

■ □ □ ■ **E. Walls (Interior and Exterior)**

Comments:

Water penetration was noted on the interior of the walls at the window frames in the house and in the garage apartment. The sources of the water penetration should be determined and repaired. The presence of water penetration may indicate the growth of microbial organic organisms that may be toxic. Indoor air quality tests are not a part of this inspection. Should you desire an indoor air quality test, the test should be arranged prior to closing. Once the sources of the water penetration have been determined and repaired, all decayed, deteriorated or damaged materials, including walls covering materials, trim, moldings, insulation and framing members should be removed and replaced and finished to match the existing structure.



Microbial organic growths were noted on the walls in the upstairs bathroom and in the attic behind the upstairs bathtub, etc. The identity of the microbial organic growths can only be determined by laboratory culturing and testing, which is not a part of a visual real estate inspection. The growths should be identified. The organisms should be treated and killed for safety. The causes of the growths should be determined and corrected. An environmental testing firm should be contacted to conduct the tests and to recommend the extent of the repairs required.



The window frames, door frames and other wall penetrations installed in the brick veneer were not properly flashed or drained. The current building code along with the 2000 and 2003 Editions of the International Residential Code, require the installation of through wall flashing above the window and door frames and below the window sill. The through wall flashing should extend from behind the wall sheathing and should terminate on the exterior of the veneer. Weep holes, for drainage of the wall cavity at the window frames, are required to be formed in the veneer above the window frames and below the sills. While weep holes had been formed in the veneer above the window and door frames, the lintels were used as the flashing. Lintels are structural support members for the veneer and are not intended for use as drains. For further information, see Sections R703.7.5, R703.7.6 and R703.8 of the IRC (International Residential Code) along with the referenced drawings in the code. For further information, go to bia.org on the World Wide Web, which is the website of the brick manufacturer's association. You can also go to the

American Plywood Association's website. There are free sites, although they may require you to sign up for a password. Once you have gained access, go to the technical notes section from information on the requirements of the manufacturer's association for the drainage of the wall cavities.

703.7.5 Flashing.

Flashing shall be located beneath the first course of masonry above finished ground level above the foundation wall or slab and at other points of support, including structural floors, shelf angles and lintels when masonry veneers are designed in accordance with Section R703.7. See Section R703.8 for additional requirements.

703.7.6 Weepholes.

Weepholes shall be provided in the outside wythe of masonry walls at a maximum spacing of 33 inches (838 mm) on center. Weepholes shall not be less than 3/16 inch (4.8 mm) in diameter. Weepholes shall be located immediately above the flashing.

703.8 Flashing.

Approved corrosion-resistive flashing shall be provided in the exterior wall envelope in such a manner as to prevent entry of water into the wall cavity or penetration of water to the building structural framing components. The flashing shall extend to the surface of the exterior wall finish and shall be installed to prevent water from reentering the exterior wall envelope. Approved corrosion-resistant flashings shall be installed at all of the following locations:

1. At top of all exterior window and door openings in such a manner as to be leakproof, except that self-flashing windows having a continuous lap of not less than 1 1/8 inches (28 mm) over the sheathing material around the perimeter of the opening, including corners, do not require additional flashing; jamb flashing may also be omitted when specifically approved by the building official.
2. At the intersection of chimneys or other masonry construction with frame or stucco walls, with projecting lips on both sides under stucco copings.
3. Under and at the ends of masonry, wood or metal copings and sills.
4. Continuously above all projecting wood trim.
5. Where exterior porches, decks or stairs attach to a wall or floor assembly of wood-frame construction.
6. At wall and roof intersections.
7. At built-in gutters.

Water Penetration Resistance - Design and Detailing

Abstract: Proper design, detailing and construction of brick masonry walls are necessary to minimize water penetration into or through a wall system. Many aspects of design, construction and maintenance can influence a wall's resistance to water penetration. The selection of the proper type of wall is of utmost importance in the design process as is the need for complete and accurate detailing. In addition to discussing various wall types, this *Technical Note* deals with proper design of brick masonry walls and illustrates suggested details which have been found to be resistant to water penetration.

Key Words: barrier, design, detailing, drainage, flashing, installation, rain, wall types, weeps.

