

PHOTOS: BRICK INDUSTRY ASSOCIATION



Photo (left) shows correct placement of expansion joints in a university building. Inset shows damage from the lack of an expansion joint at a junction.



26 WAYS TO PREVENT CRACKS IN BRICKWORK

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LEARNING OBJECTIVES

After reading this article, you should be able to:

- + **LIST** several physical characteristics and properties of brick that can affect brickwork installation and longevity.
- + **DESCRIBE** the proper location of horizontal and vertical expansion joints in brickwork according to Brick Industry Association Technical Notes 18 and 18A.
- + **DISCUSS** the use of a “lipped” brick course when a large horizontal expansion joint is called for.
- + **DELINEATE** the technical factors for locating expansion joints in thin brick applications according to Brick Industry Association Note 28C.

Changes in temperature or moisture can wreak havoc on building materials, and brick is no exception. Elastic deformation due to loads, creep, or changes in volume can cause movement, which can crack your project’s lovely brickwork.

There are two basic ways to avoid cracks in brick work: 1) minimize the movement, or 2) accommodate movement between materials and assemblies, through a system of movement joints that allow for some give in your brickwork.

THE BASICS OF EXPANSION JOINTS IN BRICKWORK

1. Be aware that brick can change slightly in volume, depending on the age and color of the brick, the direction the wall faces, and the temperature at installation.

2. Assume that bricks will increase slightly in size over their life. This is due primarily to moisture expansion and, says coauthor Brian E. Trimble, "it's part of how bricks are made." Brick Industry Association (BIA) Technical Note 18 has helpful formulas for calculating the movement of brick walls.

3. Use expansion joints in your brickwork. Expansion joints separate brick masonry into segments to prevent cracking caused by temperature change, moisture expansion, elastic deformation, settlement, or creep. They can be horizontal or vertical.

4. Don't confuse expansion joints with control joints. According to BIA Technical Note 18A, the term "control joint" is used in reference to concrete or concrete masonry construction. A "building expansion joint" is a through-the-building joint that separates a building into discrete sections to relieve stress. A "construction joint" (or "cold joint") is used primarily in concrete work when construction is interrupted.

5. Form the expansion joint correctly, by leaving a continuous unobstructed opening through the brick wythe and filling it with a highly compressible material, preferably premolded foam or neoprene pad. A backer rod and sealant are used out front to weatherproof the joint.

6. Make sure all expansion joint materials extend through the full thickness of the wythe to keep mortar and other debris from clogging the joint and block water from penetrating the joint as much as possible.

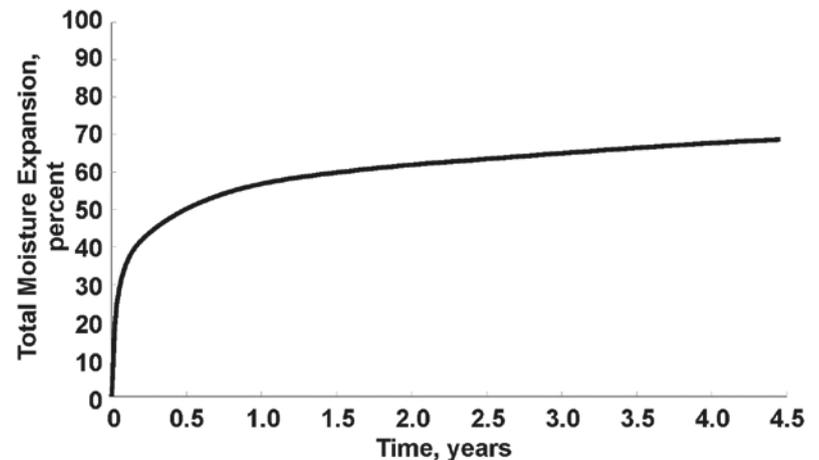
7. Don't use fiberboard or similar materials in expansion joints; they are not compressible.

8. Don't allow mortar, ties, or wire reinforcement to extend into or bridge the expansion joint, as these materials can restrict movement and undo the benefit of the expansion joint.

