

Volume 2, No. 3

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The Magazine of Effective Compartmentation

# Life Safety DIGEST

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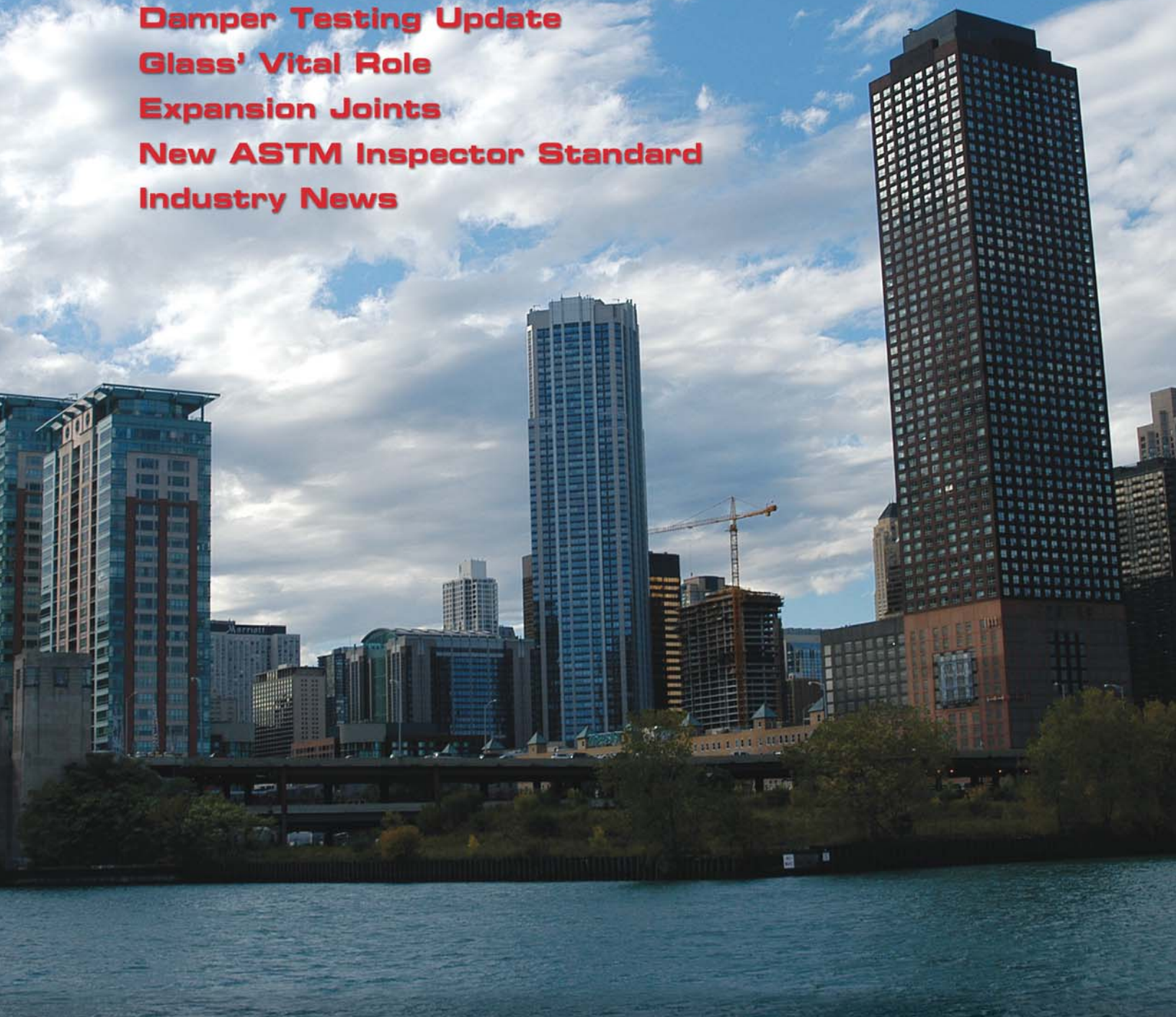
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# FPT Flammadur -an alternative to your Firestopping needs

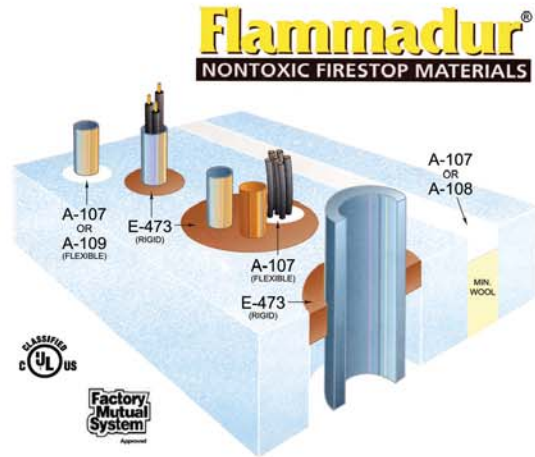
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## Editors' Message

Life Safety Digest's purpose is to offer an educational forum about effective compartmentation and structural protection while acknowledging that all types of fire protection are needed to keep people safe in buildings.

Effective compartmentation involves dividing large areas into compartments, both horizontal and vertical, to contain fires to the room or area of origin until compartmentation runs out of oxygen, automatic or firefighter suppression systems extinguish the blaze or the blaze runs out of oxygen.

Important elements of compartmentation include fire-smoke- or other resistance-rated floors and walls, with openings and gaps protected by firestopping around pipes; ducts; linear expansion joints; perimeter curtain-wall joints, wall-top/bottom joints and cables; fire and smoke dampers that limit fire and smoke spread; swinging and rolling fire doors that protect large openings for entry and exit of spaces; and fire glass systems that allow transparency and fire resistance.

There are new developments taking place in the compartmentation

industry. Design and testing processes are changing, contractor installation quality programs are making inroads, inspection protocols are starting to gain momentum and compartmentation maintenance systems are being updated for today's technology and safety needs.

From our viewpoint, the specifications community has embraced many of these quality programs already to bring their clients a building that's built better, cheaper and faster. The contracting and manufacturing industries are also responding by making zero tolerance installed systems a policy.

Those protocols not already in the code will be debated in the International Code Council and National Fire Protection Association code development and specification process over the next several years.

Join the associations that support effective compartmentation and the Firestop Contractors International Association. As a group, our education will establish fire and life safety with compartmentation as a key component.



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# Fire and Smoke Damper Testing Update

by Richard Cravy, Ruskin Co.

It has been four years since the most significant changes ever to the Underwriters Laboratories (UL) Test Standards for Fire and Smoke Dampers.

The changes to the UL555 and UL555S Test Standards in July 2002 were so consequential they required the construction of new laboratories by some manufacturers and extensive upgrading of the Air Movement and Control Association laboratories in Arlington Heights, Ill. (<http://www.amca.org>).

The purpose of this article is to review the changes to the standards, as word is still getting around about them.

The changes to the standards were part of the continual upgrading process UL uses to address changing requirements in the building codes and system design and to assure end users that the products will perform as expected. The changes which became effective July 1, 2002, can be traced to an American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) Research Project, RP680, Testing Fire Dampers at Varying Air Flows and Temperatures.

