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The Magazine of Effective Compartmentation



Life Safety DIGEST

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Glowing Pathways and First Responders

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Editor's Message

There has been a lot going on in the industry this past fall.

FCIA's "DIIM"- D-Design, I-Install, I-Inspect and M-Maintain - strategy to improve reliability of installed firestopping

continues to gain acceptance. Read more about DIIM inside this magazine. Just ask FCIA's USA and Middle Eastern members. Pieces of the DIIM are being specified and held more, especially inspection.

The International Code Council had two hearings this year resulting in several chapters of the International Building Code being updated for the 2015 Codes. ASTM and UL have been active with standards discussions amongst manufacturers, consultants and contractors.

In this high-rise building safety issue, you will find articles on effective compartmentation, firestop systems, fire & smoke dampers, fire-rated glazing, swinging fire doors and builders hardware, photoluminescent markings and many other areas.

Best wishes to all for a great finish to 2012. 🔥



FCIA Members and guests at FCIA's DIIM Educational Seminar in Dubai

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Providing Fire Protection While Keeping Patient Needs in Mind

By Jeff Razwick

Designing healthcare facilities to help accelerate patient recovery, decrease dependency on medication and improve overall wellness is no easy task. Healthcare building teams must satisfy strict hygienic needs, balance patient privacy with access to natural daylight and allow for efficient flows of medical personnel and patients, among myriad other design factors. Plus, in many cases, these healthcare occupancy buildings are also high-rise occupancies. A high-rise occupancy can be defined as a structure with height 75 feet above fire department access. Many large buildings in big cities, suburbs or regional healthcare facilities in small towns exceed 75 feet in height.



*Madison and Dearborn building stairwell enclosure.
Pilkington Photo*

Building teams must also account for occupant well being through fire and life safety protection. Patients in healthcare facilities are generally presumed to be incapable of self-preservation should a fire occur. Individuals in intensive care, neonatal and recovery units, for example, may be either unable to exit the building without the assistance of staff or incapable of perceiving a fire threat. As a result, it is critical for healthcare building teams to provide total building fire protection, allowing patients to safely remain in place until the fire is extinguished.

For healthcare building teams, balancing effective fire and life safety protection with patient needs can prove challenging. Compartmentation, or the subdivision of spaces to help slow the spread of fire, is an essential component of total building protection, particularly for buildings taking a defend-in-place approach. While numerous materials and assemblies can protect against the spread of fire—from masonry and gypsum to firestop systems—their opaque form limits the extent to which design teams can provide patients with natural daylight and views to nature.

To help resolve this dilemma, building teams are increasingly using fire-rated glass to provide compartmentation in healthcare occupancies.

Fire-rated Glazing in Healthcare Facilities

Fire-rated glass has the unique ability to deliver fire protection in a patient-focused manner. It resembles the appearance of ordinary window glass, yet it can also provide either “fire protection” or “fire resistance.”

Fire-protective glass blocks flames and smoke and is available in a range of product makeups to meet various design and performance needs. Transparent ceramic sheets, for instance, resemble ordinary window glass and are now available with a range of high-performance options, including fire ratings up to three hours and options for energy efficiency and sound reduction. Fire-protective glazing is sufficient in many healthcare settings, including for use in doors, sidelites, transoms, and borrowed lites.

Fire-resistive glass adds extra performance by also acting as a barrier to radiant and conductive heat transfer. It meets the fire-resistance standard for walls and floors and carries fire ratings up to 120 minutes. One popular type of fire-resistive-rated glazing is glass with intumescent interlayers. The clear interlayers turn to foam when exposed to heat, providing an extra layer of defense. Should a fire occur, this feature enables the non-fire side of the glass to remain cool enough for occupants to safely pass by without experiencing harm, and exit the building. Healthcare settings where individuals may be present during a fire for prolonged periods, including stairwells and corridors, often require fire-resistive glazing.



Pyrostop used as separation for stairwell to waiting area. TGP Photo

Fire-rated Glass and Patient Needs

With proper selection and installation, the benefits of fire-rated glass can extend beyond providing building compartmentation to aiding patient health goals. To help maximize fire-rated glass’s potential in healthcare settings, below are some key factors to consider prior to installation. Manufacturers can provide information on additional materials and product make-ups and how they may be suited for a given application; helpful MasterFormat® numbers to reference are “08 81 00-Glass Glazing” and “08 88 13-Fire resistant Glazing.”

Is the fire-rated glass in an area that requires impact-safety-rated glass?

It is important to consider whether the fire-rated glass is in an area that requires impact-safety-rated glass to ensure the safety of patients and staff. Per the 2006 International Building Code (IBC), all fire-rated glass in hazardous locations must also meet safety-glazing criteria. Hazardous locations include doors, sidelites, glass in applications near the floor and other areas as defined by code.

Given the fast-paced nature of healthcare occupancies, there may be instances in which the building team chooses to provide impact-resistant, fire-rated glass even if not required by code. Hospitals and care centers are frequently crowded with moving people and equipment, and installing impact-safety rated glass may help reduce glass replacement costs or potential injuries.

Since not all fire-rated glazing offers both fire and impact protection, it is important to check for fire-rated products that meet CPSC 16CFR1201 Category I or II impact classifications, depending on the application. Examples of such dual-performance materials include



Fire rated glazing used as a separation for a corridor in a school. TGP Photo

fire-rated transparent wall panels and laminated or filmed fire-rated ceramic glass.

Is the fire-rated glass maximizing light transfer?

Research shows that access to natural light and views is important to patient recovery. For example, a 2005 study assessed the significance of sunlight in a hospital room and how it affected patient recovery. The study found that patients with greater exposure to sunlight perceived less pain and used less medication (Walch et al, 2005).

Since it is up to the building team to ensure the product is oriented in such a way as to maximize light penetration, consider whether or not it is possible to:

- use floor-to-ceiling fire-rated transparent wall panels in patient rooms;
- couple sequences of fire-rated wall panels with narrow fire-rated framing to increase occupant views and daylight transfer;
- incorporate full-lite fire-resistive glass in doors where privacy is not a concern;
- install fire-rated curtain walls in waiting rooms and visiting centers; and
- install non-slip, fire-rated glazed floor systems in spaces to funnel daylight into lower rooms where



Fire rated glazing used to separate a laboratory from a corridor. TGP Photo

sunlight may otherwise be difficult to access.

In addition, fire-rated glazing can now offer greater clarity and larger sizes that used to only be available with conventional glass. For instance, some glass ceramics with fire-ratings of 20 to 60 minutes are available with maximum sizes of 3 feet x 8 feet per piece. Such materials can be specified in applications where greater visibility or natural light benefit building design and occupant health by adding to the comfort of the interior environment.


Is the fire-rated glazing in a patient-focused area?

Fire-rated glass in patient or examination rooms has a special set of considerations. The Health Insurance Portability and Accessibility Act of 1996 (HIPAA) applies not just to protection of personal health records and information, but also to visual and acoustic privacy. As such, it is important to consider glass orientation in regards to patient location and ensure windows and doors that provide adjustable visibility and privacy levels.

While curtains, blinds, and tints can provide privacy, these systems can accumulate dust and be difficult to clean. One solution is product make-ups that incorporate louvers set between hermetically sealed panes of fire-rated glass. This is essentially a cordless version of Venetian blinds-in-glass. Louvers can be positioned so that vision and light are permitted into one area, but are limited in the opposite direction. Free of tangled cords and less prone to damage, such systems can help balance access to light, provide privacy and be hygienic.

Healthcare Project Collaboration

Healthcare building teams face the challenging task of juggling a diverse set of performance criteria – in low-rise or high-rise construction. As such, conversations during the initial stages of a project can help the manufacturer or supplier better understand how fire-rated glazing fits into project goals, from long-term performance to aesthetics and cost. This leaves critical time for creative problem solving and design adjustments.

Jeff Razwick is vice president for Technical Glass Products (TGP), a supplier of specialty architectural glazing products and fire-rated glass and framing systems. He chairs the Glass Association of North America (GANA) Fire-rated Glazing Council (FRGC) and works closely with code officials, manufacturers, and other industry professionals on fire-rated glazing applications. www.fireglass.com, (800) 426-0279 

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Doors, Hardware, and Codes

By Scott J. Tobias, AHC/CDC, CDT, CSI, LEED AP

When it comes to doors and hardware, understanding the purpose of building, fire, life safety, and other codes can help design professionals select the proper products as well as enable them to create clear, correct, concise, and complete specifications. However, when selecting and specifying these Division 08 and 28 products, it is also critical to understand the balance between life safety and security. An end-user's needs or wants for functionality might not coincide with the code of law, which, of course, takes precedence. For example, a building owner may prefer a very expensive high security system that secures all openings and monitors them electronically, sending off a signal if there is an illegal entry. However, National Fire Protection Association (NFPA) 101, *Life Safety Code*, states certain doors (some of which may very well be the ones the owner wanted secured) must shunt their alarm, unlock, and release during a fire, leaving the opening unprotected.

Understanding the Purpose of Codes

In setting minimum requirements for safeguarding life, health, public welfare, and property, the codes provide for better buildings. They allow a uniformity of building laws and offer a means to police construction materials and methods. Doors and hardware are affected by local building codes, typically a direct or modified adoption of the *International Building Code (IBC)* or, in the past, one of the national model building codes.