SUMMARY OF RECOMMENDATIONS:

Wall System Selection:

- Drainage walls provide maximum protection against water penetration
- Barrier walls are designed to provide a solid barrier to water penetration and provide good water penetration resistance
- Single wythe masonry walls require careful detailing and construction practices to provide adequate water penetration resistance

Through Wall Flashing Locations:

- Install at wall bases, window sills, heads of openings, shelf angles, tops of walls and roofs, parapets, above projections, such as bay windows, and at other discontinuities in the cavity

Through-Wall Flashing Installation:

- Lap continuous flashing pieces at least 6 in. (152 mm) and seal laps
- Turn up the ends of discontinuous flashing to form end dams
- Extend flashing beyond the exterior wall face
- Terminate UV sensitive flashings with a drip edge

Weeps:

- Open head joint weeps spaced at no more than 24 in. (610 mm) o.c. recommended
- Most building codes permit weeps no less than $\frac{3}{16}$ in. (4.8 mm) diameter and spaced no more than 33 in. (838 mm) o.c.
- Wick and tube weep spacing recommended at no more than 16 in. (406 mm) o.c.

DETAILING

Through-Wall Flashing

Through-wall flashing is a membrane, installed in a masonry wall system, that collects water that has penetrated the exterior wythe and facilitates its drainage back to the exterior. Such flashing is essential in a drainage wall system, and is required as a second line of defense in a barrier wall system. Proper design requires flashing at wall bases, window sills, heads of openings, shelf angles, projections, recesses, bay windows, chimneys, tops of walls and at roofs. Flashing should extend vertically up the backing a minimum of 8 in. (203 mm). The water-resistant barrier on the backing should lap the top of the flashing. Examples of water-resistant membranes include No. 15 asphalt felt, building paper, certain high-density polyethylene or polypropylene plastics (housewraps) and certain water-resistant sheathings. Various types of flashing materials which may be used in the design of brick masonry and composite walls are covered in *Technical Note 7A*.

In regard to flashing, the designer must also address the following considerations:

Extension Through Wall. When possible, flashing should extend beyond the face of the wall to form a drip as shown in **Figure 7**. When using a flashing that deteriorates with UV exposure, a metal or stainless steel drip edge can accomplish this. It is imperative that flashing be extended at least to the face of the brickwork.