The result of RP680 was the determination that the Test Standards in effect at that time did not reflect "real life" conditions. RP680 started in 1992, meaning the process to change the UL Test Standards took ten years from start to finish.

## UL Test Standard 555 Changes

The changes to UL555 were directed at dynamic fire dampers and involved the following criteria:

### Airflow Testing Using Heated

**Air** - The previous standard only required dynamic fire dampers to close against airflow at ambient temperatures.

The new test using heated airflow requires the temperature of the air passing through the damper to be increased until the fusible link or heat operated device releases and the damper closes.

### Minimum Airflow and Pressure Ratings

- The previous standard included no minimum airflow or pressure requirements. Since there were no minimum requirements, dynamic fire damper airflow ratings varied widely among manufacturers. This caused considerable confusion among designers and installers and resulted in incorrect installations.

Minimum airflow and pressure ratings are now 2,000 ft. per minute and 4 in. water column. All dynamic fire dampers, regardless of size, must be proven to close at those parameters.

Dynamic fire dampers can be tested and rated for higher velocities, but the test and ratings must be in 1,000 ft. per minute increments and the pressure must be in 2 in. water column increments.

**Safety Factor** - The minimum airflow and pressure ratings mentioned above are achieved by testing at 400 ft. per minute above the given airflow rating and 0.5 in. water column above the given pressure rating.

For example, to achieve a rating of 2,000 feet per minute and 4 inches water column the damper must have proven to operate at 2,400 feet per minute and 4.5 inches water column.

**Bidirectional Airflow** - The previous standard did not require the dynamic fire damper to prove closure with airflow in both directions. There were plenty of dampers that were rated for airflow in only one direction and, like the airflow ratings mentioned previously, resulted in incorrect installations. Bidirectional airflow has made the installing contractor's job much easier.

## UL555S Test Standard Changes

UL555S is the test standard used to evaluate smoke dampers. The changes to it involved the following criteria:

### Airflow Testing Using Heated

**Air** - This criteria is similar to the UL555 criteria listed above except the temperature of the air passing through the damper and actuator assembly is increased until it reaches the same temperature as the temperature degradation rating of the damper which is at least 250 degrees F.

The Temperature Degradation Rating is achieved when the damper and actuator assembly is inserted into an oven and has proven to operate through three complete cycles after being exposed, for 30 minutes, to an elevated temperature of at least 250 degrees F. The minimum elevated temperature rating required by UL and the Building Code is 250 degrees F.

The damper-and-actuator assembly is exposed to the heated airflow



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for 15 minutes. After the damper is cycled closed and the pressure against the closed damper is measured, the damper is reopened. After a cool down period the process is repeated three times at ambient temperature. Once complete, heat is reintroduced and an additional cycle is done at the elevated temperature.

**Minimum Airflow and Pressure Ratings** - Same as UL555.

**Safety Factor** - Same as UL555.

**Bidirectional Airflow** - Same as UL555.

**Cycling Test** - The previous standard required dampers, with two position actuators, to prove reliability by cycling 5,000 times.

The new standard requires dampers, with two position actuators, to prove reliability by cycling 20,000 times. The four-fold increase in cycling requirements has caused a significant increase in the quality of the actuators used by manufacturers on smoke and combination fire smoke dampers.

**Leakage Test** - The previous standard included four Air Leakage Classifications. The latest standard recognizes only three. The leakage test is also now a part of a sequence of tests that include the cycling test and the heated air flow test.

The leakage test is performed at the end of that sequence of tests while the damper is exposed to at least 250 degrees F. The same damper is used in all the tests of the sequence.

The result is a better quality damper. If a damper is able to achieve a Class 1 Leakage Rating after a sequence of tests, including 20,000 cycles, then you can be sure it is of the highest quality.

It can be said that because of the changes to UL555 and UL555S, fire, smoke and combination fire/smoke dampers are some of the most stringently tested fire and life safety products on the market today. They provide a valuable service and are an essential part of a buildings' compartmentation system. 🔥

*Richard Cravy is the Product Manager for Fire/Safety and Commercial Damper Products for Ruskin Company. He has been with Ruskin for 20 years and resides in Kansas City, MO where Ruskin is headquartered. He can be reached at 816-965-4330 or e-mail rcravy@ruskin.com.*



New test standards are used to evaluate smoke dampers.



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# INVISIBLE AND IRREPLACEABLE

## Glass Plays Vital Role In Fire Protection

by Jerry Razwick,  
Technical Glass Products

When you think of firestop materials, what comes to mind? Perhaps you think of insulation or steel doors. Maybe gaskets or sheetrock or firestop systems come to mind.

The building components that play a role in compartmentation are many and varied, but one in particular is almost invisible: fire-rated glass.

The role of glass is often taken for granted, since it is found in the vast majority of buildings. Windows and glass doors are included in a project's design for any number of reasons, including lighting, security concerns and aesthetics.

But if a fire breaks out, what will happen to all those doors and windows? When the glass gets hot, will it shatter or explode, creating an opening for flames and smoke to spread? Or will it stay in place and serve to help contain the fire, providing protection for people and other areas of the building?

The answers to those questions will depend on the type of glass that's used. Standard window glass cannot withstand the heat associated with a structural fire, and it will break and fall out of its frame at about 250 degrees F. It cannot act as a fire barricade.

However, there are glazing materials that have been tested to tolerate heat in excess of 1,600 degrees F. These products are classified as "fire-rated," with ratings from 20 minutes to three hours, based on the duration of time they can be expected to per-

form. They are intended to act as invisible fire fighters, offering protection around the clock.

### Polished Wired Glass

For many decades, there was only one glass option that was fire-rated: polished wired glass. No other kind was able to survive the rigorous testing process.

As the heat of the fire cracks the glass, the wires hold it in place and prevent it from vacating the opening. This preserves the barrier to the flames and deadly smoke and enables wired glass to earn a fire rating. Over a century of use has proven time and again that wired glass functions as it should in real world fires.

However, traditional wired glass has its shortcomings. For starters, openings that use traditional wired glass are typically limited in size to 9 sq. ft. During a fire, the glass cannot maintain its integrity in larger sizes. This greatly restricts design options. There is also a common misconception that the wires make the glass stronger and more impact resistant. In reality, wired glass is significantly weaker than tempered glass and provides little protection against impact. Once broken, the wires form snags that can cause injury and make it difficult for someone to extract himself or herself from the glass.

This meant there was a dilemma: What to do when the only glass that offers fire protection also creates a hazard when broken? Which priority takes precedence -- fire safety or impact safety?

One or the other had to be com-



Ceramic glass can be made transparent, including on this building exterior.

promised in many locations, because no product existed that could fully satisfy both needs.

### Ceramic Glass

Fortunately, over the past several years, new products have been developed that solve the dilemma and offer far more flexibility.

The new glass choices have been able to surpass wired glass in terms of both fire and impact safety. Manufacturers have tapped into innovative technology to offer greater performance.

