RESIDENTIAL FIREBLOCKING

Why, What, Where, How, When, and Who?

With the majority of fatality statistics resulting from fires that occur in residential single family homes, why is so much emphasis put on firestopping commercial construction? This is not to say that commercial firestopping is not a crucial life safety element that should be devalued or overlooked, but perhaps the building industry should place more emphasis on enforcing the code wording and intent of the **residential fireblocking requirements** found in all model building codes.

The building code requirements for **fireblocking** wood frame residential construction predates actual "through penetration" testing standards for commercial construction such as ASTM-E814 and UL1479 by over 30 years. Traditional balloon framing was the general structure common to 40 year or older residential construction. This style of construction allowed large, open concealed spaces to run between floors from the basements or first floor continuously to the attic area. In the tragic event of a fire, these concealed chases acted like a chimney allowing for the flame, smoke, and toxic gases to rapidly spread throughout the walls and floors of the home.

As a result, western style or platform frame construction has become the standard in residential dwellings. This construction has the floor framing bearing on load bearing walls so there is no continuous concealed space through the story levels or floor framing. This creates a built in fireblock at ceiling and floor levels commonly found and knows as top-plates. Additional wood fireblocks are also required in soffits, drop ceilings, cove ceilings, and the top and bottom of stair runs. These improvements in the building codes were specified to contain the fire from reaching new areas of the building and reaching new fuel sources by which the fire could grow. The fire would have to burn through these wood fireblocks before it could spread to new areas. The intent is to slow down the total involvement of the house fire to allow occupants a little more time to escape to safety.

The problem occurs when these built-in wood fireblocks are penetrated by the trades when they run their wires, pipes, and other mechanical penetrating items. When they drill these holes, the integrity of the wood fireblocks are violated and they must be protected with a material that is tested and that demonstrates it is equal to or greater than the burn time of that wood top-plate. These materials generally come in the form of a caulk that has been tested to ASTM-E136 (test for noncombustibility) or ASTM-E814 (test for fire rated systems.)

Traditionally, fireblocking code sections found in BOCA, CABO, N.Y.S. Code, Mass. State Code, SBC, and the UBC all required openings around vents, pipes, ducts, and other mechanical penetrating items at ceiling and floor level to be fireblocked with "**noncombustible**" materials. The term noncombustible is defined in all model building codes as "Materials that Pass the Test Procedure for Defining Noncombustibility of Elementary Materials Set Forth in **ASTM-E136**". Simply put, ASTM has a test standard defining a noncombustible building material as a material that will not flame, smoke, or have significant weight loss when subjected to 1380° F. Upon passing this test, a manufacturer can label their product or material as a "Noncombustible" or "ASTM-E136" tested product. Using an ASTM-E136 rated product fulfils the code requirements for fireblocking penetrations because the material is tested and demonstrates not to burn at far higher temperatures than the burn time and burn temperature of wood.

Today, the IRC specifies an "**Approved**" material to resist the free passage of flame and products of combustion. This wording allows for ASTM-E814 and ASTM-E136 tested products to be used in fireblocking applications based upon the determination of the code enforcement official having jurisdiction. Many jurisdictions allow the use of polyurethane foam as an accepted fireblocking material. Inspectors and contractors should beware of allowing foam sealants for this application as **all polyurethane foam sealants are flammable and burn highly toxic gases.** Building officials should closely examine the MSDS sheets and testing documentation these foam manufacturers carry to check how their testing was performed and what flammability issues they have.

The procedures for fireblocking penetrations in residential single family homes is far less complicated than the requirements encountered in "rated systems" for commercial firestopping. Residential single family construction consists of "non-rated" systems because they are less than a 1 hour burn time. This is why the integrity (IRC R602.8.1.2) must be resumed with a material that has been tested to demonstrate it is "equal to" or "greater than" the burn time of the wood fireblocks. All penetrations at ceiling and floor levels need to be filled to entirely seal the annular space around the wires, pipes, ducts, etc. so that there is no visible air passage. When encountering larger voids, mineral wool or unfaced fiberglass should be stuffed in the penetration to act as a backer material to hold the sealant in place until the fireblocking material is cured. Manufacturers' specifications generally require a minimum depth of 1" to ensure a proper bond to the wood substrate it is applied in. Most manufacturers of fireblocking sealants often color their caulk red, orange, or pink to stand out against the color of the wood. This makes for an identifiable material that is easy to inspect for.

