Passive Fire Protection Safeguards Buildings

Less obvious than extinguishers and sprinklers, passive fire-protection systems contain fire and smoke.

Gregg Stahl,
Clark-Dietrich Building Systems

There isn't a universal product that will work for every firestop application, so it is important to select products that have been tested to meet safety standards for each specific situation.

When protecting commercial structures, where occupant rates can range into the hundreds and cost millions to rebuild, fire protection is uppermost on the list of concerns of builders, owners, and facility managers. It is crucial to look beyond active fire protection, such as extinguishers, fire detectors, and sprinklers, and pay equal attention to the less-visible, passive, fire-protection systems that work to contain fire and smoke at its point of origin. These components serve as barriers to confine and compartmentalize the spread of fire, smoke, and toxic gases.

Compartmentalization involves erecting barriers to divide a building into smaller units that will confine a fire. This step helps reduce risk and avoid reliance on any one element in a fire-safety plan. Compartmentalization is critical because it limits where the fire can spread. It also complements automatic sprinkler systems and reduces risks to occupants and property.

Fire-rated walls are an area of passive fire-protection design that helps minimize the spread of fire damage and increase occupant safety. Typically framed using light-gauge steel studs and tracks, these partitions, when properly installed with firestops, can provide the necessary protection.

Fire-rated-wall requirements

Walls (load bearing or not), floors, and ceilings can serve as fire barriers so long as they have a fire rating. Fire barriers are tested to the requirements of American Society of Testing and Materials (ASTM), West Conshohocken, PA, E119 (ANSI/UL263) and rated to resist the spread of fire for a designated amount of time, usually in hours.

There are several important things to remember about fire-rated wall assemblies and the role of steel studs in these systems. A fire-rated partition must adhere to the way the actual tested assembly was constructed, without any variation. Many of today's commonly used fire-rated assemblies were tested decades ago, and there is no requirement for retesting once an assembly passes the fire test. However, fire-rated assemblies using equivalent-gauge (EQ) steel studs are more likely to have current fire-testing reports, since the EQ studs are newer products and most of the fire testing has been performed in the past five years.

EQ studs have been fire tested or have gone through an extensive engineering evaluation to be listed in a UL fire-rated assembly. However, it's important to examine wall-assembly schedules and research the listed assembly's components to determine if the EQ studs meet the project's framing requirements.

It's a good idea to verify that product samples submitted for the project comply with the requirements of the fire-rated assemblies shown on the partition schedule. In addition, field verify that studs of proper thickness and profile are being installed according to the fire-rated assembly requirements. Steel studs are required to be labeled, making this a relatively easy visual inspection.

There are numerous laboratories, including Underwriter Laboratories (UL), Northbrook, IL; Intertek USA Inc., Houston; and Southwest Research Institute, San Antonio, that perform fire testing for a variety of building-assembly materials, including wall assemblies. This testing is

◀ BlazeFrame from ClarkDietrich Building Systems incorporates a factory-applied intumescent strip that expands as much as 35 times its size, allowing contractors to simultaneously frame, seal against fire and smoke, and reduce airborne sound transmission to dynamic and static joints.

▼ Fire-rated assemblies using equivalent-gauge (EQ) steel studs are more likely to have current fire-testing reports, since the EQ studs are newer products and most of the fire testing has been performed in the past five years.

designed to determine how quickly fire can raise the temperature to unacceptable levels and how building materials react in this situation. The results are fire-resistance ratings, which gauge the ability of a construction assembly to confine and isolate fire within a zone composed of fire-resistance-rated walls, ceilings, and floor assemblies. Fire-rated assemblies are tested in their entirety.

Passive fire stopping

Critical components of any fire-rated wall assembly are the specified fire-stopping materials used to seal openings and joints. When installed properly, these products combine with the other assembly components to prevent the spread of fire through interior wall systems.

Traditional materials used in passive firestop systems include sealants, sprays, mechanical devices, intumescent materials, and foam blocks or pillows. Total fire protection cannot be achieved with the use of a single product. Therefore, a system approach must be used when designing and specifying materials for fire-rated wall assemblies. It is not uncommon for general contractors to take responsibility for installing the firestop with their team of subcontractors.

There are four primary types of openings, or joints, associated with fire- and smoke-resistive rated assemblies to which tested firestopping systems may be applied:

- Joints—joints between fire-rated construction components (wall to wall, wall to floor, wall to ceiling)
- Floor perimeters—slab edge/exterior wall cavity (curtain wall)
- Penetrations—openings containing mechanical, electrical, structural, security, piping, or wiring
- Electrical boxes—where combined openings exceed 100 sq. in. in 100 sq. ft. of wall.

It is recommended that contractors only use products with fire-resistance properties and that are performance verified by an accredited third-party testing agency.

Let's take a closer look at three important components of passive-firestop systems—sealants, intumescent materials, and integrated firestop systems.

Sealants. Simple mastics, or sealants, are

Product Standards And Testing

ASTM E119: Fire test method, "Fire Tests of Building Construction and Materials," is conducted to evaluate the ability of a fire-resistive floor or wall assembly to perform its barrier function, resisting the passage of heat, flames, hot gases, and smoke in a fire situation.