One of the most versatile new materials isn't technically even glass but ceramic. Any elementary school

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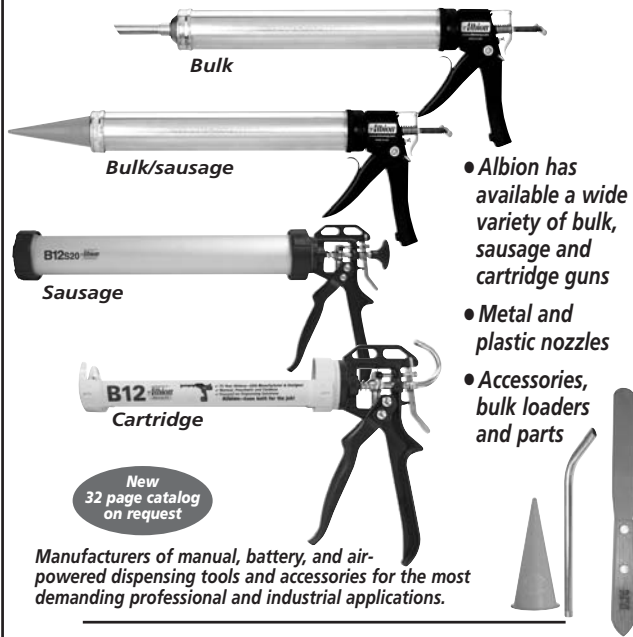


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art teacher who has fired student pottery in a kiln can tell you that ceramic tolerates heat well.

That characteristic is now being put to good use outside the classroom. Today, ceramic is commonly found in such "hot spots" as cooktops, car engines and gas fireplaces.

What is remarkable is that ceramic can be formed into transparent sheets. When installed, transparent ceramic (or glass ceramic, as it is called) looks like ordinary window glass.

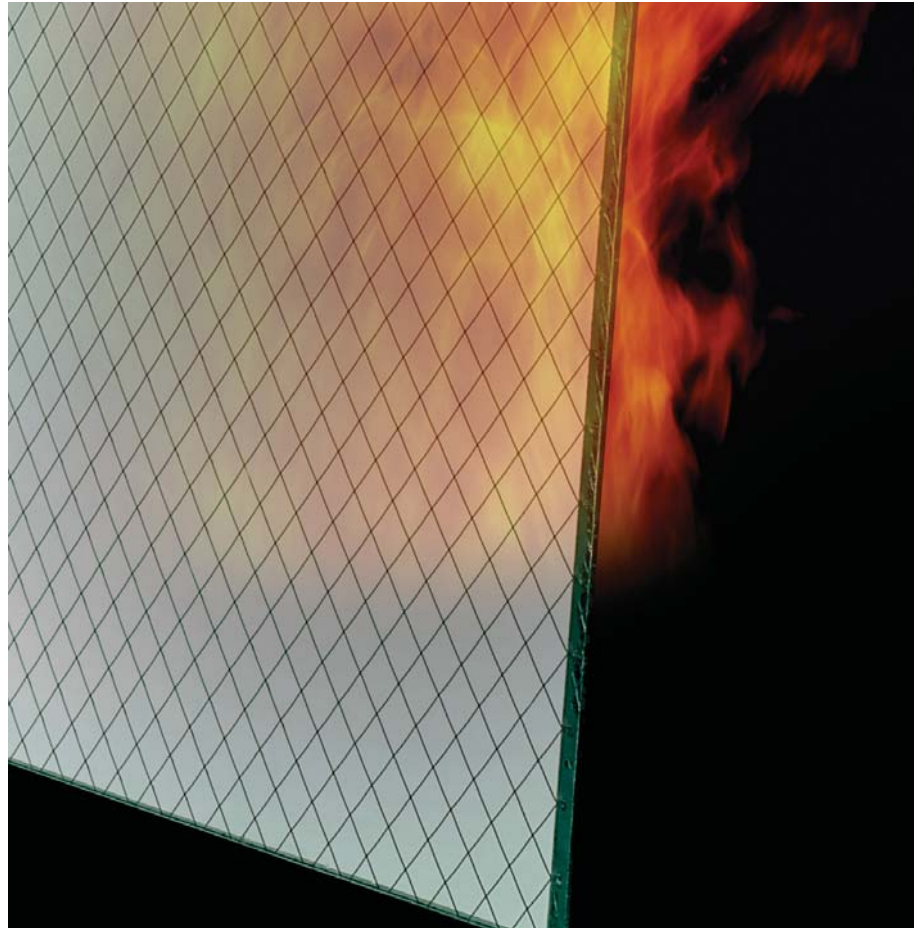
Glass ceramic (such as the FireLite® family of products and SuperLite C/SPTM) has earned fire ratings up to 3 hours and can be specified in much larger sizes than wired glass--up to 23 sq. ft. It also is available with high impact safety ratings, making it an ideal option for high traffic areas that include busy corridors and lobbies in schools and hospitals. Ceramic can also be specified in insulated units to meet energy codes for exterior applications. Those insulated units can pair ceramic with any number of other types of glass - tinted, mirrored and decorative.

### Specially Tempered Glass

Another category of wireless fire-rated glass found in the market is specially tempered glass.

This group (including such products as Fireglass®20, SuperLite ITM and Pyroedge™) offers limited fire protection, because specially tempered glass cannot withstand what is known as "thermal shock."

When glass is tested for a fire rating, it is blasted with water from a fire hose immediately after being heated in a furnace fire. This important portion of the fire test makes sure the glazing product, hot from the fire, will stay in place if sprayed with water from sprinklers or subjected to



Wired glass hasn't stood still. New options are available that have improved on the impact safety of traditional wired glass.

impact from other sources.

Specially tempered glass cannot survive the hose stream portion of the test, and so the codes dictate that it can only be given a 20-minute rating and should only be used in doors. The product tested and listed systems limitations are important to keep in mind, because 20-minute rated specially tempered glass is frequently specified inappropriately in locations that include sidelites and windows that may require a higher rating.

### Glass Fire Walls

Another category of fire-rated glazing falls under the heading of glass fire walls.

These products, such as Pilkington

Pyrostop™, Contraflam® and others, are actually tested as "walls", with ratings up to 2 hours. In addition to stopping the spread of flames and smoke, glass fire walls block the transfer of heat in much the same way a fire-resistance-rated masonry wall does. A fire can be raging on one side of the glass and the opposite surface will remain cool enough to touch. Heat can be a critical factor in areas such as stairwells where people might be trapped for long periods, or computer rooms where sensitive data and equipment could be damaged by heat.

Glass fire walls can be installed from wall to wall and floor to ceiling, and include full lite doors if desired. Designers can divide space

without the use of solid walls that diminish visibility, security and light.

What's more, glass fire walls can address security concerns. Most security or bullet-resistant glazing contains plastic, which is highly flammable. Glass fire walls are available with a Level 3 bullet-resistance rating (capable of stopping a .44 Magnum bullet), and can offer up to a Level 8 rating when combined with other products.

### New Wired Glass Options

Wired glass hasn't stood still. New options are available that have improved on the impact safety of traditional wired glass.

One method adds a surface-applied film to achieve greater strength. In high traffic areas such

as schools, the film may be prone to vandalism and damage, introducing unwanted maintenance issues.

Another form of wired glass is a laminated version that bonds a sheet of wired glass and a sheet of float glass with a special interlayer. This method of construction meets current impact safety standards (CPSC 16 CFR 1201, Category I) without requiring a surface applied film.

Some code officials are allowing "trade-outs" - permitting buildings to forego requirements for fire-rated glass if sprinklers are installed instead. The logic seems sound: Install a top-notch suppression system that activates early and eliminate the need for special glazing.