The *IBC* was created by the International Code Council (ICC), which formed in 1999 and consolidated the three existing main code entities. At the time, the Building Officials and Code Administrators (BOCA) had its *National Building Code*, the International Conference of Building Officials (ICBO) had the *Uniform Building Code*, and the Southern Building Code Congress International (SBCCI) maintained the *Standard Building Code*. The first edition of the *International Building Code* was released in 2000; it is updated on a three-year cycle and can be adopted into law by local jurisdictions or internationally either in its entirety or as amended. The current edition is dated 2012. The 2015 Code Development Process is underway as this is written.

Other important codes include the aforementioned *Life Safety Code* and NFPA 70, *National Electric Code (NEC)*. Codes become law when they are adopted by a state, city, or authority having jurisdiction (AHJ). When these codes directly reference a standard, that standard in turn also becomes law. For example, NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, is currently referenced by all editions of *IBC and NFPA 101*. The old expression, "if it isn't broken, don't fix it," applies as the codes know NFPA 80 is the most complete fire door standard and rather than recreate the wheel, reference it in its entirety.

The following excerpt is from *IBC2012* Chapter 7, Section 716: Opening Protectives:

716.5 Fire door assemblies and shutters shall be installed in accordance with this section and NFPA 80.

The different codes have common language and

standards which is ideal for uniformity. Repeated language appears throughout various code books regarding fire protection, life safety, accessibility, means of egress, electrical systems and many other disciplines that comprise a building.

Fire Door and Frame Tests

Fire endurance and hose stream tests are required for virtually all fire-rated doors. For the most part (but with exceptions) the rating of a fire door is typically three-quarters the rating of the surrounding wall or fire separation. For instance, a four-hour wall requires an A-label, or three-hour, rated fire door, while a two-hour wall requires a B-label, or 1.5-hour rated fire door.

The fire endurance test evaluates the resistance of doors and frames to fire in a furnace for a specified period. This is to ensure doors will burn for an expected time in accordance with the surrounding conditions of the doorway. The neutral pressure in the furnace is meant to mimic real-life fire conditions and is maintained equal to atmospheric pressure. The fire door test heat stages are as follows:

- 68° F ambient at start of test;
- 1,000° F at five minutes;
- 1,500° F at 20 minutes;
- 1,700° F at 60 minutes; and
- 1,925° F at three hours.

Once the door has passed the fire endurance portion of the test, the hose stream evaluates structural integrity. In other words, since the first part of the test confirmed the door withstands a fire for a certain predetermined period, the second part must now make sure the door has fused into place. The means to evaluate this properly is a firefighter's hose, which uses a great deal of water pressure, and should not result in a door flying open to allow smoke and fire to billow out.

During the test, the hose stream is always 20 feet away from the opening, the hose nozzle size is always 1.125 inches in diameter, and the water always exceeds 250 gallons per minute. The tests differ slightly by fire door rating, a 90-minute door gets 30 pounds per square inch at 1.5 seconds per square foot (or 2.5 minutes for every 100 square feet) and a 3-hour door gets 45 pounds per square inch at 3 seconds per square foot (or 5 minutes for every 100 square feet). The hose pattern is also specified in the standard.

In addition to Section 716 of the *IBC* referencing NFPA 80, other provisions of the section include requirements for positive-pressure fire testing. Until 2000, fire-rated doors were not truly tested to real-world conditions. That is to say, the pressurization of older fire testing practices maintained the neutral pressure plane in the furnace at the top of the opening and the negative pressure plane occupied the balance of the space below the neutral plane, basically the entire height of the opening from top clearance to undercut. Positive-pressure testing, on the other hand, mimics real fires where the neutral plane is established no more than 40 inches above

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the doorsill. The current *IBC* calls for positive-pressure testing by referencing NFPA 252, *Standards for Fire Tests of Door Assemblies*, and Underwriters Laboratories (UL) 10C, *Positive Pressure Fire Door Test*:

716.5.1 Side Hinges or Pivoted Swinging Doors.

Fire door assemblies with side-hinged and pivoted swinging doors shall be tested in accordance with NFPA 252 or UL10C. After 5 minutes into the NFPA 252 test, the neutral pressure level in the furnace shall be established at 40 inches (1016mm) or less above the sill.

Fire Door and Frame Labeling

Once the doors and frames have passed all the respective fire tests, it is time to address the fire-rated door/frame labeling requirements. Fire doors are required to have an affixed label showing the:

- manufacturer's name;
- third-party inspection agency's name; and
- fire protection rating such as "B"/1.5 hours, or "C"/0.75 hours

The maximum transmitted temperature end-point, such as with temperature-rise mineral cores, must also be shown on fire-rated door labels. Temperature-rise mineral cores are typically required on doors within high-rise office building stairwells and keep the temperature of the heat on the non-fire side to a maximum of 450° F. A better option would be cores that maintain a maximum of 250° F, but there is a cost factor to achieve this temperature rise reduction. The building codes set the minimum requirements, not necessarily the best-performing ones. Although fire-rated frames are also required to have an affixed label, it is only mandatory to show the names of the manufacturer and the third-party inspection agency, the actual ratings such as "B" or "C" do not need to be included.

Builders Hardware

Minimum builders hardware requirements are also covered by the building codes. A standard finish chart includes a "U.S. finish" designation for the different finishes. Although one can tell what the surface finish is by using that numbering system, there is no way to know the identity of the base material. The Builders Hardware Manufacturers Association (BHMA) implemented its own finish standards numbering system indicating not only the plated finish, but also the base metal material. For this reason, specifiers should use the BHMA numbers, rather than the older finish designations. These numbers are described in ANSI/BHMA A156.18, *Materials and Finishes*.

Hanging Devices

Building codes require the use of steel-based hinges. Logically, if one has a brass- or bronze-based hinge on a fire-rated door, the hinge material will cause it to melt at much lower temperature than steel. The result will likely be a 90-minute fire-rated door lying on the floor after just a few minutes, which is an obvious danger not compliant with code requirements.

Securing and Controlling Devices

Codes also require that fire-rated doors must positively latch and self-close. *IBC* shows that unless otherwise specifically permitted, single fire doors and both leaves of pairs of side-hinged swinging doors must

be provided with an active latch bolt that secures the doors when closed. This ensures the door will latch into place, securing its non-fire side from the fire side. The latch assists in protecting the door from being blown open by smoke, fire, falling light fixtures, mechanical equipment and ceilings, or the water pressure of a firefighter's hose during the hose stream test. The *IBC* also addresses the closing requirement, stating fire doors must be self or automatic closing at the time of a fire.

There are also code requirements regarding exit devices, flush bolts, and astragals, and other types of hardware and door openings in general, beyond the scope of this article. It is recommended that a design professional consult with a certified hardware consultant and the AHJ regarding door hardware issues ranging from fire and security to accessibility.

Electrical Room Doors

The National Electric Code states that in a room with equipment that is rated at +1,200 amperes, is more than 6-feet wide, and contains over current, switching, or control devices, there needs to be one entrance to the workspace not less than 24-inches wide and 80-inches high. Where the entrance has a personnel door, it must open in the direction of egress and be equipped with panic bars. This is due to the fact that electrical equipment of this high power could cause major damage to the limbs, for example fingers and hands, of one who might be working on it. It is more difficult for someone to open a traditional door knob or lever handle in the event of an accident. With panic or fire exit hardware swinging in the direction of egress, one could simply lean his or her body against the door and hardware, releasing it and allowing escape. As with other codes discussed in this article, the *IBC, Section 1008*, references the same requirements and language in NFPA 70 in regards to electrical rooms.

Smoke Doors

A fire door simply prevents fire from spreading from one side of the door to the other. Similarly, a smoke door protects against the spread of smoke from one side to another. While the construction of the two is typically similar, the latter is typically tested and furnished with smoke gaskets, in addition to the intumescent seals required on fire-rated wood doors. Requirements for testing of smoke and draft control door assemblies (or gasketing systems) are covered in Underwriters Laboratories (UL) 1784, *Air Leakage Tests of Door Assemblies*. It includes cycling tests to determine the rate of air leakage through a door assembly in an as-installed condition. Door assemblies or gasketing systems investigated by this test method are intended for installation and use in accordance with National Fire Protection Association (NFPA) 105, *Standard for the Installation of Smoke Door Assemblies*. Regarding labeling, this excerpt comes from the 2012 *International Building Code (IBC)*:

716.5.7.3 Smoke and draft control door labeling requirements. Smoke and draft control doors complying with UL 1784 shall be labeled in accordance with Section 716.5.6.1 and shall show the letter "S" on the fire-rating label of the door. This marking shall indicate that the door and frame assembly are in compliance when listed or labeled gasketing is also installed.

Accessibility Issues

Although fire-rated doors must close, accessibility standards also state they must have a maximum allowed opening force, and this can also be a major conflict. A typical parallel arm, surface-mounted door closer is approximately 65% efficient in its performance. What does that mean exactly? That means the closing force is approximately 65% of the opening force, so with a 5-pound maximum opening force allowed, at 65% efficiency, the door closer will only have 3 pounds of closing force. Typically, this would not be nearly enough to close a door properly, especially with changes in building pressurization and HVAC being turned on and off for heat and air-conditioning. How is this conflict dealt with? Fire codes always take precedent over accessibility standards and the door must close to protect before it has to comply with the opening force requirement.