Once the insulation is installed, fireblocking is invisible, so it is important to make sure the inspection is done at the "final rough" or mechanical inspection. Trade responsibility for fireblocking penetrations varies from area to area. Some believe that "he who drills the hole has to fill it". This would make it the responsibility of the plumbing, electrical, and HVAC contractor to fill their own holes. Other municipalities require the insulation contractor to install the fireblocking. Having the insulation contractor install the fireblocking caulk eliminates inconsistency between trades and places the responsibility on one trade. The insulation contractor often embraces the fireblocking responsibility because it is an added profit center and it helps them with scheduling. They come in to seal the penetrations after all the plumbing, electrical, and HVAC work is done and after the inspection, they begin to install their insulation. This is also seen as an air infiltration package and is often being performed by the insulation contractor already.

Fireblocking sealants are economical and readily available in markets nationwide. The average cost for a 2,000 sq. ft. home is approximately $200.00 which is a small price to pay to ensure added fire resistance to residential structures.

Fireblocking is intended for the welfare of the homeowner and the fire resistant integrity of the structure. This is an important life safety code requirement that should not be overlooked. For additional information on fireblocking code requirements, refer to section R602.8 in the 2000 IRC (International Residential Building Code) or visit www.firestoppingcaulk.com for related articles and product information.

R324.5 Knee bracing. A 2x6 brace shall extend from the column to the top chord of the truss or rafter adjacent to the post at a 45 degree angle. The vertical distance down from the bottom chord of the truss or ceiling joist to the point where the brace attaches to the post shall be in compliance the Table R324.5 as shown on Figure R324. Trusses or rafter must be spaced such that they align with the column intervals. Attachment of knee brace shall be per Table R324.7.

TABLE R324.5 KNEE BRACE VERTICAL DISTANCE

Wall Height	Vertical Dimension
8'-0" and 9'-0"	1'-6"
10'-0" and 11'-0"	2'-0"
12'-0" and 13'-0"	3'-0"
14'-0" through 16'-0"	4'-0"

R324.6 Roof Construction. Top chord of roof trusses or roof rafters shall be braced with exterior sheathing or metal roof on purlins with bracing.

R324.6.1 Roof Purlins. Roof purlins shall be a minimum of 4x2 SPF #2 laid flat of spans up to 4 feet, and 4x2 SPF #2 laid on edge for spans up to 8 feet.

R324.6.2 Roof Bracing. Provide exterior structural sheathing or bracing to resist racking and shearing forces in roof Bracing shall occur in the roof on all 4 sides of the building and shall consist of 2x6 diagonal braces perpendicular and parallel to rafters or trusses and attached to the bottom side of rafters or top chords of trusses. These braces shall start at a point just below the first purlin, rafter or truss in from the eave purlin and at each corner column. The brace shall be placed on a 45 degree angle and end below the location of a purlin, rafter or truss within 8'-0" in from the wall. If the building width or length exceeds 24'-0" then install additional braces in the same manner. Spacing of braces shall not exceed a maximum spacing of 2 feet on center in any direction.

R324.7 Attachment details. Structural fastener details for post and frame buildings shall comply with Table R324.7.

TABLE R324.7
FASTENER SCHEDULE FOR STRUCTURAL MEMBERS

Fastener Schedule for Structural Members		
Description of Building Element	**Number and Type of Fastener**	**Attachment Type**
Uplift blocking to column	5 – 16d Hot Dipped Galvanized	Each block
Skirt board to column	2 – 16d Hot Dipped Galvanized	Face nail
Wall girt to column	2 – 16d Hot Dipped Galvanized	Face nail
Diagonal bracing to column	2 – 16d Hot Dipped Galvanized	Toe nail
Diagonal bracing to skirt board	2 – 16d Hot Dipped Galvanized	Face nail
Diagonal bracing to wall girts	2 – 10d Hot Dipped Galvanized	Face nail
Knee brace to column	2 – 10d	Face nail
Knee brace to top chord of truss or rafter	3 – 16d Hot Dipped Galvanized	Face nail
Knee brace to bottom chord of truss or ceiling joist	3 – 10d	Face nail
Roof purlin to truss or rafter with span of 2' or 4'	2 – 16d	Face nail
Roof purlin to truss or rafter with span of 8'	Mechanical fastener with uplift protection greater than 225 lbs	Per manufacturer