As attractive as the concept may seem, it does not line up with reality.

Although sprinkler systems have an excellent performance record, such systems may fail to operate as intended during a fire. Without any "back-up" protection plan, a fire is then free to spread uninhibited and can result in catastrophic loss to life or property.

Sprinklers are "active" systems, requiring a number of steps to happen in order for them to work properly. For example, sprinklers require sufficient water pressure, which may be greater than a building can support. A system may be mechanically correct, but not operate properly without the right force to activate it.

Water pressure is only one of many such factors. Water supply can be accidentally turned off, sprinkler heads can be unintentionally painted over, water pipes can be damaged

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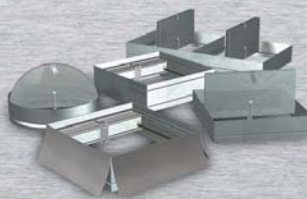
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Another category of fire-rated glazing falls under the heading of glass fire walls.



Glass ceramic has earned fire ratings up to 3 hours and can be specified in much larger sizes than wired glass.

during a fire, etc. Add to that list the possibility that the sprinkler systems may be aging, poorly maintained or improperly installed, and you begin to see the danger of relying exclusively on a single system.

Of equal importance, if the appropriate fire-rated glass isn't used, sprinklers can cause the glass to fall out of the frame. If glass has been heated by a fire and then is suddenly exposed to cooler water from a sprinkler, it will experience thermal shock - stress within itself that will result in the glass shattering. Special "deluge" systems may be able to overcome this problem, but only if water from the sprinklers is able to bathe the glass completely and evenly before it overheats.

The majority of the time sprinklers do perform as expected. They have saved countless lives. But they should not be seen as a replacement for compartmentation such as fire-rated glass, concrete, masonry and

gypsum systems and opening protectives including fire dampers, fire doors and firestopping that can provide a degree of fire protection without depending on any outside factors. And when codes allow for non-fire-rated glass to be installed in conjunction with sprinklers, the more specialized deluge sprinklers should be used in place of standard sprinkler systems. In these cases, installation of the glass and deluge sprinklers should follow test listings and manufacturer installation criteria.

Rest assured the technology exists to produce a very effective compartmentation system while retaining fire and other resistance at the same time. Through the team approach of proper design, installation by professional glaziers, inspection and maintenance, great performance in fire and life safety situations can be the result.

As for fire-rated glass, it has more to offer than ever before. Higher fire ratings, added capabilities, better

aesthetics -- in short, there now exists a wide variety of fire-rated glazing choices that have greatly expanded the options available. Glass may be virtually invisible, but the role it can play in fire protection couldn't be more vital. 🔥

*Jerry Razwick is founder and president of Technical Glass Products, a distributor of specialty glass and framing as well as architectural products. He has been a glass factory agent in foreign and domestic markets for over 25 years. Mr. Razwick has served on the Industry Advisory Committee for Underwriters Laboratories, Inc. and is an active member of AIA, CSI, NGA, and GANA. Visit [www.fireglass.com](http://www.fireglass.com)*

# Understanding Fire-Resistant Expansion Joints



A typical fire-resistant expansion joint assembly has two key components, the expansion joint system and the fire barrier system.

by **John E. Sobol**

An expansion joint is a separation bordered by two opposing building elements, such as floors, walls, ceilings and roofs. The specific purpose of the joint is to relieve building stresses by accommodating dynamic structural behavior commonly known as “building movement.”

The types of building movement that must be considered by the design professional and product manufacturers during the evaluation and selection of expansion joint systems. These include thermal cycling, seismic, wind, load transfer and concrete shrink, creep and elastic shortening. Movements may

The secondary passive assembly, or “fire barrier,” consists of multiple layers of high temperature ceramic fiber or intumescent paper commonly known as fire blanket.

occur independently of each other or simultaneously and may be measured perpendicular or parallel to the direction of the expansion joint.

Under certain conditions, load transfer may result in vertical displacement at the expansion joint. When these movements occur simultaneously, expansion joint manufacturers will typically use the term “multidirectional movement.” Selecting and providing the appropriate expansion joint system for these conditions must be considered to accommodate the full expected range of building movement.

In addition to building movement, expansion joint systems must comply with Americans with Disabilities Act requirements, accommodate and accept various building materials, accommodate heavy loads in floor applications, be aesthetically pleasing and complement the building interior and exterior design schemes, pro-

tect the building envelope against weather, moisture intrusion and the required fire rating.

Expansion joint systems are a necessary component of almost every building. They take on many different styles and their choice of materials and colors are almost endless.

These systems are manufactured by the assembly of multiple components to minimize the disruption of interior finishes and design schemes. In many cases expansion joint systems accept finished floor and wall-inlay materials.

In short, they re-establish the transition between the opposing building elements. They often measure several hundred feet connecting building compartments areas.

## Expansion Joints and Fire Ratings

Where expansion joint systems are located within fire-resistance-rated construction, they must include a secondary passive assembly that provides a protective barrier between potential areas of fire and areas to be protected. They close off vulnerable areas in buildings.

The expansion joint system alone and its immediate components are not capable of withstanding extreme temperatures of fire, which can range from 704 to above 1,093 Degrees C (from 1,300 to 2,000 degrees F and above).

Compartmentation is both recognized and practiced by our friends and colleagues in the firestopping industry as the best defense and ability to protect life and property. Leaders in the expansion joint industry agree with the life-saving philosophy of compartmentation and are promoting it.



Although expansion joint manufacturers are typically proactive in educating design professionals about compartmentation, there is confusion and lack of understanding in the industry on fire-resistant expansion joint systems.

The definition of a fire-resistant joint system according to the American Society for Testing and Materials (ASTM International) is a “device or designed feature that provides a fire separating function along continuous linear openings, including changes in direction, between or bounded by separating elements.”

A typical fire resistant expansion joint assembly (Photo 1) is broken down into two key components--the expansion joint system discussed earlier and the fire barrier system.

Expansion joint systems-or “covers” as they are called by some parties-can be classified as elastomeric or hard cover.

Elastomeric covers may be comprised of poured sealants or extruded profiles. Their behavior characteristics and performance under extreme temperatures should be a consideration by the design professional when reviewing systems. Temperatures in the area of 204 degrees C (400 degrees F) approach the melting point and state of a nonsolid for thermoplastic materials and profiles.

In comparison, systems that use metal alloys for covers and profiles typically exhibit higher melting temperatures. Traditionally, aluminum expansion joint systems are the most widely promoted and used.

With the melting point of aluminum being well above the maximum allowable temperature on the unexposed surface of the test assembly, a higher level of confidence is achieved with the use of hard cover systems. They are capa-



Test specimens have a minimum exposure to fire of generally 12 ft. for horizontals (top) and 9 ft. for verticals.

ble of carrying higher live loads at elevated temperatures compared with elastomeric systems. During a fire, there is little concern for occupants safely exiting the structure if their means of egress takes them across an expansion joint system.

This also holds true for fire personnel entering the building. During a fire, a hard cover system on a vertical wall is structurally capable of better withstanding the impact of a hose stream of water or other simulated impact vs. elastomeric covers.

