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FAILURES

Movement Control Can Prevent Masonry Cracks



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Shrinkage cracks in concrete masonry walls are not only unsightly, but can also lead to moisture penetration and performance problems. However, as Diane Throop, International Masonry Institute (IMI) director of engineering, says, “Shrinkage cracks are a fact of life, not a failure.” In other words, we need to accommodate them, directing as much as restraining and resisting.

Figure 1 shows a classic shrinkage crack. Concrete shrinks due to loss of moisture during curing; this occurs at different rates when there are changes in mass through the cross-section, where stress tends to accumulate in a wall. Controlling the shrinkage at these changes in mass at or near window/door openings, pilasters, and changes in wall height or thickness is critical. (Designers must also make provisions in a longer run of concrete masonry of the same height and thickness.) Locating well-detailed control joints at these locations allows for movement. Horizontal reinforcing directs shrinkage cracks to where they are wanted—at a control joint.

The stair-step cracking often seen at corners of doors and windows is also minimized through proper use of movement control at these locations. Figure 2 depicts stress accumulations at the corners without proper detailing to accommodate the movement that led to the stair-step cracking.

Movement control should be placed on one or both sides of the opening. The control joint should start at the next head joint past the end of bearing of a lintel. In a reinforced or structural wall, it should be located further from the opening; the engineer should be involved to ensure the control joint does not interfere from a structural performance standpoint.

Since prescriptive reinforcement is often required to be placed within 406 mm (16 in.) of openings, the control joints should, at minimum, be placed beyond that point and preferably to 1.2 to 1.8 m (4 to 6 ft) past openings. This is not a hard rule, but a general guideline. Often, placement centered between openings is a reasonable location.

Before a 1989 code change, designers could ask mason contractors to locate the control joints as they felt were necessary. This led to various problems in coordination and aesthetics, and disagreements over performance. The Masonry Standards Joint Committee (MSJC) *Building Code Requirements and Specification for Masonry Structures* (TMS 402/ACI 530/ASCE 5), states:

Section 1.2 Contract Documents and Calculations

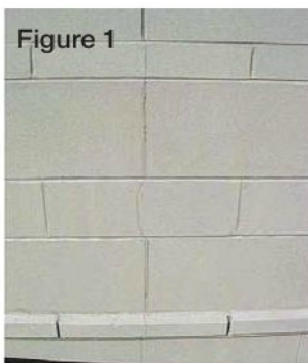
1.2.2 Show all code-required drawing items on the project drawings including:

- (h) Provision for dimensional changes resulting from elastic deformation, creep, shrinkage, temperature, and moisture.

In the “notes to the architect/engineer” section of its Mandatory Requirements Checklist: Part 3—Execution, the MSJC *Specification for Masonry Structures* (TMS 602/ACI 530.1/ASCE 6) says:

Indicate type and location of movement joints on the project drawings.

This clarifies responsibility for placing the joints is where it belongs: the designer of record. **CS**



At left, a classic shrinkage crack; at right, the result of stress accumulation at corners.