Per NFPA 80, overlapping astragals are required on fire-rated pairs of doors greater than 1.5 hours or "B" label. This is to prevent fire's spread from one side of the pair of doors to the other through the clearance between. To work properly, the code also requires a coordinating device to manage the closing of a pair of doors in the proper sequence. Picture an overlapping astragal on a pair of doors, if the doors close in an incorrect sequence, and the door with the astragal projecting off the door edge closes first, the door without the projection will get hung up on the astragal. In other words, the door will not close and latch properly.

Clear Widths

The clear width of an opening is the minimum dimension from the face of the door open at 90 degrees to the face of the opposite stop of the frame. Various codes reference the clear width opening minimum requirement to be 32 inches; the maximum allowed door leaf width is 48 inches. This allows for a set standard of clear passage through any given egress opening. In Chapter 4 ("Accessible Routes") of ICC/ANSI A117.1 2003, Section 404 on doors and doorways requires:

04.2.2-Clear Width: Doorways shall have a clear opening width of 32 inches (815 mm) minimum. Clear opening width of doorways with swinging doors shall be measured between the face of the door and stop, with the door open 90 degrees.

This leads to the question: "What is the clear width opening of a 36-inch wide door hung on standard weight 4.5-inch wide x 4.5-inch high mortise butt hinges?" To find out, one must take the door width, deduct the door thickness sticking into the opening at 90 degrees (and taking away from the overall clear width dimension), and subtract both of the stop dimensions (which also stick into the door opening and take away from the overall clear width dimension). In this case, the equation becomes:

$$36 - 1.75 - 1.25 = 33$$

The clear width opening is 33 inches, 1 inch to spare. However, what does this mean if the opening was narrow to begin with and there is not enough in the budget to rip out the door, frame, and hardware, widen the opening, and replace it with a new door, frame, and hardware? This is the same equation, starting out with a 34-inch opening:

$$34 - 1.75 - 1.25 = 31$$

The resulting clear width opening is 31 inches, 1 inch too short. There are certain cases where a simple swing-clear hinge can help save money. As its name suggests, this hardware takes the door and swings it clear of the opening. The use of such a hinge adds the additional 1.75 inches to the clear width opening. As shown in the same equation:

$$34 - 1.25 = 32.75$$

A 32.75-inch clear width opening still leaves an additional 0.75 inch to spare.

Projections Into the Clear Width

There are restrictions on the allowed projections into the clear width of a door opening. Per various codes, nothing is allowed to project off the face of a door into the clear width opening for the first 34 inches from the floor. This ensures nothing gets in the way or prevents a person from moving through an opening using a wheelchair or cane. Once at a height of 34 inches, 4 inches is allowed to project from the face of the door into the clear width opening. The project limitations are up to 80 inches in height and once above, there is no limitation. In the *IBC*, this is covered in Chapter 10 ("Means of Egress") and in *ANSI/A117.1* in Chapter 4.

The Need for Improved Egress

By examining tragic building fires (from Chicago's Iroquois Theater in 1903 to the Station Nightclub in Warwick, Rhode Island, a century later), safety experts recognize even today that improving building occupants' means of egress is necessary. Technology and code development efforts for life safety have typically focused on the actual detection, alarm, notification, and even suppression of the fire. Efforts to improve egress have historically taken a back seat to fire suppression and effective compartmentation/containment technologies simply because means of escape have been more procedure and study-based, such as with fire drills, mostly due to a lack of product availability and enhancement.

Egress Signage

Until recently, early exit signs were similar to current models. They were generally made of either metal lit by a nearby incandescent light bulb or a single-bulb fixture with a glass cover. The flaw of these initial devices was the power to light the sign often went out during a fire. This was addressed with battery backup and, eventually, generator devices. Most current signs are bigger with a back-lit incandescent bulb, which shines behind the word "exit" on both sides of the sign, making it more visible than earlier versions.

Relative to code adoption, there have been some slow improvements to exit signage and the methods for emergency evacuation, but it has begun. One method involves low-level exit signage, which would more clearly mark exits when the traditional above-doorway signs are obscured by rising smoke. California's building codes require the use of a luminescent exit sign located within the bottom 254 mm (10 inches) of the door, flush with the skin. This code is currently going through the adaptation process in Rhode Island, Connecticut, and New York.

Lighting the Way

In late September 2006, the ICC public hearings heard four proposals regarding floor proximity path marking but not one of them passed. The code council

clearly stated the proposals were technology-specific and that there was a lack of installation standards for location, and the types of occupancies proposed were not uniform. The ICC said it would allow a consensus proposal be brought back at the May 2007 final action hearings. At that point, the group was satisfied with what it saw; the proposal, although somewhat limited, was incorporated into the *IBC 2007 1/2 Supplemental* as Section 1027-Exit Path Markings as follows:

1027.1-General: Approved luminous markings delineating the exit path shall be provided in exit enclosures including vertical exit enclosures and exit passageways of buildings of Group A, B, E, I, M, and R-1 having occupied floors located more than 75 feet (22 860 mm) above the lowest level of fire department vehicle access and shall comply with Sections 1027.1.1 through 1027.1.7.

Exception: Exit path markings shall not be required in lobbies or areas of open parking garages, where such lobby or area is located on the level of exit discharge and complies with the exception to Section 1023.1.

Two forms of luminescent technology are available to comply with the referenced for exit path markings, photoluminescence and electroluminescence. Products relying on the photoluminescence technology require no electricity to glow, but need to charge with an ambient source of light (similar to glow-in-the-dark hands or numbers on a watch held up to a light before being viewed in darkness). The photoluminescent source dissipates over time if not re-energized. It can be applied as tape and can even be furnished as a baked or sprayed on pre-treated fixture on metal stair nosings.

Electroluminescence, on the other hand, is an actual light-emitting capacitor (LEC), which is far more visible than photoluminescence and actually increases in brightness over the first 10 to 60 minutes. This technology is typically provided as an integrated opening assembly such as a complete door, frame, and hardware system. It can be tied into and used in daily building operation in addition to emergency and HVAC systems.

Egress marking with luminescent technology helps occupants find exits not in the immediate line of sight by providing a guide along a low-level path down the corridor or stairway directly to a doorway (also marked with the technology). On July 1, 2007, New York City adopted the requirement for photoluminescent technology path marking on all new and existing class "E" buildings 23 meters (75 feet) or taller as part of Local Law 26. In other words, all existing buildings with these parameters were not "grandfathered" in and every building shall comply.

For New York City, "photoluminescent technology" is specifically called out, but there is active lobbying to change the requirement to "luminescent," which will allow the choice of technology. An advantage of electroluminescence is its incorporation into building systems monitoring. Just as one can now see from a desktop computer or Blackberry which HVAC unit is down, facility management will soon be able to monitor alarmed and secure doorway and emergency egress path lighting to ensure proper operation.

Recent innovations also include audio-based way-finding systems that can make exit locations highly

noticeable in emergencies, further guiding occupants directly to an exit. This is accomplished by combining audio and visual alerts, including white noise—highly effective in providing direction in an open space—and an audible, multilingual alert stating the exit's location. Some other alerts include a bright white light-emitting diode (LED) strobe and a green, triangular laser beam, which gets smaller in diameter as you approach the exit.

This, along with the various examples cited throughout the article, reinforces the importance of always including the name and date of all the appropriate codes and standard documents in one's specifications. It is crucial to be aware of any local amendments or exceptions that affect door, frame, and hardware requirements, along with any particular exceptions impacted by means of egress codes, occupancy types, occupancy loads, sprinkler systems, and fire alarm systems.

About the Author

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Smoke Control in High-Rise Buildings

By Josh Talley, P.E. & Sharon Gilyeat, P.E.

Active and passive smoke control plays a critical role in high-rise building fire and life safety. Extensive exposure to smoke remains the primary cause of most fire-related fatalities. Tall buildings have inherently longer evacuation times and in some cases it is not practical to employ total building evacuation procedures. It is paramount to the safety of the occupants that tenable conditions are maintained for as long as possible.

In the late 1960s, fire protection professionals began to look closely at the increased risk of fire and smoke spread in tall buildings, and building and fire codes have evolved to try to combat or at least control this increased risk. Smoke control requirements started initially as just passive methods, where building construction features were used to limit the movement of smoke and fire; buildings were compartmented and floor openings were sealed. The methods employed eventually became both passive and active. Even today, the primary method of controlling smoke and fire spread in a high-rise building is still by maintaining the integrity of the floor construction and enclosing vertical openings in fire barriers. Requirements for elevator lobby enclosures and pressurization of hoistways and exit enclosures have also been added to combat smoke spread. Recent building code changes continue to emphasize the importance of passive smoke control. In addition to requiring the protection of penetrations and joints with approved firestop systems, high-rise buildings in certain risk categories now require special inspections by qualified inspectors of the methods and materials used to protect these systems.

Many of the changes to building and fire codes over the years are a result of major life-loss fires. Unfortunately our industry is like most, we tend to be more reactive than proactive. The Triangle Shirtwaist Fire in 1911 was one of the first notable high-rise fires in the U.S. Of the 146 fatalities, many were attributed to smoke inhalation. Code officials for the first time specifically took notice of the impact of smoke spread in this tragedy.

