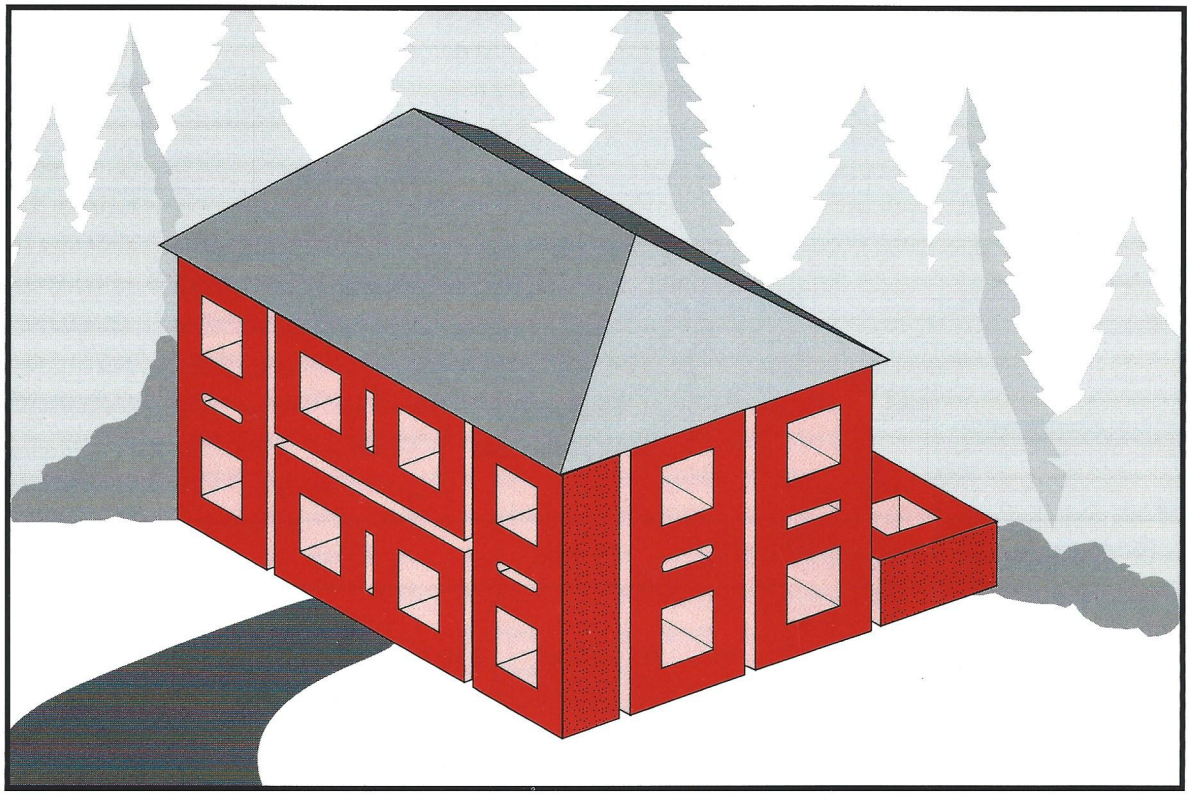
The Loadbearing Brick Home



Structurally Sound, Competitively Priced

The single-wythe loadbearing brick home is becoming more and more popular. Loadbearing brick masonry offers the brick exterior finish that customers prefer while taking advantage of the inherent strength of brick. With this type of wall system, wood framing in the exterior walls becomes unnecessary. This saves material cost and construction time, making the system attractive to the builder. Long-term maintenance, energy, and insurance savings as well as high resale value appeal to the consumer. Available in a variety of soft, natural colors and a range of textures to suit any project, brick suits the needs of today's competitive construction market.

Recognized by Building Codes

Using rational (engineered) design, multi-story residential and commercial buildings can be designed and constructed using 4", 5", or 6" hollow or solid single-wythe brick masonry. In addition, the CABO *One and Two Family Dwelling Code*, the SBCCI *Standard Building Code*, and the ACI/ASCE/TMS *Building Code Requirements for Masonry Structures* all allow one-story single-wythe 6" loadbearing brick masonry construction using empirical design. Codes contain allowable compressive stresses and lateral support requirements, but, in most applications, these requirements are met without special detailing. This brochure focuses on empirical design of 6" loadbearing brick homes.

