Masonry Movement Joints

All masonry walls will move, primarily due to changes in temperature and moisture content. Additional movement might occur from structural concrete frame moisture loss or creep, and elastic deformation. Restraining these movements may cause stress cracks to develop in the wall. The type of movement will depend upon materials, construction, and wall configuration. The primary movement in masonry wall construction is thermal expansion in clay masonry and shrinkage in concrete masonry.

ACCOMODATING MASONRY MOVEMENT

Brick masonry will typically expand due to changes in temperature and exposure to the sun. The south and west elevations of a building are always warmer than the other elevations due to the constant exposure of the sun. This will cause the brickwork to expand.

Concrete masonry, like most cast concrete, will shrink from water loss due to initial drying. This condition causes all concrete masonry units to shrink.

There typically are two types of masonry movement joints for concrete masonry and brick masonry construction. One joint will accommodate thermal movement in brickwork and the other joint will accommodate movement shrinkage in concrete masonry.

EXPANSION JOINT

An expansion joint is required to be constructed into the brick wythe to segment the brickwork, subsequently accommodating the thermal movement of the brick wall (photo #1). This should result in a crack free brick wall.

photo #1

An expansion joint detail is required to accommodate horizontal expansion. The expansion joint must be free of all non-compressible materials to allow for the compression of the joint. A compressible neoprene pad or foam backer rod should be placed in the joint. The compressibility of the filler should be a minimum of 50%. The expansion joint material should terminate approximately ½ in. to ¾ in. from the exterior of the wall and be filled with sealant. Also, all joint reinforcement must be discontinuous at the joint (Figure 1).

Spacing

Each brick masonry structure should be independently and thoroughly examined to determine expansion joint placement. The recommended spacing of expansion joints for brick veneer can be determined by a formula developed by the Brick Industry Association (BIA). The formula is as follows:

S_e = Spacing between expansion joints

W_j = Width of expansion, typically $^3/_8$ in. to ½ in.

e_J = Percent compressibility of expansion joint material (least of sealant)

$$\frac{S_e = W_j\, e_J}{0.09}$$

For example, if the width of the joint is ½ inch, the following spacing can be determined.

$$S_e = \frac{(0.5 \text{ in.})\ (50)}{0.09} = 278 \text{ in. or approximately } 23 \text{ ft.}$$

CONTROL JOINT

A control joint is required to be constructed in the concrete masonry wythe to create a plain of weakness in the wall, where a stress crack in the concrete might occur (photo #2). A control joint detail, required to resist shrinkage contraction and cracking in the concrete masonry wall, must be placed in the wall.

photo #2

Also, there are several other options to assist shrinkage cracks from developing in the concrete masonry wall in addition to control joints.

Adding additional horizontal joint reinforcement to the concrete masonry and constructing bond beam with reinforcement bar will increase restraint in the wall and will minimize any cracks from developing.

A control joint detail primarily consists of a hard, cross shaped rubber gasket. The joint is typically ½ in. wide and consists of two concrete masonry jamb block. The jamb blocks contain a notch to receive one of the flanges of the rubber control joint gasket. The rubber gasket should extend out into the head joint ½ in. to ¾ in. from the outer face of the concrete masonry. Also, the joint reinforcement must be discontinuous at the control joint. Upon completion, the joint should be filled with sealant (Figure 2).

Spacing

Spacing requirements for control joints in concrete masonry walls can be determined by the Empirical Crack Control Criteria listed in the National Concrete Masonry Associations (NCMA) TEK 10-02D.

Consider a 20 ft. high wall spanning 100 ft. in length, with each unit 8 in. high by 16 in. in length. Table 1 (NCMA TEK 10-02 modified) indicates a maximum control joint spacing of 25 ft. on center.

MASONRY JOINT LOCATION

While the spacing of expansion joints and control joints are different, the location for these movement joints are typically the same for both types of joints. Expansion and control joints should be placed at areas in the wall where the masonry is most susceptible to movement. These areas are near outer corners, adjacent to window openings, at changes in wall elevations, at wall buttresses, and where spacing requirements are required (Figure 3).