ASTM E814: "Fire Tests of Through Penetration Firestops" is the complementary test to ASTM E119 that evaluates penetrations through a tested, fire-resistive (ASTM E119 tested) wall or floor assembly. The test involves a standard time-temperature curve, a hose stream test, and assigns ratings based on T (temperature rise) and F (flame occurrence through the firestop/penetration). The objective of specifying this type of system is to return the floor or wall to the compartment's original fire rating. An L (air leakage) rating can also be assigned. Air leakage simulates smoke movement through a penetration, measured in cubic feet/minute.

Firestop Resources

These websites offer insight into firestop technologies, processes, installation, and technical advice:

- **The International FireStop Council (IFC),** Westford, MA, is a not-for-profit association of manufacturers, distributors, and installers of passive fire-protection materials and systems in North America. IFC's mission is to promote the technology of fire and smoke containment in modern building construction through research, education, and development of safety standards and code provisions. Learn more at www.firestop.org.
- **The Firestop Contractors International Association (FCIA),** Wheaton, IL, strives for member organizations to be recognized throughout the construction industry as preferred quality contractors of life-safety firestop systems. Technical information, member lists, and more are available at www.fcia.org.

Understanding UL Firestop Terminology

- **Through-penetration firestop systems:** The first character defines the assembly being penetrated. The second set of characters further defines the type of assembly. The first number defines the penetrant type. The final three numbers complete the system number and are assigned sequentially as the listings are generated.

CA-J-1079, for example, means the listing is applicable for a metallic pipe penetrating through a concrete floor or wall. The actual listed system must be referenced for specific requirements.

- **Fire-resistive joint systems:** The first two characters define the type of construction joint. The second designation defines the movement capability of the system (S=static, D=dynamic). The four-digit number defines the joint width into various categories. Consult the UL directory for the specific listings.

HW-D-0034 means the listing is applicable for a head-of-wall joint that is dynamic in nature and is less than or equal to 2 inches. The actual listed system must be referenced for specific requirements.

commonly used to seal penetrations and construction joints. These products are available in various forms and chemical formulations, but the one thing they all have in common is that their performance is solely dependent on the system in which they are tested.

Firestop sealants in caulk, self-leveling, and spray grades are readily available in silicone, latex, and solvent-based products. They often require the addition of a backing material for support. Sealants are the most recognized group of firestop products due to their versatility.

BlazeFrame's factory-applied intumescent material eliminates elastomeric fire-proofing caulks and sprays. The cured intumescent tape eliminates VOCs and off gases associated with caulked spray fire proofing and over and under application associated with caulks and sprays.

Intumescent materials. Intumescent materials are firestop products that expand in volume when exposed to heat or flames that exceed a specified temperature. They are one of the primary groups of products used in applications where one of the assembly components will deteriorate or burn away during fire exposure or where surfaces are uneven and a tight fit is not possible. When the material expands, it closes the void that is created when the adjacent component melts or burns away, thus maintaining the integrity of the fire-rated assembly. Intumescent firestop materials come in many forms, from caulks to metallic collars with intumescent strip linings. Each product is designed for a specific purpose.

Integrated systems. One recent steel-framing-related innovation is the integration of intumescent firestop materials into framing members. For commercial and institutional projects, architects and specifiers are now using steel tracks manufactured with a factory-metered dosage of intumescent material applied to the track flanges in a controlled environment.

These products help building and design professionals specify product and assembly solutions for hidden and exposed aesthetic conditions where fire, smoke, and sound-resistance ratings are required. This makes it possible for contractors to provide single-source construction of wall assemblies and installation of joint protection while eliminating any trade overlap issues, common when installing traditional firestop materials. The integrated intumescent material can provide as much as 3 inches of movement and 3 hours of fire-rated protection.

A recent advancement in the area of integrated firestop systems is BlazeFrame from ClarkDietrich Building Systems, West Chester, OH. Designs using integrated systems such as BlazeFrame eliminate the need for caulks, sprays, drywall rips, and contour drywall "castle" cuts throughout the joint systems. The factory-applied intumescent strip expands as much as 35 times its size, allowing contractors to simultaneously frame, seal against fire and smoke, and reduce airborne sound transmission to dynamic and static joints.

These integrated firestop products are easier for contractors to install than traditional firestop materials. Contractors simply have to install the track member, which includes the intumescent tape, at the top of the wall. It eliminates the need to return and install intumescent caulking at a later time, thus eliminating multiple labor and material operations.

Selecting the right materials

Understanding that there isn't a universal product that will work for every firestop application is the first step to selecting the right materials. It is also important to select products that have been tested to meet applicable safety standards.

Selection of fire-protection materials and methods is an important decision that should be carefully considered early in the design stage. While passive fire protection can successfully prevent the spread of fire, redundancy is key for total fire protection. New technologies, such as integrated firestop systems, save contractors time and money and help ensure the confinement of smoke and fire throughout commercial buildings. When combined with active fire-protection systems, such as sprinklers, alarms, detection systems, and occupant education, these materials offer a safe, more balanced approach to protecting a building and its occupants. CBP

Gregg Stahl is the product-development director for ClarkDietrich Building Systems, West Chester, OH, a manufacturer of steel construction products and services across the United States and abroad.