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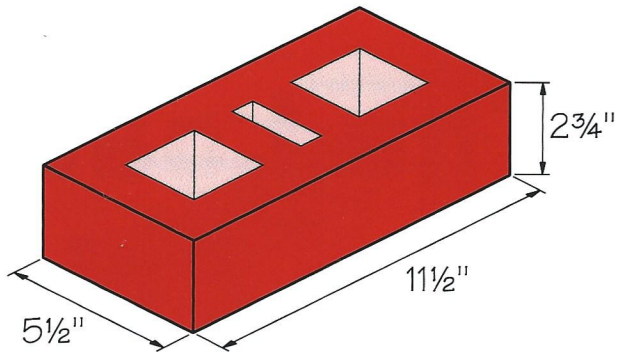
6" Brick Exterior Walls

The 6" brick "shell" of the home acts as both the exterior finish and the structural frame, greatly reducing the need for framing carpenters on the job site. Construction of the loadbearing 6" brick wall is fast and easy, allowing the mason to work from the interior floor slab. After bricklaying is completed, pressure treated furring strips (1x2 or 2x2) are attached to the interior face to create an air space for drainage, as well as to give convenient locations to attach insulation and the interior finish (typically drywall). Insulation can vary in style, but is most commonly rigid board insulation attached at the interior side of the furring strips.



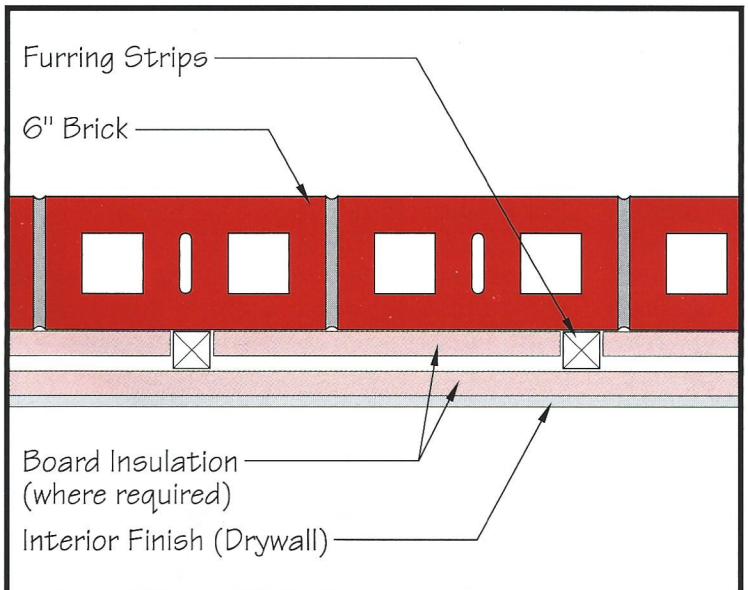
Total area of cores is typically <25% of brick area, thereby satisfying CABO requirements for use of solid masonry in exterior walls.

Typical 6" Norwegian Unit

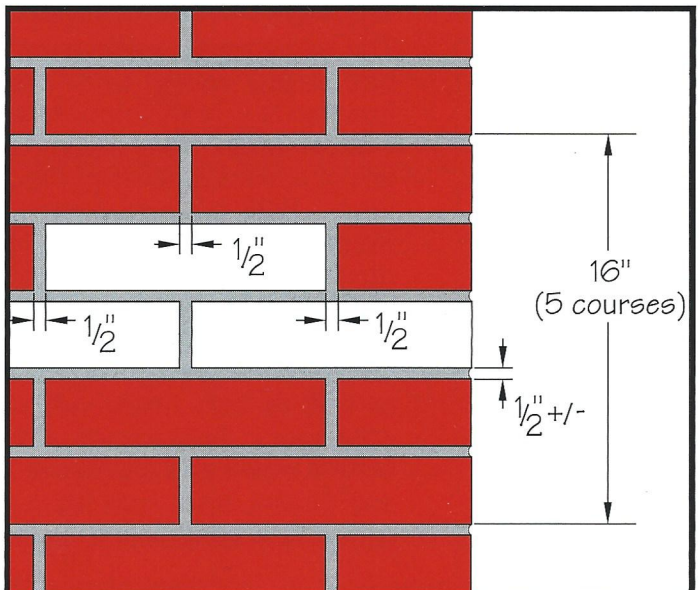
Table 1 - Material Requirements[1]

Unit Designation	Actual Dimension t x h x l	Nominal Joint Thickness	per 100 sq. ft.		per 1000 units	
			Brick (units)	Mortar (cu. ft.)	Brick (units)	Mortar (cu. ft.)
6" Norwegian	5½ x 2¾ x 11½	½ inch	375	8.1	266.7	21.6

1. Material quantities are theoretical, based on the unit and joint dimension shown. Brick quantities should be increased by 5% to accommodate waste and breakage. Mortar quantities should be increased by a factor of 2 to 2.5 to account for waste and actual consumption, based on field experience. Selection of mortar type is determined by design requirements. It is recommended to use the lowest compressive strength mortar which satisfies these requirements.