### The Fire Barrier

Located below horizontal or behind vertical expansion joint systems is the secondary passive assembly, or “fire barrier” (Photo 2).

Generally, it consists of multiple layers of high temperature ceramic fiber or intumescent paper and is commonly known as a fire blanket. Most ceramic fiber blankets are typically rated for continuous exposed temperatures exceeding 1,926° C (3,500 degrees F). They provide excellent protection. This is note

worthy as a result that other industries use traditional mineral wool as their preferred choice of fire resistant materials. The expansion joint industry does not recognize mineral wool as a high temperature material because its maximum continuous use limit may be well below the typical temperatures experienced in during a fire endurance test.

The number of and thickness of blanket layers is dictated by the targeted hourly rating and the desired opening that will define maximum outward movement of the two structural assemblies where the expansion joint is located. Layers may be encapsulated in a fabric of reinforced aluminum scrim to reduce the number of airborne fibers during installation.

The scrim also provides limited moisture resistance during shipping and installation.

The blanket layers may also receive an optional 2-mil stainless steel foil lamination. Use of the foil is determined by the manufacturer and its use is dictated by design but its use serves multiple roles in providing protection against smoke penetration and the reflectivity of intense heat during a fire.

The blankets are traditionally attached to a preformed metal retainer that provides secure and positive attachment of the assembly to the building. Fire barrier assemblies are traditionally manufactured and shipped in standard 10-ft. lengths and require a third-party-recognized butt splice transition for installation.

### Testing Fire-Barrier Assemblies

Most professionals recommend that fire-barrier assemblies need to be tested by a third party, but it was only recently that fire-resistant joint systems received dedicated test standards. Previously, the industry tested fire barriers using the standards set forth in ASTM E 814 (Standard Test Method for Fire Tests of Through Penetration Fire Stops) and E 119 (Test Methods for Fire Tests of Building and Construction Materials). Both standards subjected the specimen to a controlled fire using the widely recognized standard time-temperature curve.

The primary difference between the standards relative to expansion joints was the size of the test assembly. Many manufacturers selected

Firestop Specialties

the E 814 standard so that testing could be performed on a small furnace that provided certain benefits in expediting research, time and cost.

There were questions about whether the tests truly represented actual installations due to the continuous and lineal nature of expansion joints.

ASTM E 119 became the preferred standard because the size of the specimen closely reflected the lineal nature of expansion joints. For floor systems, the minimum length of the specimen was recognized to be 12 ft. and for vertical systems, the minimum recognized height was 9 ft.

Most important, earlier testing did not require cycling of the specimen or dictate positive pressures inside the furnace chamber. The pass/fail criteria typically found both standards were followed by the third party to qualify the specimen.

In the United States the industry has adopted two standards dedicated to the fire testing of fire-resistant joint systems. The industry has also incorporated dedicated sections and requirements into the model building codes.

Currently, fire-resistant-joint testing typically follows UL 2079 and ASTM E 1966 standards. Both standards are similar with the exception of guidelines relative to thermocouple placement and requirements.

Generally, the standards require the test assembly to be subjected to the traditional time and temperature curve with temperatures 5 minutes into the fire endurance test reaching 538 degrees C, (1,000 degrees F). After 120 minutes of fire exposure, temperatures achieved can exceed 1,010 degrees C (1,850 degrees F).

It is worth emphasizing that stand-alone expansion-joint-systems and their traditional elastomeric thermoplastic and metallic



A test specimen is mounted to a cycling apparatus.

aluminum components will not survive beyond 5 to 10 minutes into the test as a result of their melting temperatures and flame propagation characteristics. As a result, there is a need for a secondary passive high temperature assembly.

Within the current standards, the same pass/fail criteria was adopted where the maximum allowable temperature rise above the initial recorded temperature is 163 degrees C (325 degrees F) on any one thermocouple on the unexposed surface of the test specimen and 121 degrees C (250 degrees F) as an average on all thermocouples. While the 163 degrees C (325 degrees F) standard of may seem arbitrary, it actually has established an industry benchmark to prevent the spread of fire to adjacent compartments.

Close examination will show that this value closely considers the flashpoint of common materials, such as paper or newspaper.

For instance, if a fire originates in a small office and a newspaper is on a desk near a common wall in an adjoining office with a room temperature of 24 degrees C (75 degrees F), there is cause for con-

cern. Heat radiating through the wall may raise the unexposed surface temperature on the wall to exceed the newspaper's approximate flashpoint of 232 degrees C (450 degrees F), thereby permitting the spread of fire without flames breaking through the wall.

To limit this possibility, a safety factor has been built into the standard. It should be noted that if the allowable temperature rise was permitted to be higher, compartmentation and life safety as it is practiced would be difficult to achieve.

### Other Test Requirements

Further requirements of the latest test standards include testing all assemblies with a factory and/or field splice, constructing test specimens with a minimum exposure to fire of generally 12 ft. for horizontals (Photo 3) and 9 ft for verticals (Photo 4) and subjecting test specimens to cycling prior to the fire test.

This is key and worthy of extended discussion.

Expansion joints are dynamic in nature and not static. In general, it is an industry standard that expansion joints are designed for plus-or-



A vertical specimen is subjected to a hose stream test.

minus 50 percent movement.

In the case of a 4-in. expansion joint, a system would be selected by the architect to accommodate 2 in. of outward movement and 2 in. of inward movement, requiring a total of 4 in. of dynamic movement by design. Within the test standard, the sponsor must select which movement classification it wishes to qualify.

Typically, most manufacturers select Class II (wind) and Class III (seismic). If these classifications are achieved Class I (thermal) is automatically granted by the third party. During the sponsor's test in the above example, the test specimen would be mounted to a cycling apparatus (Photo 7) inclusive of the splice transition and cycled at a rate of 30 cycles per minute with 50 percent extension and compression to qualify for Class III movement.

After 100 cycles, the apparatus is slowed to 10 cycles per minute continuing the 50 percent extension and compression to qualify for Class II movement. After 400 cycles, the test specimen is examined, documented and transferred to the test furnace.

In an attempt to reduce costs, some contractors may attempt to install traditional firestopping below or behind the expansion joint sys-

tem. This would result in a compromised installation.

Most firestop systems are not cycled at 30 cycles per minute to meet Class III movement and do not provide plus or minus 50 percent movement capability.

Approving their installation with a traditional expansion joint system may place life and property at high risk. In practice the fire barrier assembly must provide the same cyclic and movement capability as the expansion joint system above or in front of itself.

### Final Notes

Cycling before the fire test subjects the fire barrier to simulated movement that will occur over its expected service life, including the possibility of seismic activity. It confirms what effect movement and fatigue have on the fire barrier's components and if the system is capable of protecting life and property long term in the event of real fire. This is a key component in the validation process to determine if the system is capable of protecting life and property.

An added requirement of the standard is to subject all vertical specimens to a hose stream test

Water pressure and duration varies according to hourly rating but for a typical two-hour endurance test, the specimen would be subjected to 30-psi water pressure measured at the base of the hose nozzle for a duration of 1.5 seconds per sq. ft. of exposed area. With a traditional 9-ft.-tall specimen and 12-ft.-wide wall, this would equate to duration of 2.7 minutes.

Although the test allows the hose stream to be conducted on a duplicate specimen, many manufacturers conduct the test on the same specimen originally exposed to the fire for the desired rating.

