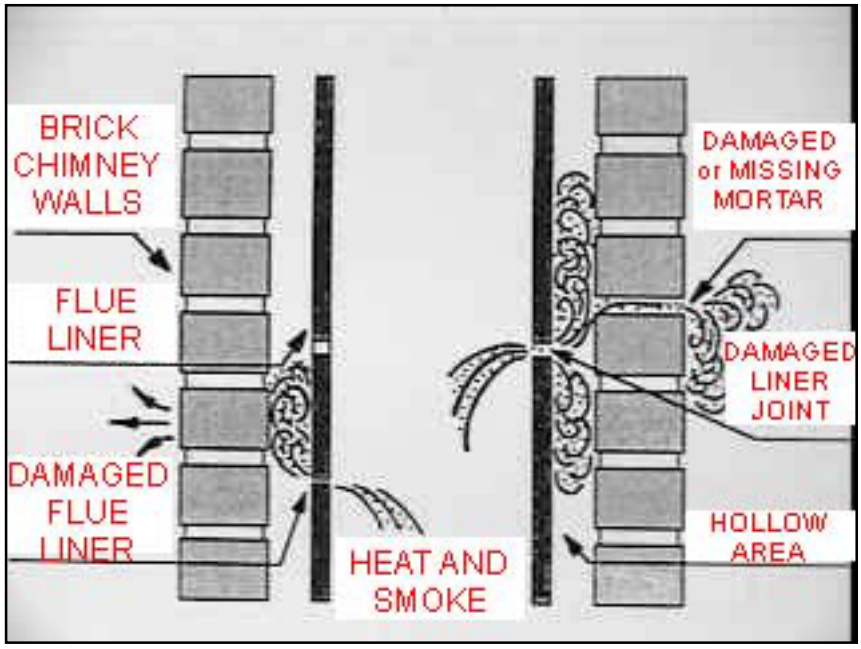
The smoke test was originally required at the time of construction for a masonry fireplace. This test was designed to locate open breaches in the masonry structure that may allow the passage of heat and smoke into dangerous areas while in operation. At the time of this test, all surface areas of the masonry structure are exposed for accurate detection. The breach, being an open, free flowing hole, also allows the simple passage of the expanding smoke without the use of pressure. The combination of these two factors, the complete surface exposure and the unobstructed breach, allowed an accurate detection.

There are many problems with the use of this test on earthquake damaged masonry fireplace structures. Many of the conditions have changed.

The two major factors listed above no longer exist. In many cases the fireplace is built in the middle of a wood framed dwelling and the exposed surface areas are limited to the attic and roof top. In most cases one or more walls of the fireplace adjoin the wood framed dwelling. These are the walls of concern due to the risk of fire.

Drywall, plaster, rock, and brick details used to make these fireplaces cosmetically appealing generally form an impervious barrier that prevents the passage of the smoke.



Cracks found in the structure caused by seismic activity are many times, small and tight fitting. These cracks are not always unobstructed nor allow the free passage of smoke as an open breach might do.

A "pressurized" smoke test has little advantage over the standard, simple expansion smoke test. The weight bearing down on these cracks can sometimes exceed twelve thousand pounds. Due to this weight factor, the cracks may not allow the passage of heat at the time of the inspection. Over time the upper material may move with wind loads and seismic activity causing the further deterioration of the damaged material. Eventually the resultant breach may-allow the free passage of heat and smoke.

The expansion and contraction of the masonry material, while under normal operation, can also effect the damaged areas. The fireplace chimney is designed to handle combustion gases of less then 1,000 degrees Fahrenheit under normal operating conditions. However combustion gases of 1,400 degrees Fahrenheit can occur during intermittent forced firing for up to one hour. These temperatures are measured at the flue outlet.

With a construction defect rate of approximately eighty percent in masonry fireplaces, another problem exists with the smoke test. It is common to find a lack of mortar between the exterior brickwork and the

inner flue liner. This area, on reinforced fireplaces , is where the steel reinforcement is located. The findings within this area are more often then not, spot bonded or completely hollow, typically known as semi-hollow or hollow core construction. The code requires that this area be filled solid with mortar for seismic strength and thermo conductivity. With a defectively constructed chimney there are often two structures, one within the other. The first would be the outer brickwork and the second would be the flue liner or inner brickwork. If either one of these two structures fails then there is a reduction in the strength. This may produce an unstable or unpredictable structure due to the combination of the damage and improper construction.

The lack of mortar may allow the heat and smoke to pass throughout the structure by traveling in the voids. If the liner is cracked, heat and smoke may travel between the liner and the outer brickwork. The heat may transfer through the single brick wyth or pass through a breach which may have gone undetected at the time of construction due to the lack of damage to the liner. Under these conditions, the chimney would often pass the smoke test. The improper construction of the fireplace structure, without damage, usually does not reduce its ability to operate safely. It does however reduce the ability to hold up to seismic activity as indicated by the fallen chimneys in the Northridge Earthquake. Many chimneys collapsed leaving the steel reinforcement, which was intended to secure the brick material, exposed yet still attached to the remaining fireplace structure.

Other conditions may lead to the misinterpretation of the smoke test results. A separation between the firebox and a decorative veneer located at the fireplace opening may permit smoke to travel into the wood framed wall. If this is not properly interpreted, the inspector may request the complete removal and replacement of the fireplace structure. Properly sealing this contact point with an approved material eliminates this particular hazard.

Many cracks do not allow the passage smoke at the time of inspection. Does this mean that this fireplace is safe to operate?... No but it may have passed the smoke test.

There are also Pre-Cast fireplaces that rarely fail a smoke test. These fireplaces are governed by the Manufactures specifications that will require removal of the entire fireplace if the crack passes through the firebox, smoke chamber or chimney walls even if it has passed a smoke test.

The problem with the smoke test is not the test itself, but the interpretation and value of the test. Home Owners can be given false assurance that their fireplace is safe to operate if it passed the smoke test. Conversely, they can be improperly advised to remove and rebuild a fireplace when test results are misinterpreted, potentially costing them thousands of dollars. In summary, the smoke test rarely has one hundred percent value in either direction. It is a tool, and as a tool is only a part of the overall inspection. A thorough investigation cannot be replaced with a simple smoke test.