Typical Wall (Plan)



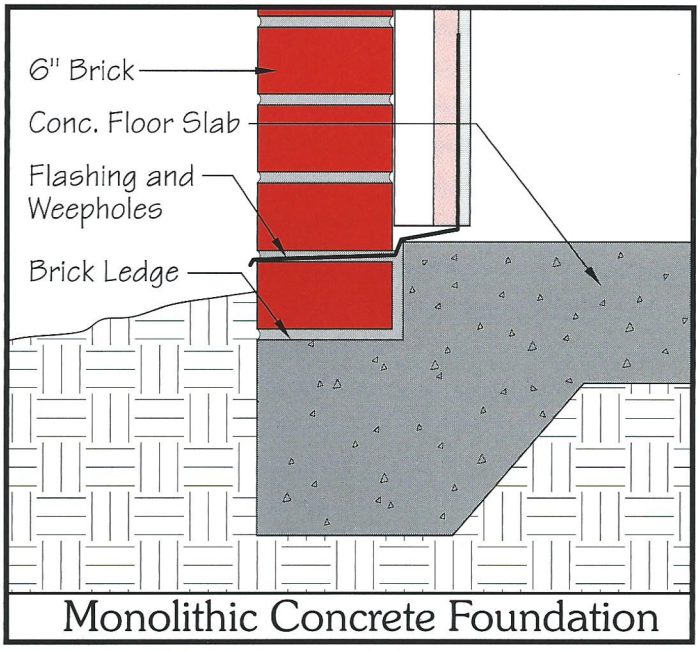
Typical Wall (Elevation)

Foundations

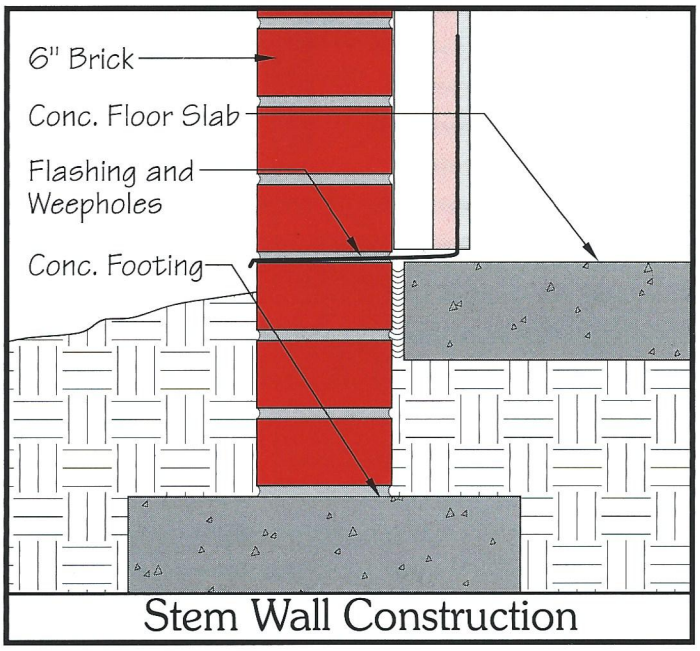
Loadbearing brick homes are typically constructed using a concrete floor slab, with several types of foundation configurations possible. Where the brick wall is continuous to the footing (stem wall construction), the concrete floor slab "floats" on compacted fill soils, and is separated from the brick walls with isolation joints. Where the brick rests on a monolithic slab foundation, a brick ledge, with appropriate flashing and weep holes, is required to maintain positive drainage of penetrating water.

For wood flooring systems, foundation walls are typically masonry units, either concrete masonry, brick masonry, or a combination of the two. It may be necessary to use nominal 4" brick or CMU in addition to 6" brick to give an appropriate design. All forms of construction must allow sufficient bearing for floor joists as well as provide for flashing and weep holes.