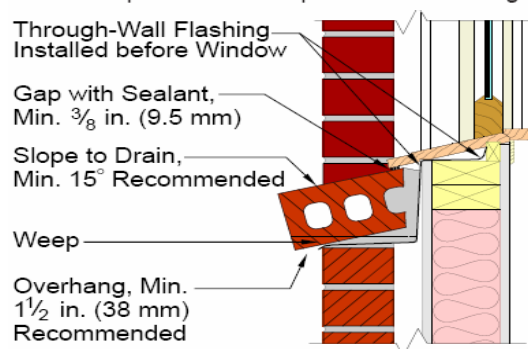


Figure 11

Window Sill in Brick Veneer/Frame Wall

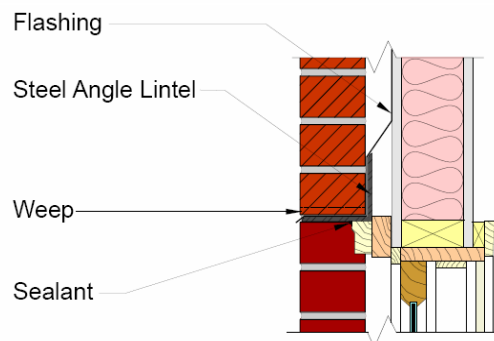


Figure 14

Window Head in Brick Veneer/Frame Wall





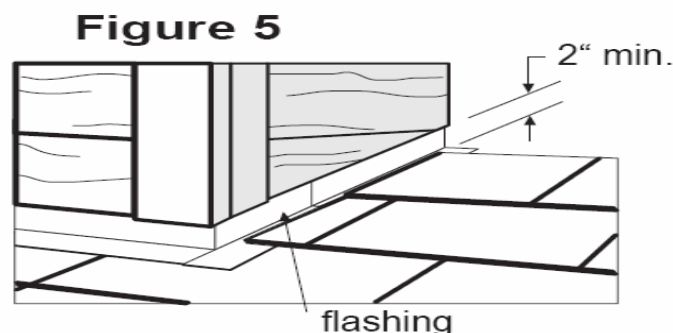
The brick window ledgers were improperly or inadequately sloped at most of the window penetrations (see figure 11 above). Proper industry installation requirements are that the ledgers slope a minimum of 15 degrees away from the house to allow the ledgers to drain completely. Some of the ledgers installed on the house actually sloped toward the house which will force water into the wall cavities. The ledgers should be removed and adequately sloped, at a minimum, new ledgers should be installed.



The wood fiber products siding was too close to the surface of the roof covering materials in some areas. The current building code and the manufacturer's installation instructions provide that a two inch clearance is required between the bottom of the siding and the surface of the roof. The clearance is required to prevent water on the roof deck from being absorbed into and damaging the siding and to prevent debris from being caught and trapped between the siding and shingles which could create dams. The siding should be trimmed to provide adequate clearance from the surface of the roof.

At the juncture of the roof and vertical surfaces, flashing and counterflashing shall be provided per the roofing manufacturer's Instructions.

Provide a 2" clearance between the roofing and the bottom edge of the siding and trim.



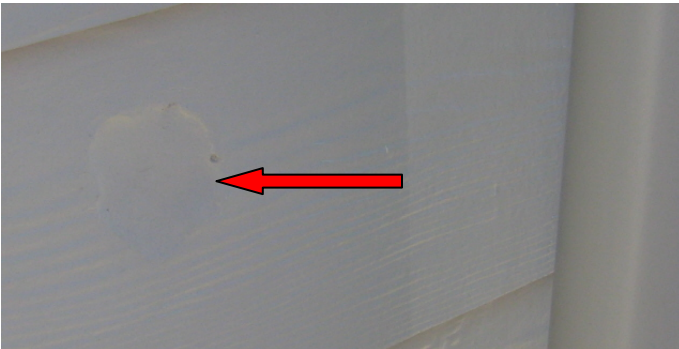
COURTESY OF JAMES HARDIE PRODUCTS, INC.



Mildew was noted on the exterior brick veneer indicating water penetration in the brick veneer. The sources of the water penetration should be determined and eliminated. Drains, such as weep holes should be installed or cleared so that the wall cavities can drain properly.



There was an improper patch in the wood fiber products siding of the garage. The damaged section of siding material should be replaced. The new section of siding material should be finished to match the existing structure.



Deteriorated wood was found on the master bathtub skirt, etc. indicating the need for an examination by a qualified licensed pest control inspector. Presence or damage from termites, rot or other wood infesting organisms is not part of this report. Detection of wood infesting organisms is reserved by Texas Law to the structural termite inspection. All deteriorated material, regardless of the cause, should be removed and replaced with sound new lumber finished to match the existing structure.



COMMENTS FROM THE OTHER INSPECTOR

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E. Walls (Interior & Exterior) - Comments: This inspection covers deficiencies of the interior and exterior wall surfaces related to structural performance and water penetration.



Comments: 1) Brick expansion joints on both sides of house need to be caulked.



F. Ceilings and Floors

Comments:

Items noted during the visual inspection that require comment, are in need of repair, adjustment, restoration, continuation of the due diligence process and/or servicing or items noted for information include but are not limited to:

The engineered silent flooring joists were improperly bored in the garage. The joists should be removed and replaced with new joists installed according to the manufacturer's requirements for safety.