From 1960 to 1980, there was a significant amount of research and industry push toward controlling smoke through building ventilation systems. American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) began to get involved in the “smoke control” fire community in the late 1960s. It made sense that, if air can be moved through the building to control the temperatures in the building, the same systems should be able to be used to move smoke and heat from a building. The federal government funded much of this work, as it began to build and therefore needed to protect, high-rise buildings. There was also a push from the detention and correction industry, which saw smoke control as one feature that could be used to protect occupants in place.

In 1971, the General Services Administration (GSA) held an international conference on high-rise building fire safety in response to a fire that occurred above the 30th floor of the One New York Plaza office building. By 1974, the Seattle Federal Office Building was designed and constructed. This building incorporated GSA’s smoke control design approach and became a model for future GSA/federal high-rise buildings. The smoke control design, known as the “sandwich” approach, is still in use today. The system provides exhaust on the floor of fire origin and supplies air on the floor above and below the fire floor. Other high-rise fire safety design concepts stemming from the Seattle model building include the concept of an emergency control center, now referred to as a fire command center; and the use of two-way fire department telephones and fire alarm voice evacuation systems. All are still included in today’s high-rise provisions.

In 1982, ASHRAE published the Design of Smoke Control Systems for Buildings. It wasn’t long afterward that NFPA established two technical committees to begin to address smoke control system design standards. By 1990, NFPA 92A, Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences and 92B, Standard for Smoke Management Systems in Malls, Atria, and Large Spaces, were adopted as either a guide or recommended practice. In 2005/2006, the documents were published as Standards by NFPA and have now been combined into a single Standard, NFPA 90.

Many of the first active smoke control methods introduced into the codes for high-rise buildings used operable windows or vertically continuous shafts that relied on natural stack effect and buoyancy forces to move smoke out of the building. The intent was to remove smoke from the building after the fire was under control and primarily was for fire department use. Later editions permitted sprinkler-protected buildings to have smoke control that utilized the building HVAC system to remove smoke from the building. These systems were by no means “engineered,” nor were they based on any analytic analysis; however, they were automatic. These systems now played an overall role in egress and life safety, and were not just being used by the fire service during post-fire operations.

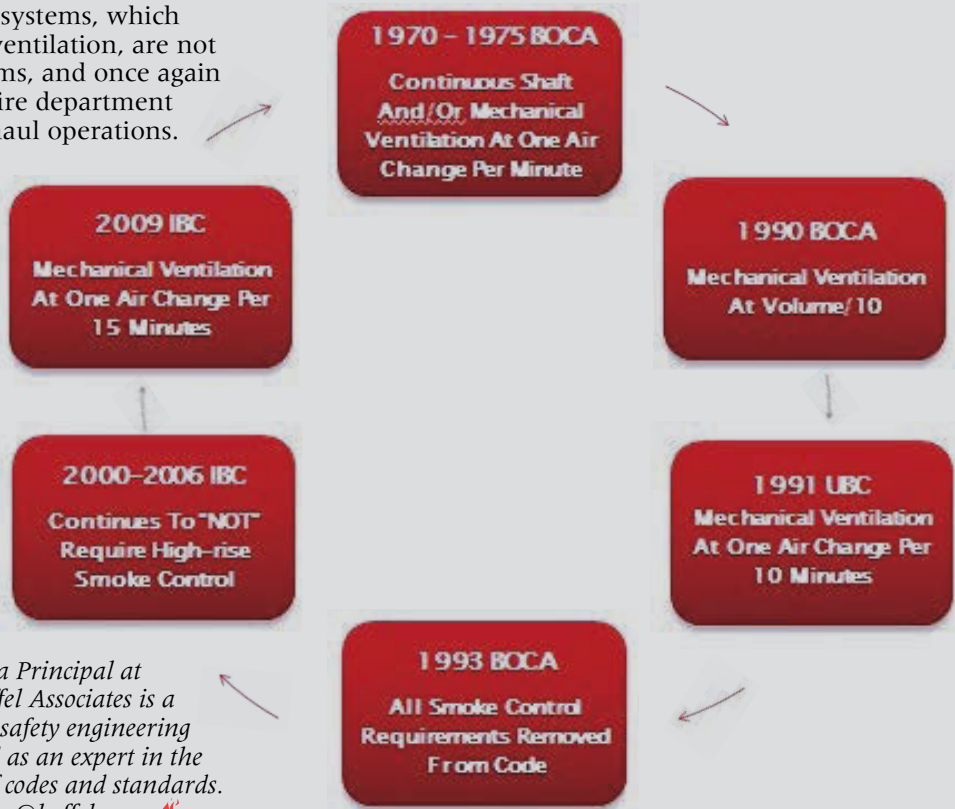
By 2000, most if not all zoned smoke control requirements for high-rise buildings were removed from the building codes. The mandate for sprinkler protection using quick response technology is recognized as an extremely effective method of controlling fire and smoke spread and led to the removal of the requirements for active zoned smoke control.

Recently, the International Building Code went full circle, and has introduced smoke “removal” requirements for new high-rise buildings back into

the building code. It is clear these systems, which use either natural or mechanical ventilation, are not engineered smoke "control" systems, and once again they are primarily for use by the fire department during post-fire salvage and overhaul operations.

Today more than ever, there is reliance on sprinkler protection and sound building design and construction to minimize the movement of smoke and heat from fire in high-rise buildings. The need for passive smoke control including the proper protection for joints, through-penetrations, membrane penetrations, and perimeter joints is as critical now as it was when high-rise building construction was first introduced, as buildings continue to be built taller than ever.

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Perimeter Fire Protection in Mid- to High-Rise Buildings

By James Shriver

In Caracas, Venezuela in 2004 where fire occurred on the upper floors and lack of water pressure prevented suppression on the fire floor, fire spread took place. At the Tamweel Tower Apartments in Dubai, UAE two weeks ago, fire spread rapidly at the exterior skin of the building as well. At the 1st Interstate Building in Los Angeles, lack of or improper perimeter fire containment was cited as a factor in the fast spread of fire from floor to floor. These are fires that occurred in sprinklered and non-sprinklered buildings leaving fire to spread rapidly at the exterior of the building.

Each individual building has very specific and unique requirements for perimeter fire protection. To provide the fire protection at the building's perimeter, the void between the interior face of the curtain wall and slab edge, it must be understood that it is a function of the total curtain wall design that creates the ability to resist floor-to-floor fire spread.

The purpose of this article is not to debate sprinklers in buildings. A balanced approach to fire and life safety includes sprinklers, detection and alarm systems, occupant education and effective compartmentation in buildings worldwide.

So what's been discovered and developed in the past 40 years that will help you better understand perimeter fire containment? How can you gain and increase the knowledge and skill to not only properly design, install and inspect these systems, but to communicate to the architect, building owner and manager, general contractor and building officials that what is being provided will indeed meet the International Building Code (IBC) requirements for life safety? Whatever your role is, this knowledge and expertise is vital for a successful bid and installation that provides the requirements for the building's protection and the occupant's life safety. Included with these key factors is a Resources Section that will route you to sites for expanding your research on perimeter fire containment.

Since 1970 when the inception of installing mineral wool (safing) insulation to fill the perimeter void to prevent the spread of flame and hot gases from floor to floor was developed, tremendous knowledge has been gained on how to improve perimeter fire protection. Today, using the standardized ASTM Standard Test Method for Perimeter Fire Containment (ASTM E2307), the industry has been educated on how complicated perimeter fire protection has become, especially with the ever-changing architectural designs. Simple designs that were tested more than 15 years ago had spandrel heights exceeding 36 inches and mullion spacing of 60 inches. Since that time, curtain wall designs have dramatically changed with the desire

for greater vision area, green building requirements, and the emphasis to reduce construction costs. Recent designs with shorter spandrel heights, wider mullion spacing, factory-built curtain wall panels, and uniquely shaped mullion and transom extrusions have expanded the design complexity and challenged the industry to provide the life safety requirements necessary to meet the latest building code requirements.

The 2009 International Building Code Section 714.4 states:

714.4 Exterior curtain wall/floor intersection.

Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and floor assemblies shall be sealed with an approved system to prevent the interior spread of fire. Such systems shall be securely installed and tested in accordance with ASTM E 2307 to prevent the passage of flame for the time period at least equal to the fire-resistance rating of the floor assembly and prevent the passage of heat and hot gases sufficient to ignite cotton waste. Height and fire-resistance requirements for curtain wall spandrels shall comply with section 705.8.5.

Currently a majority of ASTM E 2307 listed systems are aluminum curtain walls that include stick built and unitized curtain walls with typical spandrel heights ranging from 36 to 69 inches. Systems using precast concrete, metal studs and insulated panels also have listings; however, this article will focus on the **aluminum curtain wall designs**. Since aluminum unitized systems continue to gain popularity in the curtain wall industry, testing has been focused using these designs which are presenting the industry with numerous challenges.

These curtain walls fabricated in a factory are often built to include the requirements for perimeter fire containment with the concept of improving quality and costs. The completed panels are then shipped to the jobsite and installed on the building. The void that is created between each floor perimeter and the wall must be filled with safing insulation and covered with an approved smoke sealant to stop flame, hot gases and smoke from migrating to the floors above.