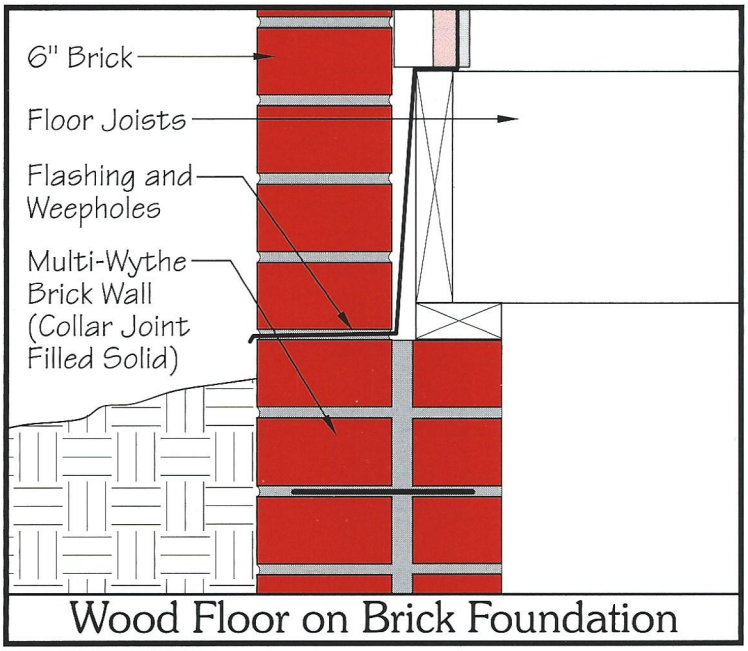
In some situations, a foundation wall thicker than 6" may be required due to imbalanced soil loading, wind loading, etc. In these cases, a foundation wall similar to that for wood flooring systems can be constructed of brick or concrete masonry or poured concrete. Consult local building codes for information regarding minimum required foundation wall thickness.



