

The more flexible the mortar, the more masonry expansion is generally offset within the wall panel.

Type N is idea in most situations due to its flexibility.

The foundation should always be separated from the masonry with a slip sheet or flashing.



The purpose of a compressible filler is to make sure that mortar is not installed in the joints. When we install a compressible filler, we must take into account the material compression plus the space needed.



The joint around a window needs to be reviewed due to the height in the wall and the type of structural frame. The high placement of the window, the greater chance of movement in the masonry that needs to be accounted for.

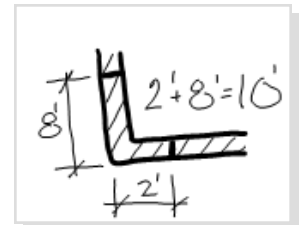
**A wall tie shall be placed 8"-12" on either side of a movement joint or corner...Which means that a stud is needed if the backup is CFMF.**

Building materials change size with temperature and moisture. Different materials within a wall section will move, expand, & shrink at different rates. The stress which is created by these differential movements are considerable and is only compounded by today's material technology and design. We must make sure that these facts are accounted for in our wall construction, otherwise, moisture will enter our wall system and cause damage to the exterior and interior of our buildings.

**Corey Zussman, AIA, NCARB - Director of Quality Management**



- ▶ There are three (3) types of movement joints: **Expansion** (Clay Masonry) **Control** (Concrete ), and **Isolation**.
- ▶ According to the "Masonry Standards Joint Committee" (MSJC), which develops masonry design & construction standards for the building codes states that "Designers shall locate all movement joints".
- ▶ Older masonry buildings which used 3 to 5 wythes of load bearing masonry were far less likely to crack due to the thickness of the masonry and live & dead compressive loads which restrained the wall and provided greater strength to resist the stresses. Also, the mortar was formulated to allow for more movement.
- ▶ When vertical movement is not properly accommodated in the design, the following happens:
  - LONG WALLS..... Sealant is forced out of the joint or diagonal cracks happen between openings.
  - CORNERS ..... Cracking occurs at the 1st head joint in plane of a wall.
  - OFFSETS/SETBACKS .... Vertical cracking at junctions.
  - STRUCTURAL FRAME .... Creep of frame or deflection of frame—horizontal cracking.
  - PARAPET WALL..... Exposed 2 sides & top and no dead load to resist movement —bowing at corners & middle.
  - WALL INTERSECTIONS.. Bowing and expansion toward the junction
  - FOUNDATIONS..... Create a diagonal crack in foundation or masonry, depending on the bond of the mortar.
- ▶ A 2-sided parapet wall which faces south & north will have a considerable about of temp. differentiation within the same wall section and compared to the wall below the parapet, which only has one face exposed.
- ▶ Clay masonry expands due to moisture. This expansion is irreversible. 60% of the masonry's expansion will happen within the first 3 months, 85% within the first 18 months after firing.
- ▶ Frequency of movement joints should be **25'-0" wall w/o openings, 20'-0" w/ openings & 15'-0" at Parapet walls** with exposed masonry on both sides and top.
- ▶ Locate Vertical Movement Joints:
  - Within 2'-0" to 10'-0" of a corner...with a total of 10'-0" between the two joints around a corner.
  - Offsets, Setbacks, Wall intersections, and Changes in wall heights.
  - Wall backing system changes (CMU backup to a steel stud backup).
  - Support of veneer brick changes and Wall function or interior climate changes.
  - When the space between openings is 8'-0" or greater, place in the middle, between the openings.
  - On one side of an opening if less than 6'-0" long, on both sides if greater than 6'-0" wide.
- ▶ Determining joint frequency and width, we should take into consideration the masonry color, orientation, and mortar type. A dark brown brick will be up to 20°F warmer than a light-colored brick.
- ▶ Typical total movement of brickwork: Movement = (0.0009) x (Length). [Movement & Length is in inches]



**EXAMPLE:** 10' wall: 0.0009 x 120" = **0.11" of movement**

- ▶ Actual size or frequency of movement joints may be 2x or 4x as originally calculated based on sealant choice.
- ▶ Equation for spacing between joints using sealant movement capability:
 

$S'' = W \times E / 0.09$	$S'' =$ spacing between joints
$W =$ width of expansion joint;	$E =$ percentage of sealant movement capacity
- ▶ **EXAMPLE:** (NP-1 has 35% & NP-2 & Dow 795 has 50% movement capability): NP-1:(3/8" x 35) / 0.09 = 145.8" = 12'-2" Between joints      NP-2/Dow 795:(3/8" x 50) / 0.09 = 208.3" = 17'-5" Between joints
- ▶ Brick expands from the base to a maximum at the top of the wall, while a concrete frame will shrink. This differential movement must be accounted for in the horizontal movement joint.
- ▶ Horizontal movement joints shall be located below shelf angles and structural elements with masonry is an infill.
- ▶ Horizontal joints should be 1/4" per 20'-0" of height (Brick Relief/Shelf Angle).
- ▶ When the back-up is steel studs, the maximum distance between horizontal movement joints shall be 30'-0".
- ▶ When back-up is concrete or steel, maximum distance between horizontal movement joints should be 50'-0".
- ▶ Locate an Isolation joint at different materials, such as CMU, Cast Stone, & contrasting color bands, etc. The isolation joint should consist of a racked back joint with backer rod & sealant and or a slip sheet (flashing).

The following information was compiled from various sources, such as BIA Tech Notes #18 & 18a, and other industry experts & associations.