As with unitized systems, the demand and movement toward energy efficiency, green construction plus the desires for greater eye appeal has the curtain wall construction industry changing in numerous ways. No longer are the spandrel heights a minimum of 36 inches but some are as short as 8 inches. The mullions and transoms are not just a box but an engineered system that snaps together and allows for movement and critical water drainage. These systems make decisions on screw penetrations

required to support the spandrel insulation, an important function to ensure the perimeter fire containment will remain in place to meet the building code requirements. Transom locations at the floor are creating attachment issues for standard methods that have been used for years. These changes are challenging the designing of perimeter fire containment systems to meet the typical two-hour building code requirements. The new design changes that have no listings based on ASTM E2307 have created a need for additional testing, engineering judgments and evaluations to meet the requirements for Authorities Having Jurisdiction (AHJ) and specifications as a result of clear building code requirements.

It is recommended that the engineering judgment follow the International Firestop Council's recommended guideline for Perimeter Fire Barrier Systems. On its website at www.firestop.org, proceed to "About the IFC" and then download the guideline and review the "Engineering Judgments Guidelines-Perimeter Fire Containment Systems" - Premise of Firestop Systems, IFC Engineering Guidelines, and Basic Presentations Requirements. The guideline includes these five basic principles for perimeter fire containment:

1. **Mechanical Attachment of the Spandrel Insulation**
2. **Protection of the Mullions**
3. **Compression fitting and orientation of the Safing Insulation**
4. **Installation of a Reinforcement Member(s), stiffener, at the Safe-Off area behind the Spandrel Insulation**
5. **Firestop Coating, type, thickness**



*Windsor Tower Fire in Madrid, Spain.
Juan Carlos Rohas,
© Dusko Despotovic/Corbis*

These five basics principles have proven over decades of testing to be absolutely necessary. Fortunately major fires at the perimeter have been minimized because of U.S. building codes, but not so in other countries. The future of **building protection and life safety** must continue to be kept in the forefront. As the dynamics of these creative exterior buildings change, the systems may not have been tested to the perimeter fire containment requirements per the IBC Building Code. Therefore, the nature of the curtain wall design will dictate the relative capability to resist floor-to-floor spread of flame and hot gases. After decades of system testing and fire observations, key factors known to impact the curtain wall's resistance to vertical fire spread can include but are not limited to the following:

1. **Spandrel panel height**
2. **Spandrel material (e.g. glass, aluminum, granite, insulated panels, back pans, etc.) Full or partial height vision glass**

3. **Nature of the curtain wall components (e.g. aluminum framing, extrusion design, spandrel panel design, wet or dry mullions and transoms)**
4. **Floor rating and structural designs that impede efficient and proper installation**
5. **Unitized designs**
6. **Curtain wall anchor types (e.g. aluminum, steel, below the slab, etc.)**
7. **Exterior vertical or horizontal projections that may deflect or enhance flame behavior**
8. **Building geometry at curtain wall (e.g. inclined, staggered, curved, etc.)**
9. **Nature of the glass used to construct glazing system**
10. **Insulation (e.g. thermal requirements, vapor control, mechanical attachments, proper location)**

Spandrel Panel Heights and Full or Partial Height Vision Glass

During testing of perimeter fire containment systems, vision glass breakage and falling out of the glass from the floor above is often observed. Numerous tests have proven that preventing flame and hot gases from entering the room above through the perimeter void that is created between the interior face of the curtain wall can be accomplished. This is supported by fires that have occurred and were contained to the floor of origin. An example is the fire at 135 S. LaSalle Building in Chicago, IL on Dec. 6, 2004, that was contained for six hours. Fig 1.

But what about the flame and hot gases that are venting up the exterior face of a building and causing vision glass fallout on the floor above? This represents a unique fire exposure. The magnitude of flame and hot gases billowing out of a window opening from the room of origin is sufficient enough to cause the re-entry of the fire by breaking the glass on the next floor and causing ignition of combustible materials in the room above. This condition circumvents the interior perimeter fire barrier joint system and inherent fire resistance of the exterior wall assembly. When this mechanism of fire spread occurs at any floor, it has the potential to repeat via the same mechanism to every floor above it. This phenomenon is referred to as the "leap-frog" effect. Figures 2 & 3 are examples of how flames can leap-frog up the face of a building.

With numerous curtain wall designs being built and installed with spandrels as short as 8 inches, the potential for the leap-frog effect to occur looms large in the background. Research on the leap-frog effect includes literature reviews on glass breakage; a research project conducted by engineering students at Worcester Polytechnic Institute (WPI); and a test at UL with a 10-inch spandrel using ASTM E2307 resulted in flames in the room above in less than 15 minutes. The most recent testing by Thermafiber at Southwest Research Institute verified that 36 inches is sufficient to prevent the leap-frog phenomenon based on the current perimeter fire containment standard using

ASTM E2307 test method and the fire load as required in the standard.

Industry awareness is critical of these findings, especially with literature reviews on glass breakage, heat flux energy created when the flame extends above the floor due to spandrels shorter than 36 inches, and full height vision glass. Although limited testing has been done with short spandrels along with varying results, the recent findings indicate that with life safety as the primary concern, thought needs to be given to what would occur should an uncontrolled fire develop.

Types of Curtain Wall Anchors

Anchors used to hang a unitized curtain wall on the exterior of a building are typically made of aluminum. Recently, designs and installations have the anchors mounted to the underside of the floor slab with direct exposure to flame and hot gasses should a fire occur. Specifications need to address the protection of these anchors in that event. Aluminum not only melts in typical fire temperatures, but loses structural strength thereby subjecting the unitized curtain wall to shift and potentially cause failure at the perimeter joint. Flame and hot gases would then enter the floor above. This creates the domino effect that the perimeter fire protection was installed to prevent.

Nature of the curtain wall components (e.g. aluminum framing, extrusion design, spandrel panel design, wet or dry mullions and transoms) along with the floor rating and structural designs often impedes efficient and proper installation.

Floor-to-ceiling glass means a transom will be located at the slab. Transoms and the extrusion

designs that are located at floor level often prevent an accessible means to mechanically attach the spandrel insulation and mullion covers, or provide the space necessary to install a standard backer bar for supporting the safing insulation at the perimeter void. A recent tested and listed system published in the UL Fire Resistance Directory (CW-D-1012) helps resolve the backer bar issue and congestion that occurs at the edge of slab and the curtain wall mounting anchor.

Issues with transoms extruded with special shapes introduce another element on how to mechanically attach the spandrel insulation when standard hangers will not work. Custom hangers are one alternative. Mullions and transoms designed to channel water accumulation away from the building and maintain a dry structure means minimum or no penetrations. Any permitted penetrations must be sealed to prevent water leakage over the life of the building. Structural floor designs that prohibit the installation of mullion covers can be resolved by installing safing at the top and bottom of the beam and still providing the smoke stop seal at the top of the slab.

Building geometry at curtain wall – inclined, staggered, curved, etc.

Unusual and unique building designs are increasing with today's technology. A building's curtain wall that is designed and installed with various angles and shapes creates an exposure that in event of a fire will cause the glazing to break and fall out. Again, the result is flames and hot gases spreading to the floor above bypassing the perimeter fire containment system.

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Let's not wait on a major incident to trigger the high-rise building industry into taking action. Today, areas are being observed that can cause serious failures in the event of an uncontrolled fire and should be addressed now. Some of the issues cited above are basic building science issues and can be resolved through proven engineering practices. However, curtain walls with short spandrels must have extra consideration given to perimeter fire protection.

Remember, it is the responsibility of all parties to be vigilant in maintaining the current level of LIFE SAFETY and strive for continuing improvement.

Resources:

Today the need for perimeter fire containment is recognized, and it is known that it must meet the requirements as specified in the building codes and be properly installed. But, where do you obtain that specific knowledge to design and properly install the correct system? The obvious and most frequently used resource is the Internet. Search key words **"Perimeter fire-containment"** and you will be introduced to articles on the basics of perimeter fire containment, specifications documents, International Firestop Council training program, AEC Daily - Online AIA approved Educational programs, etc. The International Firestop Council (IFC) at www.firestop.org is an excellent website for training programs and understanding the engineering guidelines. Underwriters Laboratory at www.ul.com in its Fire Resistance Directory has tested and listed systems that can be found under UL perimeter fire containment systems in the OnLine Certifications Directory - Category XHDG. Intertek at www.intertek.com, also lists tested perimeter fire containment systems as tested per ASTM E2307. Listed and tested systems can also be found on the websites of individual companies that have systems listed with UL and Intertek. Another resource is the Firestop Contractors International Association (FCIA), www.fcia.org, that list contractors throughout North America, which can provide the installation services on curtain walls and offers

education as well.

In addition to the hundreds of listed and tested systems in the testing laboratories' published fire-resistance directories, another source for information and assistance is the technical staff at individual companies. An example is Thermafiber's Insulation© Group, www.thermafiber.com, that has excellent knowledge combined with supporting perimeter fire containment tests for curtain wall systems. Its technical staff is very knowledgeable on the published systems and capable of providing perimeter fire containment designs and engineering judgments to assist you in meeting the requirements of the building code and the Authorities Having Jurisdiction.

References:

Refer to this article at www.thermafiber.com/technicallibrary/technicalpapers for a complete listing of the references and details. 🔥



Jim Shriver, of Shriver Consulting Service, has a BS in Mechanical Engineering and has over 36 years of experience in the construction industry, most recently as Corporate Director of Technical Services for Thermafiber, Inc. He is also the author of several published articles pertaining to perimeter fire containment. Jim can be reached at jshriver45@gmail.com or 260-312-3406.