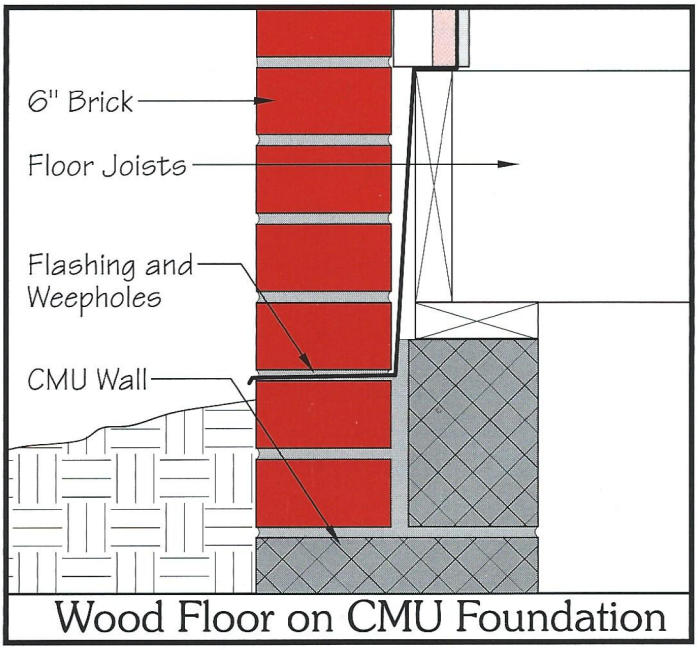
Monolithic Concrete Foundation



Stem Wall Construction



Wood Floor on Brick Foundation



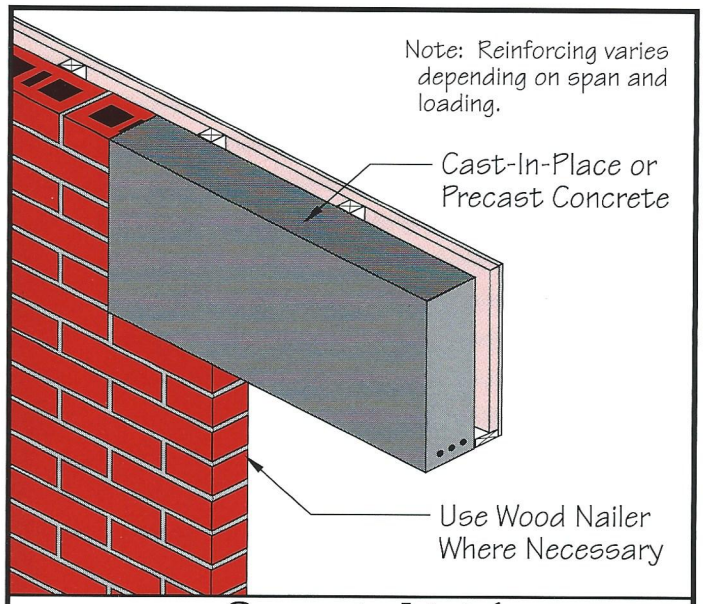
Wood Floor on CMU Foundation

Wall Openings

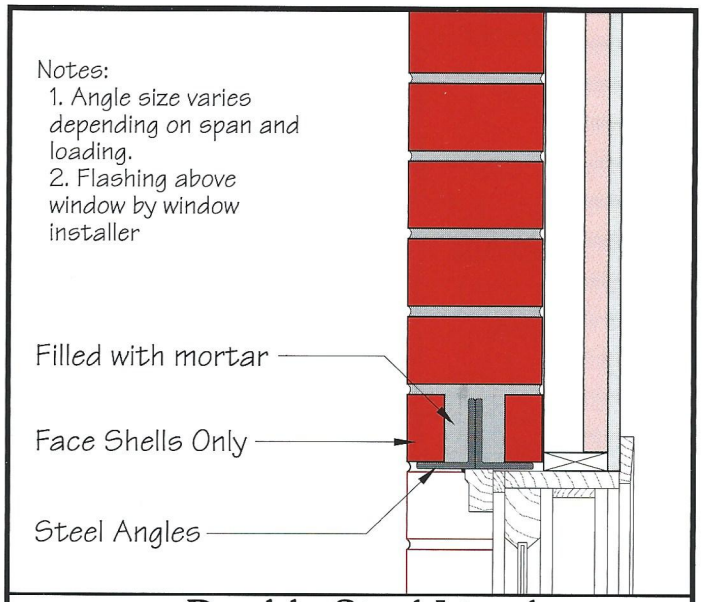
At windows, doors, and other openings, lintels are necessary to carry the masonry and roofing loads imposed. In loadbearing 6" brick construction, cast-in-place, reinforced concrete lintels are sometimes used. To maintain the brick bond pattern above openings, back to back steel angles or special steel shapes which have upturned legs within the brick course above can be used. The face shells of the brick above are removed and laid in mortar on each side of the upturned legs, with the normal course above holding the shells in place.

The most common type of lintel relies on reinforced masonry, brick or concrete, to span the opening. Allowable spans are dependent upon lintel construction and are determined by the structural designer. As with any opening in a brick wall, flashing and weep holes are required at the top of the opening.

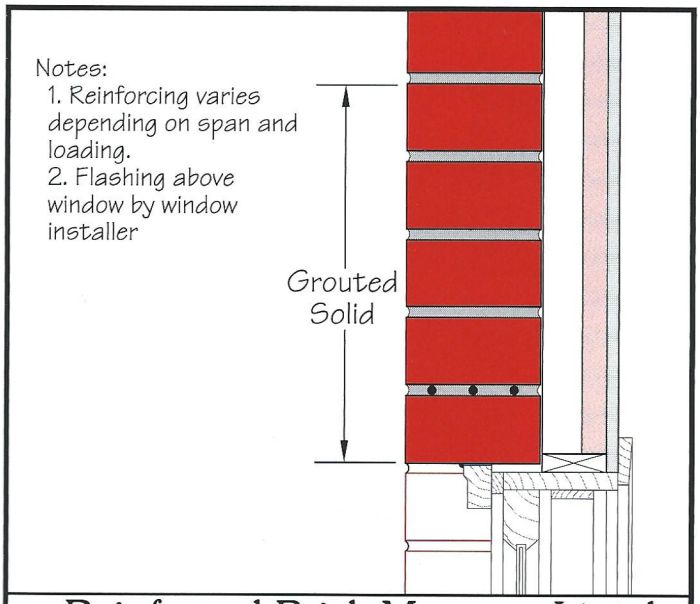
For brick window or door sills, either 4" or 6" standard or special-shaped brick can be used as a rowlock. As with lintels, proper flashing and weep holes are required at window sills and can be placed directly below or one full course below the bottom of the rowlock.