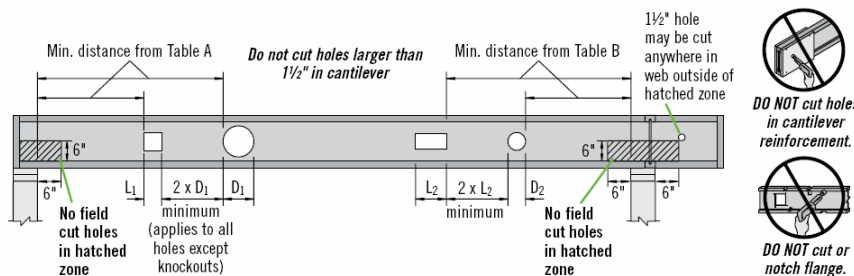


Table A—End Support

Minimum distance from edge of hole to inside face of nearest end support

Joist Depth	TJI®	Round Hole Size							Square or Rectangular Hole Size						
		2"	3"	4"	6½"	8¾"	11"	13"	2"	3"	4"	6½"	8¾"	11"	13"
9½"	110	1'-0"	1'-6"	2'-0"	5'-0"				1'-0"	1'-6"	2'-6"	4'-6"			
	210	1'-0"	1'-6"	2'-0"	5'-0"				1'-0"	2'-0"	2'-6"	5'-0"			
	230	1'-0"	2'-0"	2'-6"	5'-6"				1'-0"	2'-0"	3'-0"	5'-0"			
	360	1'-6"	2'-0"	3'-0"	6'-0"				1'-6"	2'-6"	3'-6"	5'-6"			
11¼"	110	1'-0"	1'-0"	1'-0"	2'-6"	5'-0"			1'-0"	1'-0"	1'-6"	4'-6"	6'-0"		
	210	1'-0"	1'-0"	1'-0"	2'-6"	5'-6"			1'-0"	1'-0"	2'-0"	5'-0"	6'-6"		
	230	1'-0"	1'-0"	1'-0"	3'-0"	6'-0"			1'-0"	1'-0"	2'-0"	5'-6"	7'-0"		
	360	1'-0"	1'-0"	1'-6"	4'-6"	7'-0"			1'-0"	1'-0"	2'-6"	6'-6"	7'-6"		
	560	1'-0"	1'-0"	1'-6"	5'-0"	8'-0"			1'-0"	2'-0"	3'-6"	7'-0"	8'-0"		
14"	110	1'-0"	1'-0"	1'-0"	1'-0"	2'-6"	5'-0"		1'-0"	1'-0"	1'-0"	3'-6"	6'-0"	8'-0"	
	210	1'-0"	1'-0"	1'-0"	1'-0"	3'-0"	6'-0"		1'-0"	1'-0"	1'-0"	4'-0"	6'-6"	8'-6"	
	230	1'-0"	1'-0"	1'-0"	1'-6"	3'-6"	6'-6"		1'-0"	1'-0"	1'-0"	4'-0"	7'-0"	9'-0"	
	360	1'-0"	1'-0"	1'-0"	2'-6"	5'-6"	8'-0"		1'-0"	1'-0"	1'-0"	5'-6"	8'-0"	9'-6"	
	560	1'-0"	1'-0"	1'-0"	2'-6"	6'-0"	9'-0"		1'-0"	1'-0"	1'-6"	6'-6"	9'-0"	10'-0"	
16"	210	1'-0"	1'-0"	1'-0"	1'-0"	1'-6"	3'-6"	6'-0"	1'-0"	1'-0"	1'-0"	2'-6"	6'-6"	8'-0"	10'-6"
	230	1'-0"	1'-0"	1'-0"	1'-0"	2'-0"	4'-0"	6'-6"	1'-0"	1'-0"	1'-0"	3'-0"	7'-0"	9'-0"	11'-0"
	360	1'-0"	1'-0"	1'-0"	1'-0"	3'-0"	6'-0"	9'-0"	1'-0"	1'-0"	1'-0"	4'-0"	9'-0"	10'-0"	11'-6"
	560	1'-0"	1'-0"	1'-0"	1'-0"	3'-0"	6'-6"	10'-0"	1'-0"	1'-0"	1'-0"	5'-0"	10'-0"	11'-0"	12'-0"



HOUSE STAIRCASE: The staircase winder treads were not wide enough through the turn in the staircase. The winder treads are required to be a minimum of six inches in width at any point and may not be any narrower at any point. It would be difficult to repair this condition without removing and rebuilding the entire staircase.

