THE BRICK INDUSTRY ASSOCIATION

Brick Brief

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SUPPORTING BRICK MASONRY VENEER

Introduction

Adequate support of brick masonry is vital for long-term performance of wall assemblies. To ensure proper masonry support, the designer must consider structural capacity, safety concerns, and construction tolerance issues. This *Brick Brief* discusses the support of brick masonry veneer and provides solutions to common field installation problems.

Structural Masonry vs. Veneer

Structural masonry elements must be designed in accordance with one of the engineered design methods in TMS 402 *Building Code Requirements for Masonry Structures* (TMS 402) and are therefore outside the scope of this document. TMS 402 presents several permitted methods for the design of masonry veneer. This document applies to veneer designed in accordance with the prescriptive method.

Bearing Material

Brick masonry veneer must be supported on materials that meet the following requirements:

- They must be allowed by the local building code and must be noncombustible—such as concrete, steel or masonry. In certain circumstances, brick veneer can be supported on wood construction.
- They must have sufficient bearing area to properly transmit the weight of the brick masonry and any applied loads to the supporting member or foundation.

Bearing Dimensions

Unless the veneer is engineered, the first course of brick must have at least two-thirds the thickness of the brick wythe (unit) bearing directly on its support (Figure 1). This keeps the weight of the brick masonry over the support. This minimum bearing requirement applies to foundations, lintels and shelf angles (Figure 2) and is consistent with the corbelling requirements of TMS 402, the *International Residential Code* and the *International Building Code*. In the case of steel lintels and shelf angles, the bearing dimension does not include the radiused edge of the angle toe. Projecting more than one-third the thickness of the brick wythe can lead to wall instability, cracking of the brick masonry and failure by collapse. Occasionally, the differing construction tolerances of various materials and errors in construction make achieving adequate bearing challenging.

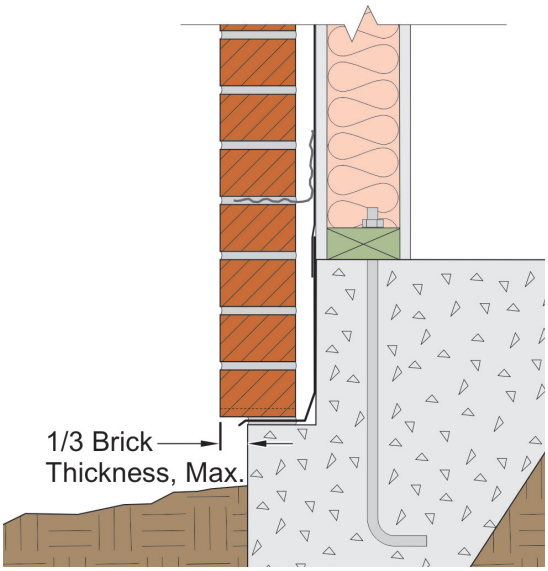

Figure 1: Bearing on Brick Ledge

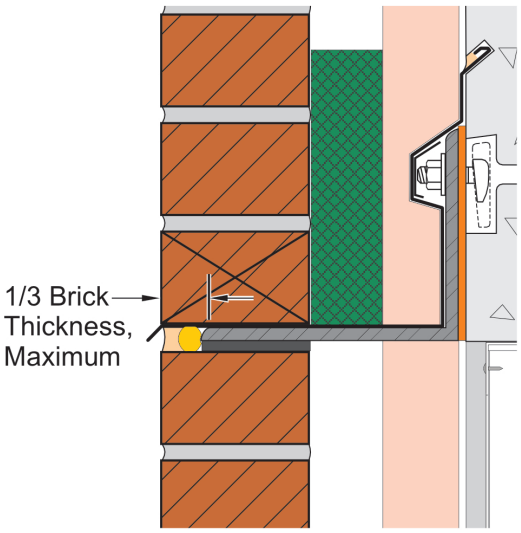

Figure 2: Bearing on Shelf Angle

Causes of Reduced Bearing

Construction Tolerances. Construction tolerances refer to the permissible dimensional variation of each component of the assembly. The combinations of these variations, while individually within permissible tolerances, can make it difficult to achieve adequate bearing of the brick masonry. It is unlikely that the maximum or minimum value of these tolerances will occur simultaneously. As a result, when planning for

tolerances as part of new design, it is recommended to use a probabilistic approach such as square root of the sum of the squares (SRSS) rather than simply adding the tolerances. Permissible construction tolerances:

- **Material tolerances for the brick units, Type FBS Rough:** ⅛ in. (3.2 mm) for 3 to 4 in. (76 to 102 mm) thickness
- **Brick masonry walls:** ±¼ in. in 10 ft (6.4 mm in 3.05 m), horizontally or vertically (from plumb or line)
- **Brick masonry walls:** ±½ in. in 20 ft (12.7 mm in 6.10 m), from location in plan
- **Concrete foundation or spandrel beam:** ±¼ in. in 10 ft (6.4 mm in 3.05 m)
- **Concrete foundation or spandrel beam:** ±½ in. in 20 ft (12.7 mm in 6.10 m), from location in plan
- **Shelf angles and other structural steel:** ⅜ in. (9.5 mm) out of alignment

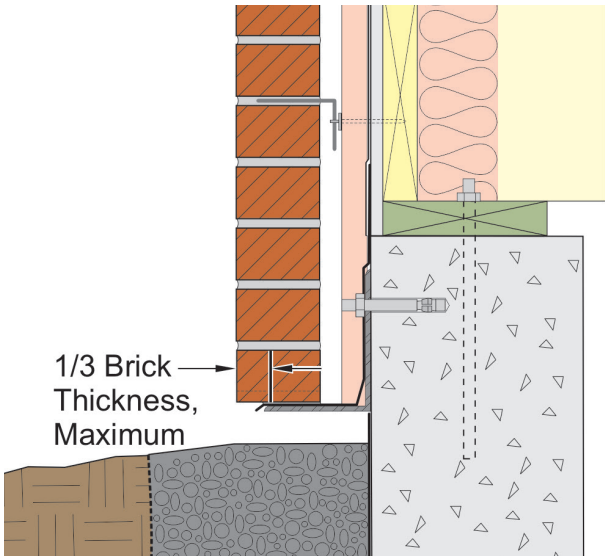

Figure 3: Retrofit Shelf Angle

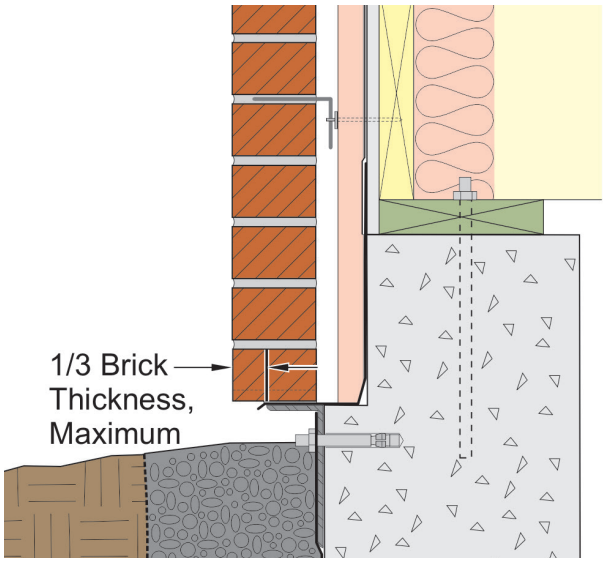

Figure 4: Inverted Angle to Extend Bearing

Deviations in Construction. Deviations in construction occur when frames are out-of-plumb, framing elements are misaligned or mislocated, foundation walls are improperly located, or any other as-built condition occurs to adversely affect the bearing of brick masonry.

Prior to setting the first brick unit, the existing conditions that relate to or impact the brickwork should be examined to determine whether they are in conformance with the project requirements. If items that impact the installation of the brick are found to exceed the project standards (out of specification tolerances) those conditions should be brought immediately to the attention of the person in charge and a remedy implemented.

Correcting Reduced Bearing

When existing conditions or work built by others result in bearing dimensions less than the recommended minimum, potential remedies include the following:

- **Increasing the width of a bearing surface:**
  - Welding a steel plate to a shelf angle, effectively lengthening the bearing surface, or extending the horizontal leg of the angle.
  - Bolting a steel shelf angle to the foundation as shown in Figure 3 and Figure 4. Consideration must be given to the effect of the increased eccentricity of the brick masonry on the support. Steel plates or angles, including their attachments, fastened to concrete must be hot-dipped galvanized before fabrication if made from mild steel, or provide elements made from Type 304 or 316 stainless steel. Plates or angles, including their attachments, that will be below finished grade must be fabricated from Type 304 or 316 stainless steel.
- **Corbelling the brickwork above the bearing surface** (see Brick Brief “Corbels”):
  - When the first course of masonry projects more than one-third of the brick’s thickness or the prescriptive corbelling limits are exceeded, an engineering analysis must be conducted, and additional ties may be needed to resist the induced overturning.

In all circumstances, brick ties should be placed as close to the bearing course as possible without adversely affecting flashing performance, no more than 16 in. (406 mm) from the bearing surface.

In some cases, these remedies may be the only means to provide sufficient bearing or to avoid laying wavy walls resulting from the bricklayer adjusting the position of the brick masonry to accommodate field conditions.

Brick Briefs are short discussions of a particular topic. The information contained herein must be used with good technical judgment. Final decisions on the use of this information must rest with the project designer and owner.