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	MAXIMUM LENGTH AND HEIGHT RATIO FOR CONCRETE MASONRY	MAXIMUM SPACING OF JOINT (IN.)
NOMINAL UNIT HEIGHT 8"	1.5 TO 1	25 FT.
NOMINAL UNIT HEIGHT 4"	1.5 TO 1	20 FT.

TABLE 1. NCMA CONTROL JOINT SPACING FOR CONCRETE MASONRY WALLS (MODIFIED)

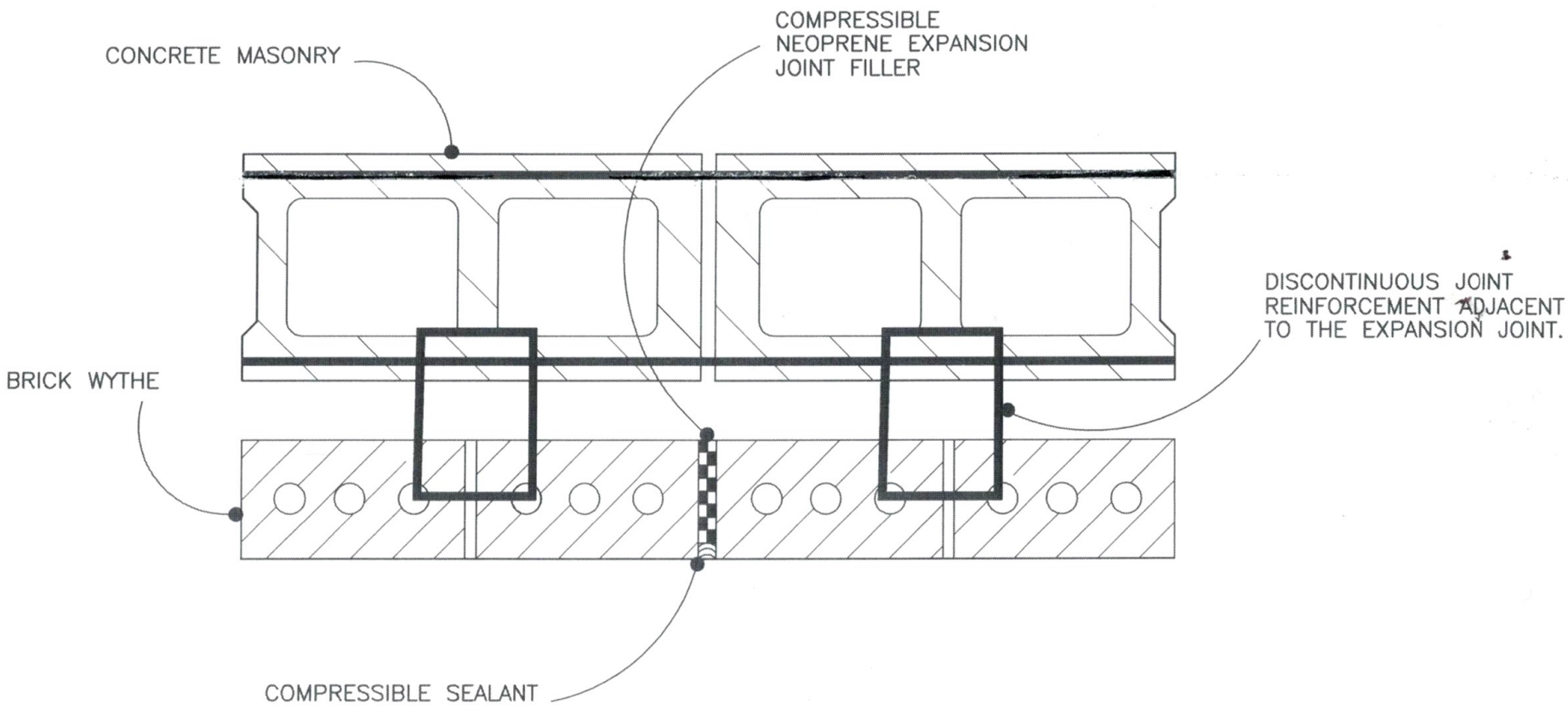
CONCRETE MASONRY
COMPRESSIBLE
NEOPRENE EXPANSION
JOINT FILLER
DISCONTINUOUS JOINT
REINFORCEMENT ADJACENT
TO THE EXPANSION JOINT.
BRICK WYTHE
COMPRESSIBLE SEALANT

FIGURE 1.