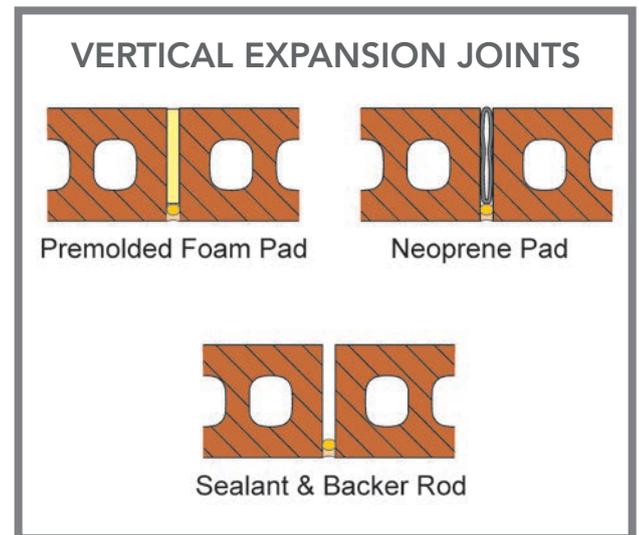
HOW TO APPLY VERTICAL EXPANSION JOINTS

9. Be aware that the positioning and spacing of expansion joints in brickwork will vary from structure to structure, depending on a variety of factors: the amount of expected movement, the size of the expansion joint, the compressibility of the expansion joint materials, restraint conditions,

Projected Moisture Expansion. Fired Brick vs. Time



Most of the expansion of fired brick due to moisture occurs in the first year of installation (above). Graphic (right) shows various methods for installing vertical expansion joints, as recommended by the Brick Industry Association. Source: BIA



elastic deformation due to loads, shrinkage and creep of mortar, construction tolerances, and wall orientation. "There's something of an art to getting this right," says Trimble.

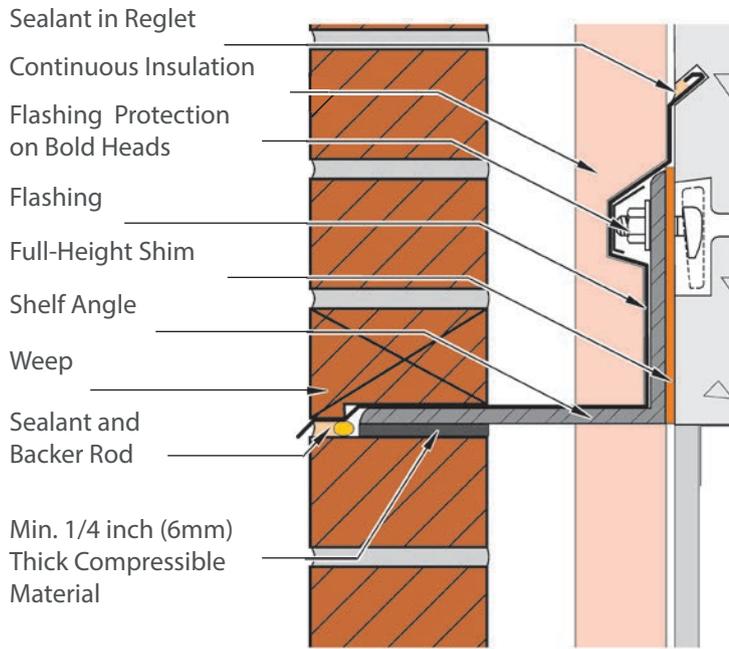
10. Don't go more than 20 feet without a vertical expansion joint for brickwork in a veneer or cavity wall. For brickwork without openings, place expansion joints no more than 25 feet apart. "This is a well-accepted rule of thumb in the industry," says coauthor James Tann.

11. Don't leave it up to the masons to position the expansion joints. "The design professional should take responsibility for determining the placement and spacing of joints," says Trimble.

12. Prioritize expansion joint placement in areas of high stress concentration, where cracking is most likely to occur. Starting at a corner and

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EXPANSION JOINT WITH LIPPED BRICK



▶ **Graphic illustrates the correct method for locating an expansion joint in a lipped brick course, which is used to allow movement while reducing the potential negative aesthetic impact of the expansion joint.**

placing joints at the typical spacing around the building perimeter is not recommended.

Tip: Begin placement at material transitions, junctions, and offsets before placing at an outside corner. By placing expansion joints at these high-priority areas first, only a few expansion joints, if any, will be required to meet the maximum spacing recommendations. For step-by-step details, refer to BIA Technical Note 18A, page 7.

13. Place vertical expansion joints at or near corners (outside and inside), offsets and setbacks, openings, wall intersections, changes in wall heights, and parapets. For corners, place an expansion joint within at least 10 feet of the corner on at least one of the two walls.