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High-Rise Building Safety - Glowing Pathways and First Responders

By Steve Cooper

Well, the dust has finally settled in the building code debates regarding High Rise Building Egress requirements. Now we can get on with the business of educating everyone who participates and benefits from the related code adoptions of 2009 and 2012 for the International Building Code (IBC) and International Fire Code (IFC). The list of beneficiaries begins with High Rise Building occupants. The intended effect of the new codes was established primarily to save lives of people escaping from any emergency that requires evacuation of a high rise structure.

Benefits obvious to First Responders

The benefits quickly became obvious to First Responders as well. First responders like fire-fighters, medical personnel and law enforcement are now able to navigate a structure in the dark 30% more efficiently than before the codes were adopted.¹ Both occupants and first responders gain a measure of safety due to the advances in product technology that lead to the approval and adoption of new code requirements in the IBC and IFC for Chapter 10 Sections 1022 and 1024 "Means of Egress".

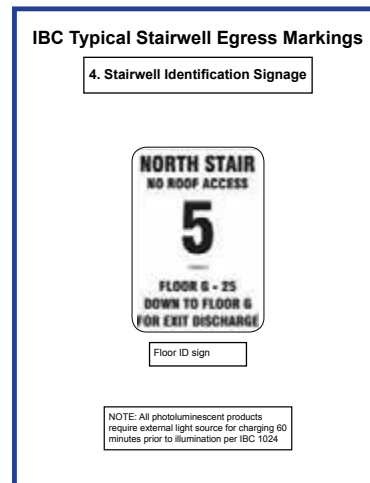
Manufacturers of egress components for high rise buildings developed the technologies and methods for application that benefit a wide range of communities. Beginning with the building occupants and first responders mentioned above and also the architectural and technical communities that now have enhanced life safety products to reduce life safety risks. Product choices that require very little energy and are primarily made of reusable resource materials are available from many manufacturers.

High Rise Building Evacuation philosophy

High rise buildings are defined as any building with occupants at a level 75 feet or higher above fire department access, according to the 2012 International Building Code and NFPA 101, The 2012 Life Safety Code. Manufacturers have the responsibility to educate the public, first responders, code enforcement agencies and architectural communities about High

Rise Building Safety and these new requirements.

Building Occupant egress for high rise buildings has changed strategy in recent years. The primary change is the philosophy of evacuation. The strategy used prior to the collapse of the World Trade centers on Sept 11, 2001 was to evacuate occupants using a "floor by floor" method based on location of the danger.



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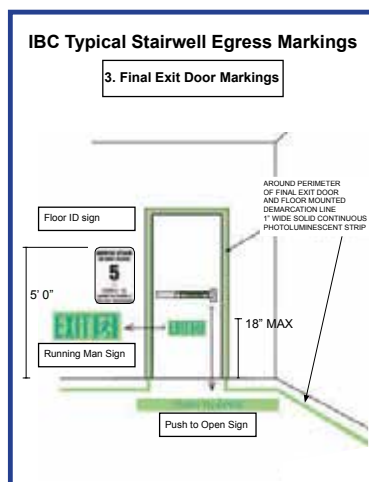
The current strategy is "total building evacuation" with measures as rapidly as possible.

Excerpt from 2009 IFC 4604.23 Egress Path Markings, Code Commentary, "Historically, code requirements for high-rise buildings were written under the assumption that buildings would be evacuated floor-by-floor... Acts of terrorism and accidental incidents, such as power failures, have made it necessary to consider design for full building evacuation..."

First responders are key to high rise building safety because they bring order to very stressful and often chaotic emergencies. Their mission is to save lives. The advancements in Photoluminescent (PL) technologies have increased the potential lives saved beyond building occupants and extended the life saving benefits to first responders as well. They risk their lives as a routine part of their job. In Pennsylvania three firefighters lost their lives because they were disoriented and did not know which level of the building they were on. This confusion is believed to have led to them being trapped in a dangerous location with tragic results.²

The IBC/IFC Chapter 10 Section 1022 was revised for the 2012 version of the code to require the addition of stairway identification signage with distinctive markings. These markings are intended to provide information for evacuees and first responders alike. Stairwell identification signage is required to be photoluminescent in high rise buildings because PL is known to function for an extended period in complete darkness even when backup generators fail to operate.

After complete power is cutoff or lost in a structure, PL egress markings light the way through darkness and smoke providing a 30% increase in



Balco image

rescue efficiency according to tests conducted at the fire fighter training center in Anaheim, CA in 2011.³ PL egress markings were also proven to be as effective as standard lighting in a stairwell evacuation according to tests run by a Canadian laboratory after the world trade center evacuations.^{4,5}

Practical use of Photoluminescent Egress components

The 2012 version of IBC and IFC Chapter 10 both have sections 1022 and 1024 that require six distinctive components of PL pathway markings for high rise building egress. The 6 distinctive markings are:

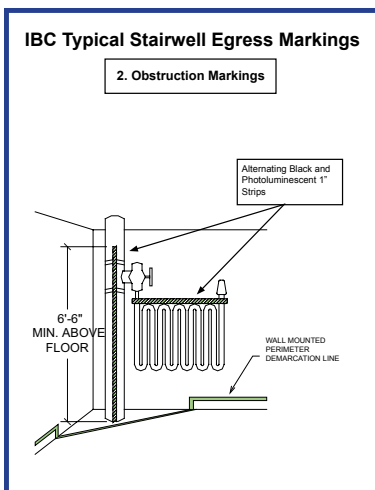
Per IBC/IFC Chapter 10 Section 1022 for version 2012 Stairway Identification Signage.

1. *Stairway Identification Signage.* A 12" wide x 18" tall sign is located 5'-0" above the floor in an egress stairway. The sign must be located in a place that is always visible, even when the door is open. See *illustration 4.*

The Stairway Identification sign must contain the following data:

- a. Identification of Stair or Ramp
- b. Availability of Roof Access or No Access
- c. Floor Level
- d. Braille floor number – Tactile Characters
- e. Terminus top and bottom
- f. Story and direction of Exit Discharge

Per IBC/IFC Chapter 10 Section 1024 for the codes, version dated 2012 Pathway Markings.



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2. *Stair Nosings* must be an integral part of the stair edge and have PL markings up to 1" wide within 1/2" of the leading edge of the step. The nosing must extend the full width of the steps. See *Illustration 1.*

3. *Handrail markings* must be placed on the top of the handrails for the continuous length of the handrails except for a 4" gap allowed at directional changes in the handrail. See *Illustration 1.*

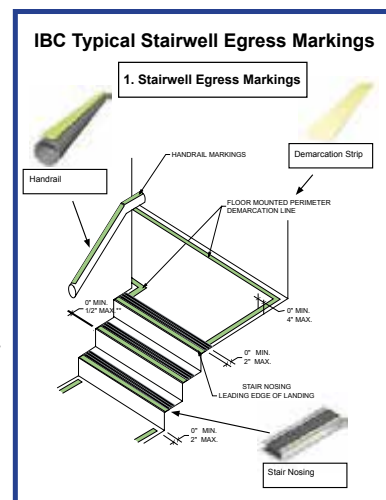
4. *Demarcation strips* are required at stair landings to guide occupants in a path that is intuitive from one level to the next. Demarcation is also required to direct any pathway that leads to a final exit door. See *Illustration 1.*
5. *Obstruction markings* are alternately striped black and PL yellow to provide warnings of objects that protrude 4" or more into a defined egress path. Common obstructions are fire hose cabinets, stand pipes, columns and header beams that extend below 6'-6" from the landings or steps. See

Illustration 2.

6. *Final Door Markings* are required only at the door leading directly to an approved building exit or for doors that must be passed through in order to reach a final exit door. See *Illustration 3.*

Final exit door markings are:

- a. Demarcation strip around the door frame but not across the base of the door frame.
- b. Door handle markings must be minimum 16 square inches of material either in the form of a strip on or above a push bar or in a square or rectangle adjacent to a door handle or knob.
- c. A running man sign must be located 18" above the floor in the center of the final exit door.



Balco image

Photoluminescent technology saves lives by lighting a glowing path for a critical duration of time to evacuate occupants and navigate stairways during extreme circumstances like total darkness due to loss of power in a high rise building. PL glows through darkness and smoke filled stairways allowing first responders to get in and find their way to alleviate the threat and evacuate building occupants in a manner that is safer for everyone. 🔥

Steve Cooper, Vice President of Sales and Marketing, Balco, Inc. Steve is a graduate of the School of Engineering at Oklahoma State University and has over 25 years of product design, field installation training and executive management experience in the construction products and life safety industry. Steve can be reached at scooper@balcousa.com.

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Industry News

FCIA FIC Update – FCIA’s Firestop Industry Conference & Trade Show, Nov. 6-9, 2012 was a great success! Educational sessions from Dr. John Hall, NFPA’s Chief Statistician, Gary Lougheed, the National Research Council of Canada, Anne Guglielmo, Joint Commission, Kevin Dale of Hendrick, Phillips, Salzman and Flatt, Clay Booth of Thermal Ceramics all brought new information to FCIA’s Attendees. Presentations are in the FCIA Members Only section. Watch for details as the FCIA Education and Committee Action Conference is being planned by the Program Committee. Save the dates.... April 30, May 1-3, 2013.



Shoeb, STI and Eastern Wings enjoy FCIA's DIIM Firestopping Educational Seminar in Dubai.