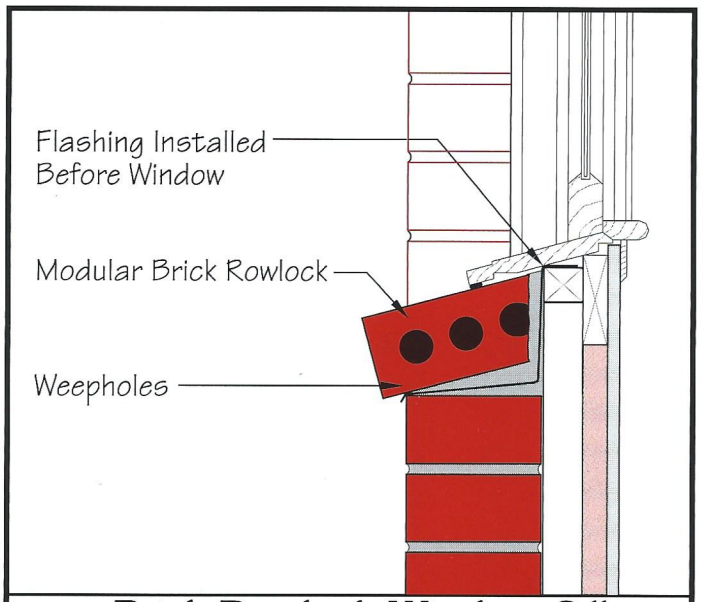
Concrete Lintel



Double Steel Lintel



Reinforced Brick Masonry Lintel



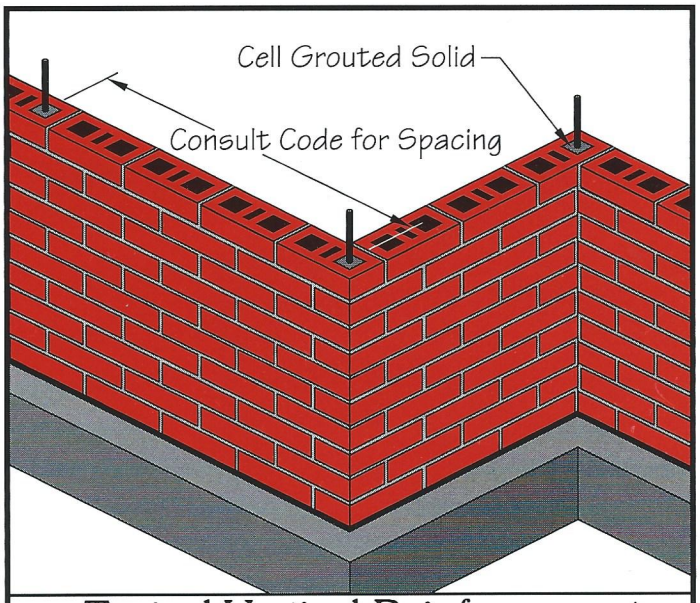
Brick Rowlock Window Sill

High Wind Areas

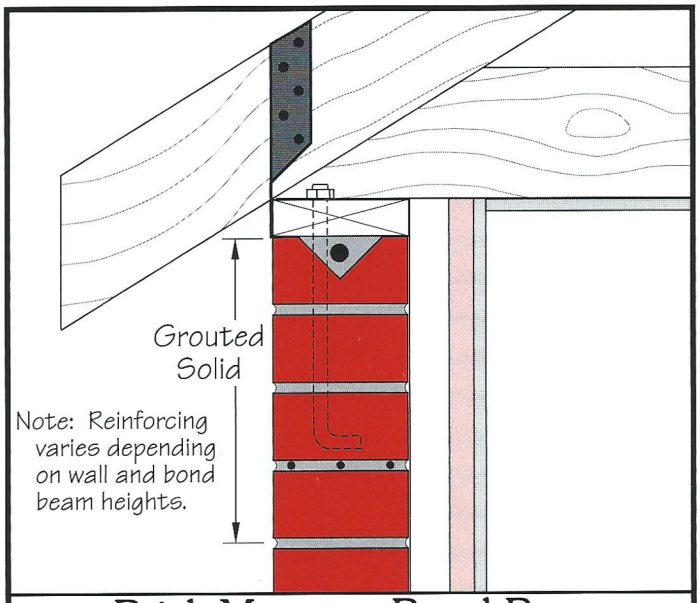
In coastal and other regions of the country, high wind conditions necessitate careful attention to detailing of brick masonry exterior walls. Generally, this means adding reinforcing steel within the masonry, as well as anchoring the walls to the foundation. Specific building code requirements vary from location to location, depending on the design wind speed.