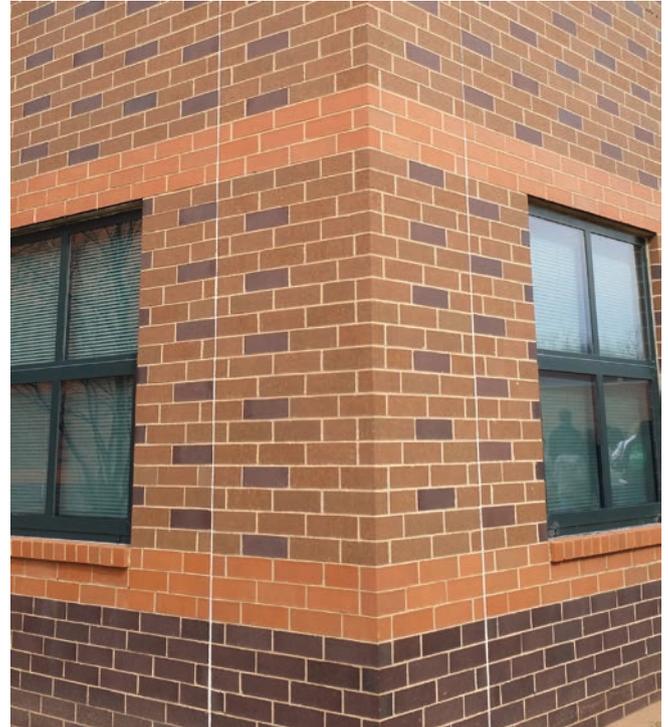
14. Place expansion joints at the junction of walls with different environmental or climatic exposures or support conditions.

Tip: Use expansion joints to separate adjacent brick walls of different heights to avoid cracking caused by differential movement. The joint can be placed at the interior corner or, if appropriate, a foot or so away from the corner to provide a masonry bonded corner for stability.

Note: Wall ties must be in place to properly support the brick wythes adjacent to the interior corner.

ADDRESSING HORIZONTAL EXPANSION JOINTS IN BRICKWORK

According to BIA Technical Note 18A, "Horizontal



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expansion joints are typically needed if the brick wythe is supported on a shelf angle attached to the frame or used as infill within the frame. Placing horizontal expansion joints below shelf angles provides space for vertical expansion of the brickwork below and deformation of the shelf angle and the structure to which it is attached."

15. Provide horizontal expansion joints under each shelf angle in structures that support the brick wythe on shelf angles.

16. Remove temporary shims that may have been used to support the shelf angle during construction.

17. Consider using a "lipped" brick course in cases where you see the need for a large horizontal expansion joint. Lipped bricks allow movement while reducing the potential negative aesthetic impact of the joint.

Tip: To avoid breakage, the height and depth of the lipped portion of the brick should be at least a half-inch (13mm).

Caution: For quality assurance, have your lipped brick made by your brick manufacturer. "Masons can saw cut a lip brick from a standard unit, but this is not as precise as what manufacturers can do. Overcutting, often performed when field fabricating lipped brick, can cause the cut units to fail," warns Tann.

18. Be sure to evaluate the movement tolerances of adjacent materials, including the

building frame itself. This is especially true for an anchored brick veneer with a wood frame backing when its height exceeds 30 feet. Additional detailing may be required to address the shrinkage of the wood.

For more information, refer to BIA Brick Brief: “Designing Anchored Brick Veneer Above 30 feet with a Backing of Wood Framing” (<https://bit.ly/3bmVxhP>).

19. Don't allow contact at any time between the lipped brick and the brickwork below the shelf angle or between the lip of the brick and the shelf angle.

ADDITIONAL FACTORS TO CONSIDER

20. Consider ways to make expansion joints less noticeable, especially on long, flat walls.

Tip: Try using architectural features such as quoins, recessed panels of brickwork, or a change in bond pattern to reduce any negative effect.

Or you might go so far as to call attention to the expansion joint by recessing the brickwork at the joint, or by using special-shaped bricks.

21. Try to locate expansion joints at inside corners, where they are less noticeable.

22. Don't hide expansion joints behind downspouts or other key building elements, unless you want to get a lot of nasty calls from the building's maintenance department.

23. Don't “tooth” expansion joints to follow the masonry bond pattern. This practice makes it harder to keep debris out of the joint during construction; such debris can interfere with the proper movement of the joint.