For the **I-Install**, FM Approval’s Vidur Berry presented about the FM 4991 Standard for the Approval of Firestop Contractors and the UL Qualified Firestop Program’s Romnish Kapoor on their contractor Qualification Program.

In the **I-Inspection**, we covered the ASTM E 2174 and ASTM E 2393 Penetration and Joint Firestop Inspection Standards and International Accreditation Services IAS AC 291 Accreditation Criteria for Special Inspection Agencies.

To finish, HILTI’s Amir Toma presented an updated program on **M-Maintenance** of Fire and Smoke Resistant Construction in existing buildings.

Contacts were made with several FCIA’s friends and colleagues from around the Persian Gulf Region. Dubai Municipality, consultants such as KEO, the Civil Defence, Department of Municipal Affairs and many more were in attendance. Visit www.fcia.org to check out the agenda and presentations.

ULC Qualified Firestop Contractors – FCIA Canada Members report they are seeing specifications for the Qualified Firestop Contractors in Canada. It’s happened in the west, central and eastern parts of Canada. After several years of work, efforts are starting to pay off. Look for several FCIA visits to Canada in 2013.



ULC's Betsy Titus at FCIA's FIC Conference

ICC Board Accepts cdp ACCESS Report – Action Pending – The concept of remote participation in ICC’s code development process was first raised as early as 2003. In April 2011, the Code Development Review Ad-Hoc Committee recommended the initiative to the ICC Board, which confirmed the proposal later in the year. The first cdp ACCESS Steering Committee meeting was held in January 2012 with webinars, surveys and forums to seek Member feedback leading up to a report. In surveys, the majority of respondents support the cdp ACCESS initiative. “It’s not just about having the money to travel to the hearings,” Dupler explained, “it’s also about having the time to do it.”

During its Oct. 22 meeting in Portland, the Code Council Board of Directors voted to accept the cdp ACCESS Steering Committee’s report for the initiative to increase participation in ICC’s code development process. Code Council Board President William D. Dupler, who also serves as a steering committee member, explained to Annual Conference delegates during a cdp ACCESS Forum that the Board will make a final decision on the recommendations at its meeting in December. More as we learn it.



Joint Commission's Anne Guglielmo



FCIA Conference Delegates



National Research Council of Canada's Gary Lougheed



Thermal Ceramics' Clay Booth

Join FCIA on Facebook and LinkedIn! – FCIA is now on Facebook and LinkedIn with Twitter to follow shortly. If you don’t have a Facebook page or LinkedIn profile, don’t worry, it’s easy and fun! You can go to our webpage at www.fcia.org and click on the Facebook or LinkedIn icons. You’ll be prompted to make either a page or profile. Remember to ‘like’ us on Facebook, and join the conversation! FCIA social media outlets are designed to connect with firestop professionals and facilitate industry news and discussions. Postings will not be accepted for advertisements, job listings, job estimating or costing, anti-trust issues or inappropriate comments. Thank you for helping us keep the conversation going!

FCIA’s Firestop DIIM Seminar in Dubai, United Arab Emirates – FCIA’s Executive Director Bill McHugh visited FCIA Members and important industry influencers in Dubai. FCIA’s DIIM Educational Seminar in the UAE welcomed 100 people over two days Nov. 28 and 29, 2012.

“At this session, we broke the Firestop ‘DIIM’ into four different presentations”, states FCIA Membership Chair, Bill Hoos.

For the **D-Design**, Bill McHugh presented about the advantages of firestop systems tested to ASTM E 814, UL 1479, and UL 2079. Specified Technologies, Inc. Tony Abou Rjeily presented about Perimeter Fire Containment Systems and ASTM E 2307.

ICC Chapters win Awards – At the ICC Annual Conference, ICC President Bill Dupler announced five Chapter Merit Award Winners for 2012:

- Colorado Association of Plumbing and Mechanical Officials
- Kansas City Metro Association of Permit Technicians
- Northwest Building Officials and Code Administrators of Illinois
- Southern California Fire Prevention Officers Association
- Virginia Building and Code Officials Association

FCIA Congratulates these ICC Chapters for the service they provide promoting fire and life safety in buildings through many avenues.

New ICC Chapters – Six new ICC Chapters have been approved since the 2011 Annual Conference in Phoenix:

- Illinois Mechanical Inspectors Association
- Wisconsin Code Officials Alliance
- Cayman Islands Codes Association
- C.A.S.E.D.I. from Mexico (an International Chapter)
- Louisiana Building Code Alliance, LLC
- Region II that includes Chapters in the states of Alaska, Idaho, Montana, Oregon, Washington and Wyoming

“Congratulations to all of you and welcome to the ICC family of Chapters as the newest Chapters,” ICC President Dupler said. “We hope you will play an active role in ICC and look forward to building a partnership with you in the future.”

NIBS Symposium – Evaluating Risk & Improving Building Performance - Attend the Integrated Resilient Design Symposium and learn how to evaluate buildings against the threat of multiple hazards, using methods that quantify risk, resilience and performance to help ensure planning and operations are safe, secure, durable, efficient and sustainable. With the theme *Evaluating Risk, Improving Performance*, the Integrated Resilient Design Symposium offers attendees a number of tools to assess potential risks to buildings from blast, chemical, biological and radiological (CBR) threats and natural hazards, while incorporating high-performance attributes into building design.

Scheduled for Wednesday, January 9 from 8:00 am – 11:45 am during **Building Innovation 2013**, seating for the Integrated Resilient Design Symposium is extremely limited. Find out more about this event. Register to attend, at www.nibs.org.

Firestopping NAICS Code and Economic Census – The Economic Census is the U.S. Government’s official five-year measure of American business and the economy. It is conducted by the U.S. Census Bureau, and response is required by law.

Forms go out to more than 4 million businesses, including large, medium and small companies representing all U.S. locations and industries. Respondents are asked to provide a range of operational and performance data for their companies.

As part of the U.S. Census Bureau’s mission to

measure America’s economy, the next Economic Census will be conducted for the year ending December 2012. We need YOU to respond that you are a ‘Firestop Contractor using the code NAICS 238310. With this declaration, it proves that firestopping is a trade.

FCIA worked with the North American Industry Classification Code groups in the USA, Canada and Mexico to have this NAICS code created for Firestop Contractors. Thanks to Bill Hoos and Bob Hasting for their diligence working with this group.

Holes in Healthcare Facility Barriers, Really? – The Joint Commission’s (JC) George Mills has stated at the American Society of Healthcare Engineers (ASHE) Conventions the past two years, ...

- Top 10 2011 JC Violations – Penetrations and Doors
- Top 2 JC Violations – Penetrations and Doors

Penetrations of Fire Barriers are found to fail, becoming violations in 52% of the surveys conducted.

Penetrations of Smoke Barriers are found to fail, becoming violations in 47% of the surveys conducted.

The question being asked by George Mills of the JC is, “Holes in fire and smoke barrier walls are a problem, still?” Is the real problem after the specialty firestop contractors leave the new or renovated areas? Is this a management problem? Are above ceiling permits needed to do work on building services in healthcare occupancies to control the work around barriers?

How can this be controlled by facility management? FCIA is working on this as a Fire Barrier Initiative. Look for solutions to unravel throughout 2013.

Fire Department Accredited by IAS – The village of Tinley Park, Ill., Fire Prevention Bureau is the first local department in the nation to achieve Fire Prevention and Life Safety Department Accreditation from the International Accreditation Service (IAS). A subsidiary of the International Code Council, IAS provides an independent assessment and verification the department operates at the highest legal, ethical and technical standards. Tinley Park is a south Chicago suburb and one of the fastest growing suburbs in the area. The accreditation is based on the IAS Accreditation Criteria for Fire Prevention Departments/Code Enforcement Agencies (AC426). The accreditation process included an IAS review of the bureau’s policies and procedures, an onsite pre-evaluation in April and a full evaluation of the bureau onsite in July. Visit www.iasonline.org for more info about accredited building and fire departments, special inspection agencies who inspect construction work covered in Chapter 17 of the International Building Code, Chapter 17. 🔥



Joint Commission’s
Anne Guglielmo



IAS’ Board Chair John Barrios and President Chuck Ramani present Fire Department Accreditation to Tinley Park’s Ken Dunn and Daniel Riordan’
IAS Photo

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Code Corner

ICC Final Action Hearings Summary -

Portland's Downtown Convention Center was the site for the Fire Safety, General, and Egress Hearings where FCIA's proposal (and others) were presented on Thursday, Oct. 26 and Friday, Oct. 27.

The American Society of Healthcare Engineers and the International Code Council's (ICC) Ad Hoc Committee on Health Care provided a package of proposals for the assembly to debate and decide. According to Bill Koffel, Koffel Associates, FCIA Code Consultant, "ASHE's goal in this effort at ICC is to reduce building construction and maintenance costs due to having to use multiple codes that may in some cases conflict." Koffel goes on to state, "in some states such as Maryland, ASHE members must comply with the International Building Code 2012, the NFPA 101-2009 and NFPA 101-2000 simultaneously." ICC's goal was to gain recognition by the Center for Medicare and Medicaid Services (CMS) either alone or in addition to the NFPA 101 Code.

"The proposals have minimal changes to fire-rated or smoke-rated compartmentation," according to Bill Koffel, FCIA Code Consultant. "Suites may be larger which may impact corridor wall construction and more current versions of standards such as NFPA 80 means that annual inspection of fire doors rather than 'frequent' inspection will be required."