Vertical reinforcing is typically placed within the brick cores, spaced throughout the wall and at building corners, grouted solid (not slushed) through the entire height of the wall, and tied into the foundation. Horizontal reinforcing is typically placed within a bond beam at the top of the wall. The bond beam can be either cast-in place concrete or reinforced, solidly-grouted brick or concrete masonry and varies in height depending on materials. Consult local codes and standards for requirements for locations and sizes of reinforcing.

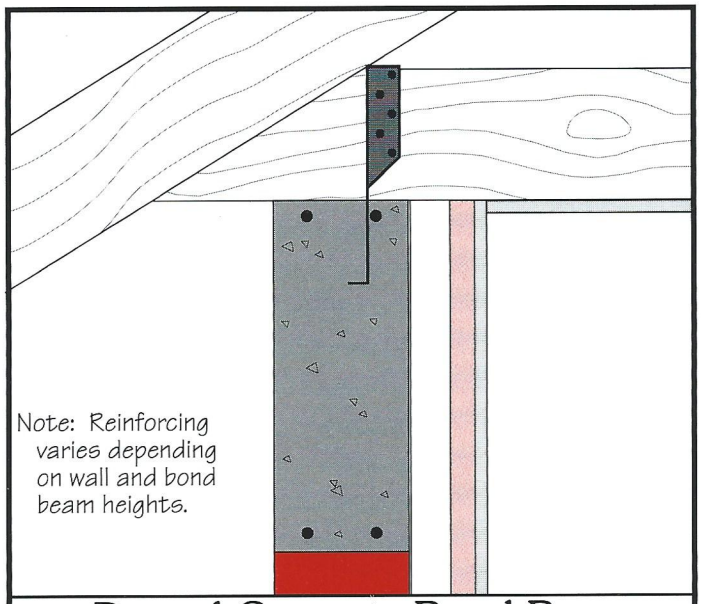
In the majority of one-story homes, the bond beam is integrated with window lintels and/or rake beams to give a continuous band around the home's perimeter. Appropriate reinforcing and other details to tie these elements together should be used.