A significant requirement of the latest standard is to run the endurance test at positive pressure. There are particular requirements in the standard to determine how both vertical and horizontal test specimens are to be exposed to positive pressure and measured.

Horizontal specimens must be exposed to a minimum positive pressure of .01 in. of water over their entire length, including splice. Pressure is measured 12 in. below the exposed horizontal surface of the test specimen.

Vertical assemblies must be exposed to a minimum positive pressure of .01 in. of water measured at their mid-height elevation. Pressures increase along with the height and can be significant at the top of wall, causing results to fall short of the manufacturer's expectations.

Quality and workmanship has been compromised in our industry in recent years. It has become competitive, with manufacturers rushing to close orders and contractors attempting to regain profits by value-engineering systems to reduce costs and meet aggressive project schedules.

Factory trained applicators and manufacturer work together as a team to ensure quality and an installation that meets the latest test standards and building codes. Specialty contractors expressing interest in receiving the training to become factory trained applicators do so with the highest level of commitment and dedication. 🔥

*John Sobol, CSI, FCIA, is Northeast Regional Manager for Watson Bowman Acme Corporation. He has served WABO locally and nationally, and is a Manufacturer Member of the Firestop Contractors International Association. He can be reached at john.sobol@basf.com.*

## New ASTM Inspector Standard Under Development

by **Randy Bosscawen**  
**Multicon Fire Containment Inc.**

Firestopping can look really easy. Just install some red sealant, sheet metal collars, and off we go. Well, nothing is as easy as it looks.



Prior to firestop system application.

In the 'before' picture, it seems obvious that a penetration firestop system needs to be installed. However, there's much detail that needs to take place before firestop installation.

The fireproofing, insulation or sound reduction material on the metal decking needs to be removed, penetrating item and opening surfaces cleaned, annular space and pipe size measured, hourly rating of the floor/ceiling system understood prior to system selection and installation. We've measured that there is enough clearance at the 90 degree bend in the pipe and that the coupling is not occurring where the penetrating item goes through the floor/ceiling system.

As seen in the 'after' picture, a metal composite sheet material was fastened to the metal deck to create a flat surface for the firestop collar. Fastening patterns are specified in the tested and listed system, along with the type of intumescent wrap or insert in the round sheet metal collar, which is also fastened to the composite sheet mate-



Penetrations protected with firestop system.

rials. Also, a mineral wool and firestop sealant has been applied on the side of the composite sheet to fill voids where the composite sheet meets the fluted decking and around the penetrating items for smoke protection.

In retrofit applications, the firestopping environment can get more complex. Obviously, there's something wrong with this picture.



Firestopping isn't easy.

The foam behind the black firestop sealant is the first clue. It's not completely covered, meaning the foam could burn through quickly, leaving an open hole for fire to spread to the next compartment. To repair, the specialty firestop contractor must remove the foam, sealant and drywall compound not tested and listed as a firestop and prepare the wall and penetration for the appropriate firestop system that allows multiple pipes through a fire-resistance-rated gypsum wall system.

Firestopping isn't as easy as it looks...and should be left to the specialty firestop contractor and qualified inspector.

The construction industry has started to embrace the quality process, while retaining entrepreneurial efficiencies and allowing for the unique work environment inherent in the industry. Project sites are very dissimilar to manufacturing facilities.

Similar to ISO process used in manufacturing and general contracting, the firestopping quality process includes the use of a qualified FCIA Member, FM Approved contractor, inspected to these new inspection protocols.

The Firestop Contractors International Association has initiated a new standard to complement ASTM E 2174 Standard for the Inspection of Penetration Firestops and ASTM E 2393 Standard for Inspection of Fire Resistive Joint Systems.

The new standard addresses qualifications of the inspector who is reviewing the installed firestop systems on project sites. This important service is critical to the firestopping quality process as it verifies that the firestop systems were installed to the tested and listed system.

Although great standards, ASTM E 2174 & ASTM E 2393 are protocol standards for inspection, with little about inspector qualification. However, the standards do make strong statements about the inspector overseeing the contractor's work.

- Acceptable to AHJ
- Insured
- 2 years experience
- Independent of installer, contractor, distributor, manufacturer (to prevent conflicts of interest)

Although some qualifications exist, they do not address inspector knowledge about the ability to understand tested and listed firestop systems analysis. There is currently no test to establish a minimum level of firestop systems analysis knowledge of the inspector, similar to the FM Approvals, FM 4991 designated responsible individual (DRI) exam. Therefore, FCIA's Standards Committee is advancing this new inspector qualification standard at ASTM.

To understand why further qualifications are needed, a step by step description of the inspection protocols is needed. The following is what a firestopping contractor, installer and firestop inspector can expect during an ASTM E 2174 and or ASTM E 2393 inspection process:

- Pre Construction Meeting: The inspector meets with firestop specialty contractor and all affected construction trades to review submittals and discuss conflicts with tested and listed systems.
- Mock-Ups: Contractors build a mock-up of the installations to establish the level of quality the inspector can expect in the field.
- Material Verification: Inspector verifies that the materi-

als used are in compliance with tested and listed systems.

- Inspector Schedule: The contractor and inspector agree on the schedule and anticipated completion.
- Inspection: The inspector is to use inspection documents as shown in the standard, which are reviewed later by the Authority Having Jurisdiction and the Authorizing Agency.
- Compliance: The inspector shall verify compliance of the firestop system by observing the installation process and by taking and recording measurements of substrates and materials being installed or by destructive evaluation. Either ongoing viewing of 5 percent of the linear feet of joints in ASTM E 2393, 10 percent of the penetrations in ASTM E 2174, and with no less than one of each type reviewed for either category.

Destructive testing can also be used, with 2 percent of penetrations and a minimum of one sampling per 500 lin. ft. of joints, no less than one of each type.

- Deviations: Should deviations from tested and listed systems occur on more than 10 percent of the firestop systems, either joints or penetrations, the inspector should stop work, ask the contractor or installer to inspect its work and notify the inspector of the corrections and readiness for the reinspection.

- Report: At the end of the installation, the inspector submits final report to the authorizing agency. Information includes the types and quantity of systems inspected, percentages of deficiencies of each type of firestop noted, total deficiency percentage and all information submitted by the contract inspector to the authorizing agency.

The standards also both have requirements for engineering judgments used with both penetration and joint firestop systems.

In section 7.4 of ASTM E 2174 and ASTM E 2393, it is noted: 'As part of the inspection documents, Listed Designs shall be provided for every fire resistive joint system, as a reference against which to compare the installation. As an alternative for every case where a Listed Design does not exist for a particular application, a Judgment, issued by a manufacturer or an accredited testing laboratory and acceptable to the AHJ, shall be provided as a reference against which to compare and inspect the installation.'

Implications of this paragraph are that tested and listed systems are the inspectors' expectations. An engineering judgment should be used only if there are no tested systems available.

Using these ASTM inspection protocol standards requires knowledge of construction project sites, the construction process and firestop systems selection, analysis and evaluation.