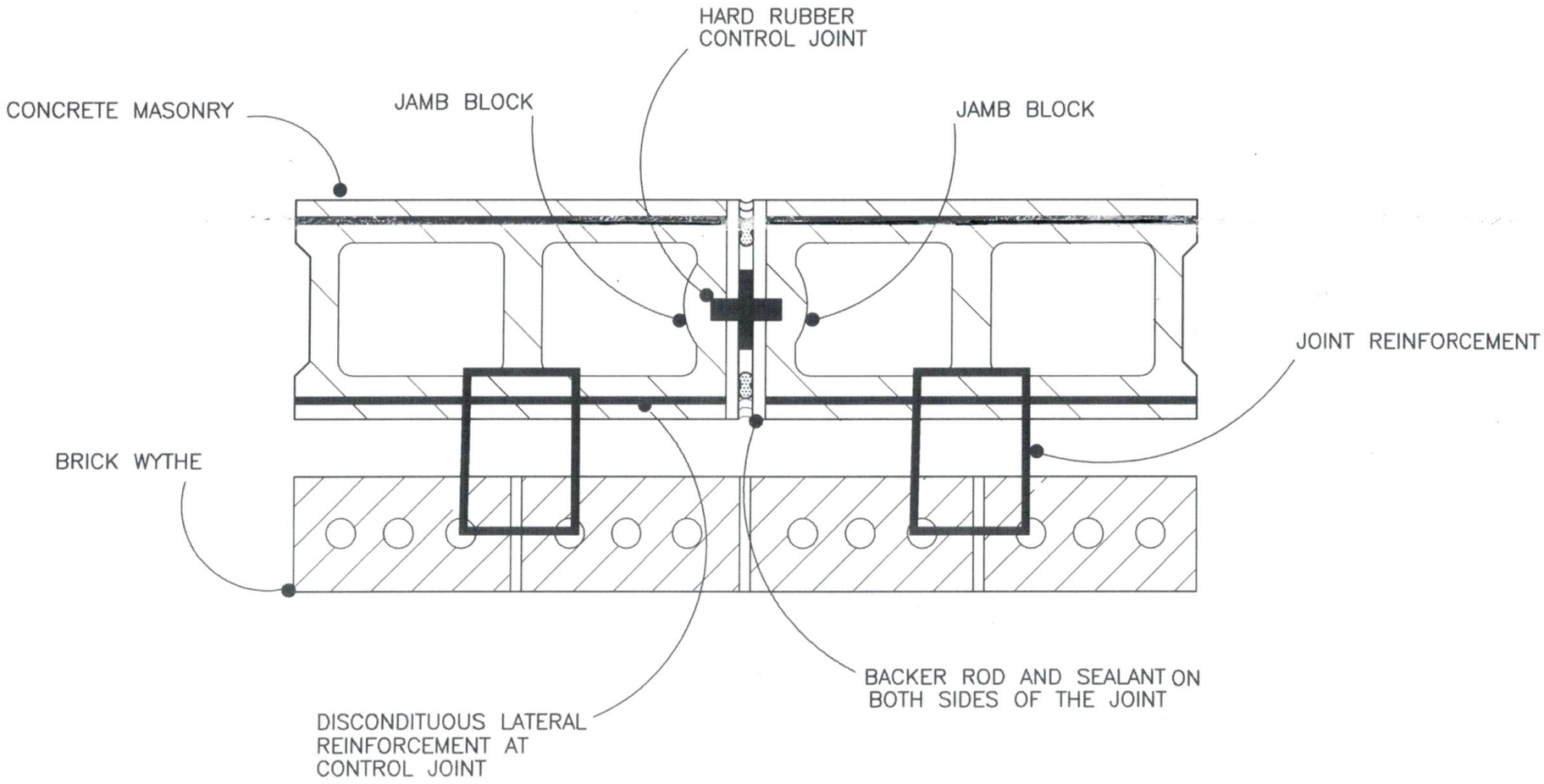
HARD RUBBER
CONTROL JOINT
CONCRETE MASONRY
JAMB BLOCK
JAMB BLOCK
JOINT REINFORCEMENT
BRICK WYTHE
BACKER ROD AND SEALANT ON
BOTH SIDES OF THE JOINT
DISCONDITUOUS LATERAL
REINFORCEMENT AT
CONTROL JOINT

FIGURE 2.