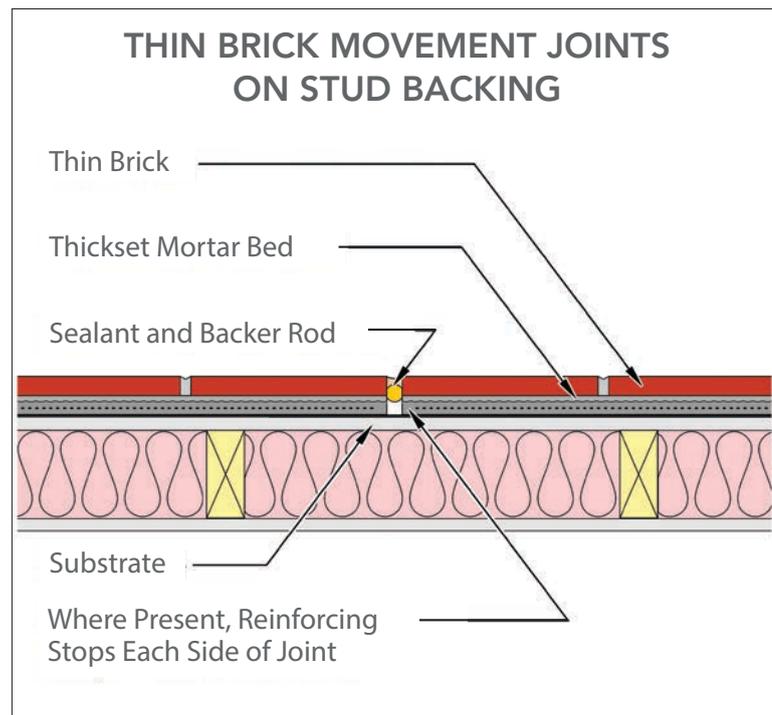
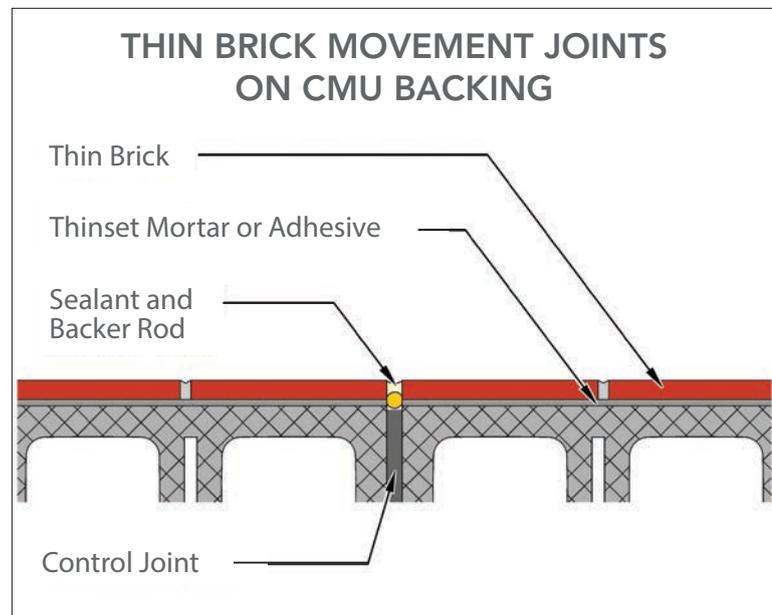
24. Consider the use of expansion joints in reinforced brick walls. “While the reinforcing aids in resisting movement, expansion joints at traditional placements can reduce stress concentrations in the masonry, as well as the potential for cracking,” says coauthor Charles (Chip) Clark.

25. Provide expansion joints in thin brick applications, per BIA Technical Note 28C.

BIA Technical Note 28C on expansion joint placement in thin brick recommends the following:

Extend movement joints through the thickness of the entire veneer assembly, for the full length or height of the veneer, including parapets. Space joints no more than 18 feet (5.5 meters) on center in either direction.

The maximum area between movement joints should not exceed 144 sf (13.4 square meters) or a length-to-height or height-to-length ratio of 2½:1. Align veneer movement joints directly over



substrate movement joints.

For proprietary modular and prefabricated thin brick panels, follow manufacturer's instructions.

26. Study the BIA Technical Notes. Technical Note 18 (“Volume Changes – Analysis and Effects of Movement”), Technical Note 18A (“Accommodating Expansion of Brickwork”), and Technical Note 28C (“Thin Brick Veneer”) at:

<https://www.gobrick.com/read-research/technical-notes>. +

Two techniques for proper installation of thin brick movement joints. For best results with thin brick projects, follow Brick Industry Association Technical Note 28C.