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The existing ASTM E 2174 and ASTM E 2393 Inspection Process Standards, designed by both the contractors and manufacturers of firestopping systems, are meant to improve the installed quality of fire and life safety firestopping systems used in compartmentation around the world. They are part of the firestopping quality process, where properly designed (laboratory tested), installed, (FCIA Member, FM 4991 Approved Contractor), inspected (to ASTM Inspection Protocol) and maintained firestopping helps keep compartmentation an effective option in total fire protection.

With the new Firestopping Inspector Qualification Standard under development at ASTM, the building owner, manager, construc-

tion manager, Authority Having Jurisdiction and others can expect that a person qualified in the firestopping discipline conducts the inspection process properly.



Proper firestopping is a team sport, specialty firestop contractor and qualified inspector.

Are you an inspector who wants to learn more about this standard? A contractor? Attend the FCIA Firestop Industry Conference & Trade Show to

visit with specialty firestop contractors who understand the firestopping quality required to keep inspection not the main focus of the projects, but efficient installation followed by effective inspection processes ... not bogged down by incorrect submittals or improper installation. Questions, contact FCIA...info@fcia.org . 🔥

*Randy Bosscawen is general manager of Multicon Fire Containment Inc., Columbus, Ohio. Bosscawen, who is also a board member at the Firestop Contractors International Association, is current chair of the ASTM Task Force on Firestop Inspector Qualifications. He can be reached at 614-251-4683 or rboss-cawen@multicon.us*

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## Code Corner

## Industry News

### ICC Code Changes

Effective Compartmentation is a very important part of fire and life safety in buildings. Where it is used, it should receive the utmost attention to detail for effectiveness...for when it's really needed. From designer, installing contractor, inspection firm and maintaining authorities, everyone has a play in effective compartmentation.

FCIA submitted several code change proposals to the International Code Council Code Development Process. The changes included ways to recognize the importance of both fire- and smoke-resistance-rated compartmentation, as well as structural fire protection ratings. Important items such as contractor certification, inspection, the definition of compartmentation, are just some of the changes to be heard at ICC this cycle.

Other groups that submitted proposals for firestopping and compartmentation in addition to FCIA included the National Association of State Fire Marshals, International Firestop Council, State of California Fire Chiefs Association, ARUP FIRE Consultants, Underwriters Laboratories, Inc., Phil Brazil of Reid Middleton Architects, Sean DeCrane (new IFC Director) for the Cleveland Firefighters Union, Local #93, Specified Technologies, Inc and others.

The ICC Code Technology Committees' chair Paul Heistadt also submitted a code change on behalf of the committee. Reacting to NIST Reports' findings about the World Trade Center, the committee recommends to the ICC changes

for inspection frequency and density of structural steel fireproofing in buildings, for more robust and reliable fireproofing systems.

The building codes in the US are driven by people involved in the code change process. If you have a burning desire to change something, get involved with the FCIA Code Committee. Look for reports about these code change proposals and hearings in coming Life Safety Digest issues.

### FCIA November Conference

The Firestop Contractors International Association's Firestop Industry Conference & Trade Show has much to offer the specialty firestop and effective compartmentation contractor, manufacturer, consultant, distributor, manufacturers' rep...plus the building official and fire marshal.

FCIA's conferences feature education sessions on the New FCIA / US Department of Labor Firestop Worker Apprenticeship Program, effective compartmentation, perimeter fire containment, Fire Door and Fire Damper Inspection, ASTM Firestop Inspection Protocol, FM 4991, the Standard for Approval of Firestop Contractors Education and DRI Testing.

Learn about International Code Council and National Fire Protection Association code changes in firestopping and compartmentation from leaders like Bill Koffel, FCIA code consultant; Bert Polk, a key spokesperson for the National Association of State Fire Marshals; and others.

The Firestop Industry Day and Trade Show on Thursday, November 9, 2006 is open to architects, specifiers, engineers, building officials and fire marshals. Tabletop displays by



The Firestop Contractors International Association will hold its annual conference in November, in South Carolina.

those serving the industry are featured, in addition to education speakers, for valuable health safety and welfare credits.

FCIA invites contractors to participate in this valuable event. Meet other firestop contractors, consultants and inspectors, manufacturers, distributors and manufacturers' reps from around the United States and Canada. Visit <http://www.fcia.org> for information and downloadable convention forms.

### AFSCC Meets

The Alliance for Fire and Smoke Containment and Control met in the Chicago area recently for its annual meeting and summit.

The group of about 20 people planned strategy for 2006/2007 code development efforts.

### New IFC Director

The International Firestop Council named Sean DeCrane, a Cleveland firefighter, its new executive director.

In addition to his full time role as a firefighter, his new IFC responsibilities include day to day management and increased visibility in code development.



## Code Corner

### DHI Foundation Renamed

The Door and Hardware Institute has renamed its foundation the "Foundation for the Advancement of Life Safety and Security".

According to DHI, this better reflects the group's work undertaken this last year. "There is much to be done to provide enhanced security within buildings through education about the important fire door inspection program, while improving code requirements for fire and life safety," said Bill Johnson, the foundation's managing director.

For information, visit <http://www.dhi.org>.

# Life Safety Digest 2006 Industry Calendar

### Sept. 11 to 16

Door and Hardware Institute DHI Conference & Exposition, San Diego

### Sept. 17 to 30

ICC Annual Conference & Code Development Hearings, Lake Buena Vista, Fla.

### Sept. 24 to 26

IAPMO Annual Conference, Chicago

### Oct. 8 to 12

SMACNA Annual Convention, Phoenix

### Oct. 22 to 25

PCI Annual Convention and Exhibit - Grapevine, TX

### Nov. 8 to 10

FCIA Firestop Industry Conference, Charleston, S.C.

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3"	PECORA AC-20 FTR	PECORA DYNATROL II PECORA AC-20 FTR	
2"	SONNEBORN NP-2 PECORA DYNATRED PECORA DYNAFLEX	LYMTAL 880 LYMTAL 881 LYMTAL 830	SIKA 2 CNS GE PENSIL 300 GE PENSIL 300 SL
3/4"	PECORA 864 PECORA AC-20 FTR PECORA DYNATROL II GE SIL PRUF GE ULTRA GLAZE GE EP 600 GE PENSIL 300 DOW CORNING 790 DOW CORNING 795 SIKA SIKAFLEX 2CNS SIKA SIKAFLEX ISLM TREMCO VULKEM 921 TREMCO VULKEM 922 LYMTAL 880 GB LYMTAL 881 LYMTAL 830 CARLISLE COATINGS OSC 1026 C.R. LAURENCE CRLM64		



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## Industry News

### Testing & Qualification News

#### FCIA at ASTM Meetings

FCIA's Barclay Meyers and Randy Bosscawen attended ASTM Meetings in Toronto, Ontario, in April and June.

#### FCIA Firestop Inspector Qualification Standard

- Where there is a non educated Firestopping Contractor and Inspector, a risk to fire and life safety exists. FCIA's Randy Bosscawen, ASTM Firestop Inspector Qualification Standard Task Team chair and the committee are developing this new standard to prevent this from occurring. Randy met with representatives of the Firestopping industry at the ASTM Meetings, Toronto, Ontario, Canada in April, heard objections, incorporated many of them while soliciting further comments from the group. Inspector firms are welcome to join FCIA in this effort to continue pursuit of the proper 'design, installation, inspection & maintenance' of firestop systems and effective compartmentation.