311.5.3.2 Tread depth.

The minimum tread depth shall be 10 inches (254 mm). The tread depth shall be measured horizontally between the vertical planes of the foremost projection of adjacent treads and at a right angle to the tread's leading edge. The greatest tread depth within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm). Winder treads shall have a minimum tread depth of 10 inches (254 mm) measured as above at a point 12 inches (305) mm from the side where the treads are narrower. Winder treads shall have a minimum tread depth of 6 inches (152 mm) at any point. Within any flight of stairs, the greatest winder tread depth at the 12 inch (305 mm) walk line shall not exceed the smallest by more than 3/8 inch (9.5 mm).



GARAGE STAIRCASE: The landing on the staircase was not adequate for safety. Section R312.2 of the International Residential Code requires a minimum length of a landing to be 36 inches in the direction of travel. The user of the stairs would have to bend down to open the doors while standing on the staircase. This can cause the user of the staircase to fall.

311.5.4 Landings for stairways.

There shall be a floor or landing at the top and bottom of each stairway.

Exception: A floor or landing is not required at the top of an interior flight of stairs, provided a door does not swing over the stairs.

A flight of stairs shall not have a vertical rise greater than 12 feet (3658 mm) between floor levels or landings.

The width of each landing shall not be less than the stairway served. Every landing shall have a minimum dimension of 36 inches (914 mm) measured in the direction of travel.



The stair risers were not uniform in size and the height of the first riser from the garage exceeded the maximum allowable riser height. This condition creates a hazard to the user of the stairs. The brain adjusts your stride to the height and depth of stairs and one step that is a different size can cause you or another user of the staircase to trip and fall. The risers should be made uniform in height for safety.

311.5.3.1 Riser height.

The maximum riser height shall be 7 3/4 inches (196 mm). The riser shall be measured vertically between leading edges of the adjacent treads. The greatest riser height within any flight of stairs shall not exceed the smallest by more than 3/8 inch (9.5 mm).

The code establishes that the maximum riser height is 7 3/4 inches (197 mm). The International Residential Code does not provide a minimum riser height as does the International Building Code, where a 4-inch (102 mm) limit is specified. The provisions specify how the riser height is to be measured. See Commentary Figure R311.5.3.1(1). A significant safety factor relative to stairways is the uniformity of risers and treads in any flight of stairs. The section of a stairway leading from one landing to the next is defined as a flight of stairs. It is very important that any variation that would interfere with the rhythm of the stair user be avoided. While it is true that adequate attention to the use of the stair

can compensate for substantial variations in risers and treads, too frequently the stair user does not give the necessary attention.

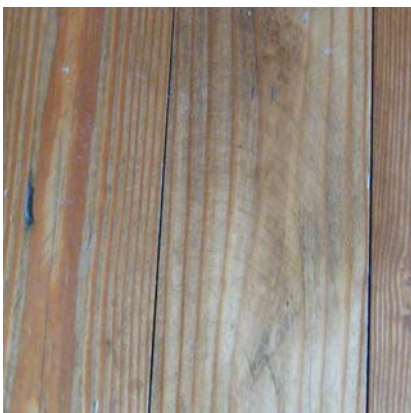
To obtain the best uniformity possible in a flight of stairs, the maximum variation between the highest and lowest risers is limited to 3/8 inch (9.5 mm). This tolerance is not to be used as a design variation, but its inclusion is in recognition that construction practices make it difficult to get exactly identical riser heights and tread dimensions in constructing a stairway in the field. Therefore, the code allows the variation indicated in Commentary Figure 311.5.3.1(2).



There were some excessive spaces between the wood flooring planks. As there is no subflooring in this installation, it is extremely important that the floor be well sealed as the floor is the only barrier between the air in the crawlspace and the air in the house. Air entering the house from the crawlspace will most likely be at a different temperature and will most often have higher humidity than the air in the house. This will cause the air conditioning systems to operate more often and will raise the humidity levels in the house. Higher humidity will increase the discomfort of the interior ambient air.



There were indications that the floors had been ground flat and there were some surface nails installed. This indicates that the flooring planks had cupped or crowned from excessive moisture. The floors should be inspected by a competent flooring contractor to determine if the floors need drying or sealing to prevent a reoccurrence of the deformation of the floors.



COMMENTS FROM THE OTHER INSPECTOR

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F. Ceilings & Floors - Comments: This inspection covers deficiencies of the ceilings, floors and stairways related to structural performance and water penetration.

Comments: **None**