



# Masonry Wall Cracks: Shelf Angle Failure



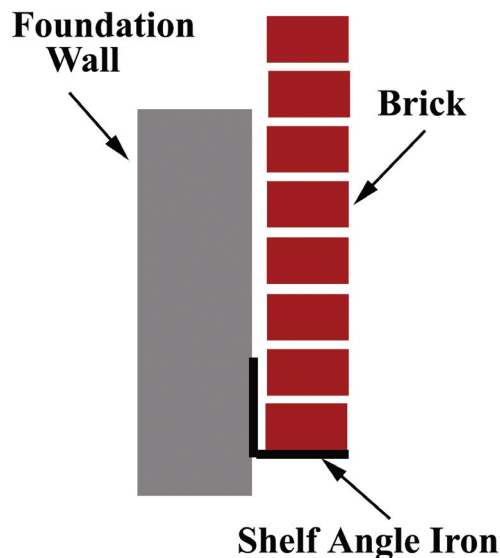
▲ Figure 1

Cracks in masonry walls can have multiple causes including construction defects or the settling of the foundation. Determining the accurate cause will take some careful investigation.

Figure 1 is a view of an insured's brick wall that started cracking near the base (upper arrow). One of the lower masonry units had fallen out, leaving the gap as indicated by the lower arrow. One may suggest that this is typical settling of the foundation wall, but no such downward deflection was noted in the foundation. There appeared to be a problem with the steel support of the brick veneer.

Figure 2 reviews the concept of the shelf angle support typically used in the construction of residential brick walls. The angle iron is secured to the foundation wall to support the weight of the masonry veneer wall. This transfers the weight of the veneer wall to the foundation, which can support the load without significant deflection when the foundation is designed properly.

Figure 3 is a view of the angle iron at one of the corners of the insured's ma-



▲ Figure 2



▲ Figure 3

sonry wall. The angle iron was fastened to the foundation wall at the ends only, with no fastening in the middle of the support.

Figure 4 shows the middle of the angle iron which has fractured and dropped down, causing a loss of support of the veneer and the initiation of a large crack in the grouting between masonry units.

Figure 5 is a close-up of the fracture surface. The lower arrow points to torch cut marks suggesting that this angle iron was cut at one time and then re-welded to form a straight piece. The upper arrow points to a poorly executed weld.

There was evidence of undercuts and lack of penetration, characteristic of a



▲ Figure 4

poor welding technique that resulted in a defective weld. The weld eventually failed, causing loss of support and development of cracks in the veneer. The root cause is a construction defect resulting in



▲ Figure 5

the failure of the shelf angle iron and not settling of the foundation. ❗

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Roberts Consulting Engineers, Inc., which provides professional engineering services in accident reconstruction, failure analysis, fire causation, explosion analysis, and biomechanics.

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