#### FCIA ASTM E 2174 & ASTM E 2393 - Maintenance

- These two standards required cleaning to insert mandatory language, making the standards suitable for the code change process at ICC and NFPA.

#### ASTM E 1529 - High Intensity Fires

- Discussion was held regarding the scope of this standard and how to incorporate testing with the current time and temperature rise curves without limiting the scope of the standard for the future. FCIA's Barclay Myers suggested ASTM write the standard in a "modular" way for simplicity.

#### ASTM E 814 - Penetration Seals

- According to FCIA's Barclay Myers, this was the largest group and longest discussion of the June ASTM meetings in Toronto. Discussion centered on the need for an air leakage (L) rating standard for ASTM E 814, test method for through penetration fire stop systems, similar to what exists in UL 1479 already. There was also discussion about whether the "L" Rating test should be performed during the actual fire test as part of ASTM E 814 rather than before fire exposure. The chair, John Valiulis, HILTI, Inc., acknowledged FCIA's comment to change wording from Fire-Stop to Firestop System, with reference to compartmentation. FCIA applauded John and the committee for making these suggested changes because it reflects 'systems, not products'...an important FCIA goal since its inception.

#### ASTM E 814 - Membrane Penetrations

- Discussion was centered on the locations and number thermocouples on the single sided assembly for these types of penetrations...and even methods on how to build the testing assembly for testing procedures. FCIA's position is that the testing should reflect actual conditions as they may occur in the field, regardless of cost of testing equipment.

#### Draft Standard, Standard Test Method for Fire Resistive Ventilation Duct Enclosure Systems - Duct Protection

- Discussion on a new standard for testing fire protected ductwork as it passes through fire resistance rated floors and walls took place. This adds actual testing for firestopping fire protected ductwork.

#### Building Perimeter Fire Containment

- This 'leapfrog' protection standard, protecting where fire may jump from floor to floor at the exterior of a building, has been discussed for several years according to the committee chair, Jim Shriver, Thermafiber, Inc., Wabash, IN. According to the group, limitations to passing the standard include lack of equipment to test uniformly at testing laboratories, direction from code authorities, and the method used to determine ratings of the wall and floor juncture at the perimeter using engineering evaluation. FCIA supports the need for this standard. It is important for the firestopping industry to have a tested system for hourly leapfrog fire protection at the building perimeter.

#### Guide for Developing a Cost Effective Risk Mitigation Plan

- FCIA recently commented on the ASTM Standard E06 on Risk Mitigation submitted by NIST. FCIA suggested that a reference be made to fire and smoke resistance rated effective compartmentation in the engineering risk mitigation section. Building owners, managers, designers and others should have the option to reference this method for risk mitigation. Recommendations for education of employees and building occupants about where safe havens are located in buildings, and which walls / floors are compartmented with fire resistance rated construction for safety were proposed by FCIA. FCIA appreciates its relationship with NIST people, and looks forward to growing our relationship with this and other strong US, Canadian and other worldwide resources.



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## FCIA Membership is for you!

FCIA is a very dynamic group of Firestopping Contractors, Manufacturers, and Associate Members. FCIA represents the Specialty Firestop Contractor & Industry while promoting Firestopping, Effective Compartmentation and Total Fire Protection Concepts.

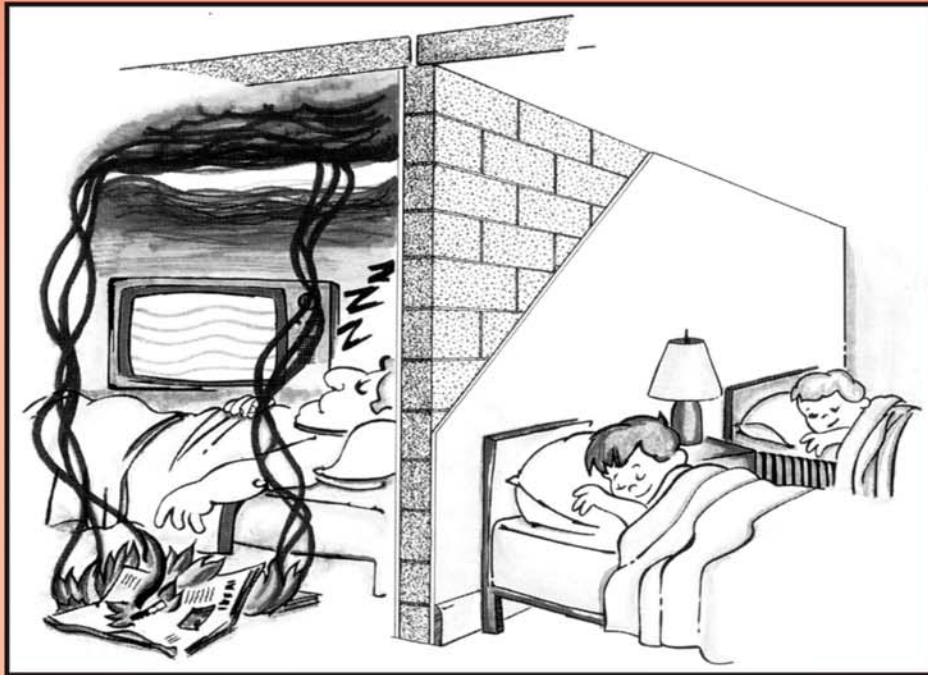
### FCIA Members enjoy the following benefits:

- FCIA Life Safety Digest Magazine
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  - Firestop Education Powerpoint CD's
  - FCIA Firestop Industry Manual of Practice (*\$295 members*)
  - Firestop Education DVD (*\$145 members*)
  - Firestopping Trade Show Booth
- Building & Fire Code, Architect, Building Owner & Manager Promotion
- FCIA Conferences - *FCIA's Education and Committee Action Conference, and FCIA Firestop Industry Conference and Trade Show.*

Join FCIA now, and get involved in a vibrant group. Learn and form lifelong friendships, with others who are into Firestopping and Compartmentation with passion! Visit <http://fcia.org/membership.htm> for an application!



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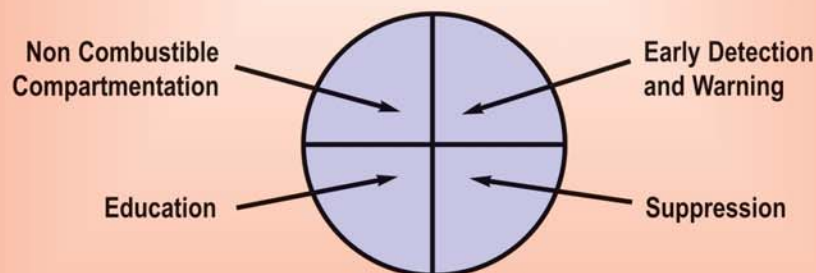


## If your neighbor fell asleep while smoking . . .

in his or her apartment or townhouse, what separates you from their actions . . . a wood frame wall with drywall, or a masonry wall?

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## Balanced Design for Lifesafety

The solution is clear - adequate firesafe buildings depend upon noncombustible construction and containment of fire; early detection, warning and suppression of fires; and the education of the general public and occupants of these buildings, provided by the fire department and/or building owners, as to the hazards of fire and the procedures to follow in case of fire.



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