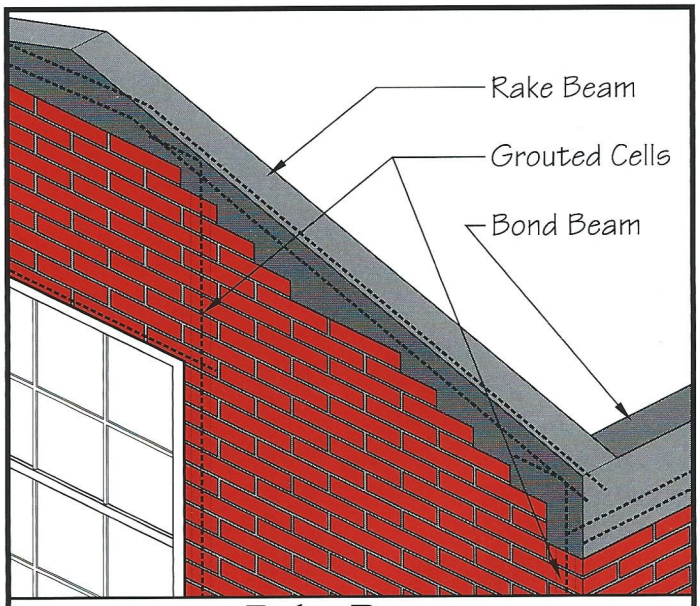
Typical Vertical Reinforcement



Brick Masonry Bond Beam



Poured Concrete Bond Beam

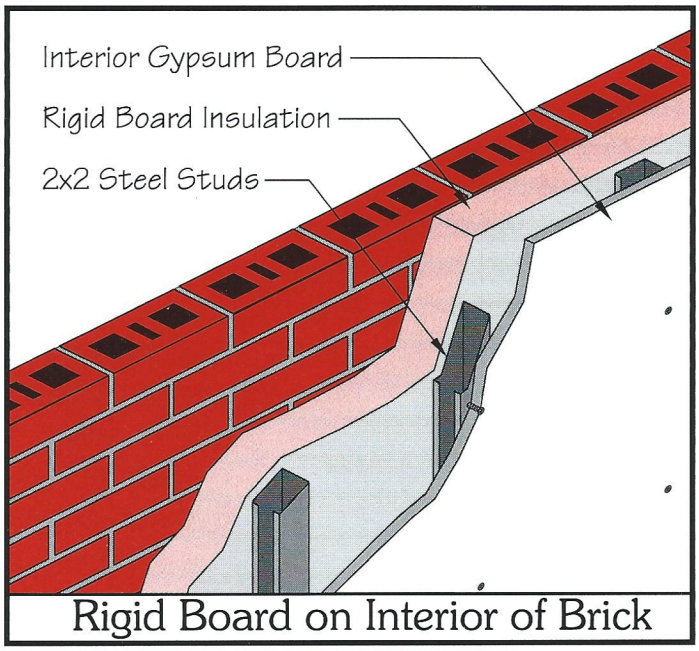


Rake Beam

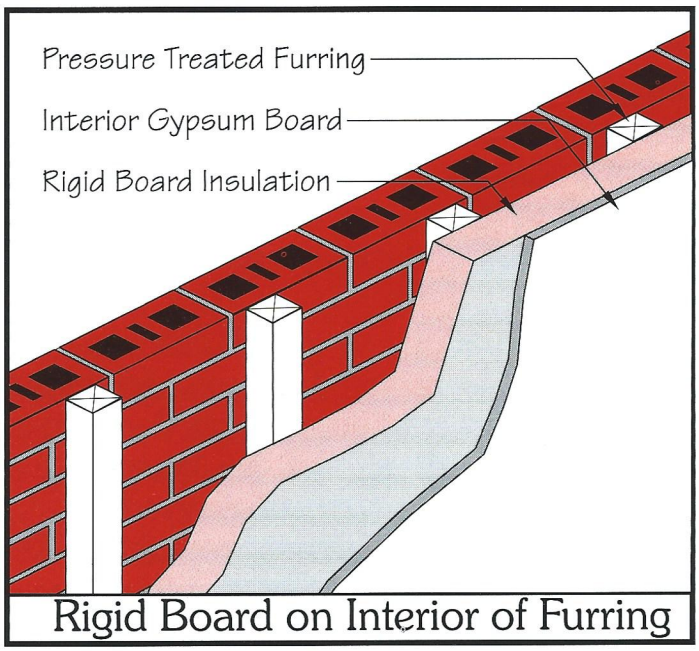
Insulation

Brick masonry homes offer several energy advantages, including a single "skin", a layer of insulation unbroken at stud locations, and thermal mass. The single skin means that the entire wall system (including finishes) acts as a single unit, limiting cracking and separations due to individual movement of differing wall materials. The continuous layer of insulation provides a more energy efficient and more comfortable home. Finally, thermal mass is a property which slows the passage of heat through walls, lessening the load on heating and air conditioning equipment, saving the homeowner money on utility bills. Because of thermal mass, energy codes require lower insulating values for brick masonry versus other building materials, saving the builder money during construction.

Typically with single-wythe masonry, rigid board insulation is used. It can be placed either directly against the interior face of the brick or on the interior side of furring strips. In the first case, either furring is nailed into the mortar joints through the insulation board or non-loadbearing steel studs are fastened to floor and ceiling on the interior of the insulation. In either case, joints in the insulation board should be taped on the interior side to maintain the air space as an insulating cavity.



Rigid Board on Interior of Brick



Rigid Board on Interior of Furring

Furring/Stud			P.T. 1x2 or Steel 2x2[1]		P.T. 1x2	P.T. 2x2	Steel 2x2
Spacing (in.)			16 or 24		24		24
Insulation Loc.			Continuous Over Wall Area		Bet. Furring[2]		Bet. Studs[2]
Insulation Type			Standard	Foilback	Standard		Standard
Value Required for Total Wall	U	R	R-Value of Insulation to Use to Achieve Value Required for Total Wall (linear interpolation permitted)				
	0.25	4.0	1.1	None	2.1	2.1	2.2
	0.20	5.0	2.1	0.6	3.3	3.1	3.5
	0.15	6.7	3.8	2.2	5.3	5.1	5.7
	0.12	8.3	5.4	3.9	7.6	7.1	8.1
	0.10	10.0	7.1	5.6	10.0	9.2	10.9
	0.09	11.1	8.2	6.7	11.7	10.8	12.9
	0.08	12.5	9.6	8.1	14.1	12.8	15.7
	0.07	14.3	11.4	9.8	17.4	15.5	19.8
	0.06	16.7	13.7	12.2	22.5	19.5	26.4
	0.05	20.0	17.1	15.5	31.0	25.9	38.8
	0.04	25.0	22.1	20.5	49.0	37.6	70.1

Notes: 1. For pressure-treated 2x2 furring, decrease required insulation R-value by 0.1.
2. Insulation between furring or studs can be rigid board, foil/paper, etc. Batt insulation not recommended.