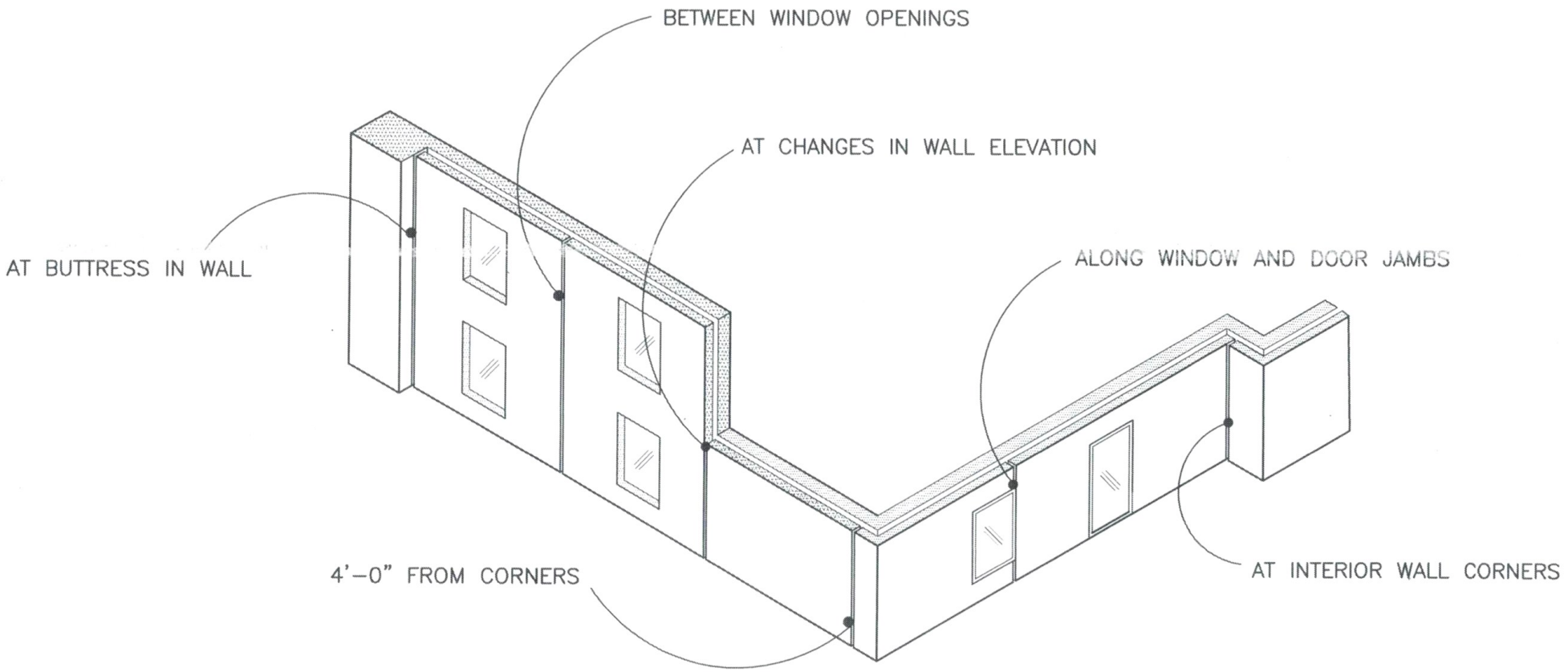
BETWEEN WINDOW OPENINGS
AT CHANGES IN WALL ELEVATION
AT BUTTRESS IN WALL
ALONG WINDOW AND DOOR JAMBS
4'-0" FROM CORNERS
AT INTERIOR WALL CORNERS

FIGURE 3.