Proposals were submitted for healthcare and other occupancies. A summary of some is below. Look for more in the next issue of *Life Safety Digest*.

Proposals to eliminate elevator lobbies in Group I-2 and all buildings were disapproved.

Proposal **G-76**, increasing the compartment size to 40,000 square feet in Group I-2 occupancies, was approved. There is still the travel distance to a smoke barrier limited to 200 feet which restricts the size of the compartment.

In **FS-114**, a proposal to eliminate smoke dampers in smoke barriers for Group I-2 Hospitals and Ambulatory Care Facilities was approved.

FS-114 - 717.5.5 (IMC 607.5.4) Smoke barriers.

A *listed smoke damper* designed to resist the passage of smoke shall be provided at each point a duct or air transfer opening penetrates a *smoke barrier*. *Smoke dampers* and *smoke damper* actuation methods shall comply with Section 717.3.3.2.

Exceptions:

1. *Smoke dampers* are not required where the openings in ducts are limited to a single smoke compartment and the ducts are constructed of steel.
2. **Smoke dampers are not required in smoke barriers required by Section 407.5 ambulatory care facilities and for Group I-2 hospitals** hospital occupancies where the

HVAC system is fully ducted in accordance with Section 603 of the *International Mechanical Code* and where buildings are equipped throughout with an *automatic sprinkler system* in accordance with Sections 903.3.1.1 and equipped with quick response sprinklers in accordance with Section 903.3.2.

Other Code Development Proposals -

There were **proposals** submitted, including by the International Firestop Council to mandate firestopping in head-of-wall applications to test method, **ASTM E 2837-11 Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed between Rated Wall Assemblies and Nonrated Horizontal Assemblies.**

This new test is for where a fire-resistance-rated wall assembly meets a non-rated roof assembly, which occurs frequently in one-story structures. The council mentioned that the assembly testing was similar to the building perimeter fire containment testing that currently exists in the code. Opposing testimony stated that since the roof is not rated, why should the gap be rated to extend the wall to the non-rated roof assembly? The proposals were DISAPPROVED.

There were also **proposals FS-136 and FS-142** from the International Firestop Council to add the new **ASTM E2816-11, Standard Test Methods for Fire Resistive Metallic HVAC Duct Systems** test to the code for stair pressurization ducts and air ducts with the objective to eliminate fire dampers in fire-resistance-rated assemblies. The fire-resistance-rated ductwrap is used on the complete length of the duct and exposed to many different fire conditions. At the hearings, none of the proposals were successful. Some opponents commented that "fire-rated ductwrap is no substitute for a fire damper," "there is no drop test in this assembly test." Proponents stated that the assembly was tested to several standards including ASTM E 119, ASTM E 814 fire exposures.

FS-136 909.20.5.1 Stair Pressurization Ducts.

Where interior exit stairways are pressurized, HVAC ducts used to supply uncontaminated air shall be protected with shaft enclosures in accordance with Section 713, or tested in accordance with ASTM E2816.

FS-142 909.21.3 Ducts for system. Any duct system that is part of the pressurization system shall be protected with the same *fire-resistance rating* as required for the elevator shaft enclosure. **Exception:** Ducts tested and listed for not less than 2-hour fire-resistance in accordance with ASTM E2816 are permitted.

In **FS 73**, a proposal on firestop engineering judgments (EJs) from the Wisconsin Code Officials

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Alliance was disapproved. The original proposal tried to restrict the use of EJs to instances in which a listed system is non-existent and reconfiguring the penetrating items is impractical. It also sought to have EJs prepared by manufacturers' technical representatives, and approved by the AHJ. In the public comment, the proposal focused on only where a listed system was determined to be non-existent. Verification of the "non-existing" listing is through the contractors, manufacturers and testing laboratories public information.

Opponents to the EJ proposals came from building departments, fire marshals and those who oversee healthcare facilities. They thought the proposal would legitimize EJs making them equal to tested and listed systems. Others believed that this should be covered in the performance code and that there should be a better definition of "approved source." FCIA had submitted a similar proposal last cycle that was disapproved.

In **G-15**, the Chapter 2 Joint definition modifications were heard. Originally, at the ICC Committee Hearings in Dallas, FCIA had submitted proposal G-15 to better define a "joint" using the continuity concept that the joint was the space between two assemblies rather than the junction.

FCIA's G-15 proposal at Dallas ICC Committee Hearings

JOINT. The opening in or between adjacent assemblies that interrupts the continuity of a fire-rated or smoke-rated assembly and either involves the intersection of dissimilar materials or assemblies, is created due to building tolerances, or is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.

FCIA's proposal at ICC FINAL Action Hearings in Portland, Ore. then tried to refine the proposal in the context of Chapter 7 only while covering objections heard at the committee hearings in Dallas. While there was some support for the concepts, this was also disapproved.

715.1 General. Joints that interrupt the continuity of installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed. Fire-resistant joint systems shall be tested in accordance with Section 715.3.

715.1 General. Joints that involve dissimilar materials in installed in or between fire-resistance-rated walls, floor or floor/ceiling assemblies and roofs or roof/ceiling assemblies shall be protected by an approved fire-resistant joint system designed

to resist the passage of fire for a time period not less than the required fire-resistance rating of the wall, floor or roof in or between which it is installed. Fire-resistant joint systems shall be tested in accordance with Section 715.3.

The International Firestop Council focused on the definition of the joint in another fashion, by focusing on the junction where the assemblies meet.

JOINT. The opening junction in or between adjacent assemblies that ~~is interrupts the continuity of a fire-rated or smoke-rated assembly and either involves the intersection of dissimilar materials or assemblies~~, is created due to building tolerances, or is designed to allow independent movement of the building in any plane caused by thermal, seismic, wind or any other loading.

In **FS180**, Bill Koffel, of Koffel Associates, had proposed adding that penetrations in thermal barriers would need to be sealed to maintain the thermal barrier integrity.

2603.4 Thermal barrier. Except as provided for in Sections 2603.4.1 and 2603.10, foam plastic shall be separated from the interior of a building by an approved thermal barrier of ½- inch (12.7 mm) gypsum wallboard or a material that is tested in accordance with and meets the acceptance criteria of both the Temperature Transmission Fire Test and the Integrity Fire Test of NFPA 275. Penetrations of the thermal barrier shall be protected to maintain the integrity of the thermal barrier. Combustible concealed spaces shall comply with Section 718.

Although successful at the committee hearings, this proposal was DISAPPROVED.

The International Code Council Code Development process is quite exciting to attend. There were days of hearings and testimony that took place in Portland, Ore. for this code cycle. We'll cover more of the proposals in the next issue of *Life Safety Digest*.

The 2013/2014 Code Development Cycle starts with proposals due Jan. 3, 2013 for the International Code Council Performance Code, International Existing Building Code, International Energy Conservation Code, International Fire Code, International Property Maintenance Code, International Swimming Pool and Spa Code, International Residential Code, International Wildlife Urban Interface Code, and International Zoning Code. Hearings take place April 21 – 28 in Dallas.

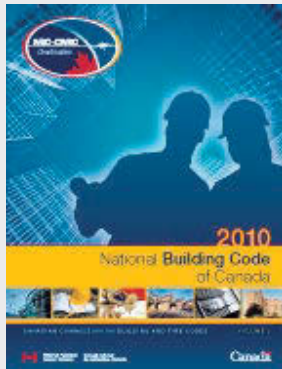
Canada Codes – The Canadian Commission on Building and Fire Codes has several committees that manage the Canadian National Building and Fire Codes. There is a "Standing Committee on Fire Protection" that meets from time to time. The most recent meeting of the Committee on Fire Protection was in Quebec City, Nov. 21-22. The



next meeting is April 30-May 2, place TBD. More as we hear from NRC-CRC.

Abu Dhabi National Building Code – Abu Dhabi, UAE has been fast tracking the adaptation of the Abu Dhabi National Building Code. The code is based on the 2009 version of the International Building Code. We understand that the Abu Dhabi Department of Municipal Affairs (DMA) may be requiring special inspections of firestopping as an amendment to the code. We sent the 2012 International Building Code language for special inspections of firestopping that FCIA was successful with at the ICC Hearings for DMA to use as a reference. Efforts like this continue to improve the reliability of installed firestopping in buildings. We met Ms. Fatma Amer at the FCIA Educational Seminar in Abu Dhabi, UAE last year. Check out the winter edition *Life Safety Digest* for more about this development.

FCIA at ICC Hearings - FCIA had the honor of being selected by the ICC Councils and Board of Directors to participate as a member of the International Building Code Fire Safety Committee. The service on the Fire Safety Committee this code cycle was a lot of work, but well worth the time to “give back” and volunteer at this important code



development process. FCIA made some friends while at both the Committee Action Hearings and the Final Action Hearings visiting with building officials, fire marshals, and industry representatives from around the world.

Thanks to Bob Hasting and Tonnie Cavanais who worked the FCIA Exhibition Booth at ICC’s Trade Show while Executive Director Bill McHugh travelled to Atlanta for ASTM E06 Meetings.



ICC Code Development Final Action Hearings allow debate for governmental members to make voting decisions.

Additionally, Bob Hasting and Bill McHugh spoke at the ICC Expo education sessions on Tuesday and Wednesday. FCIA co-presented the session with the International Firestop Council’s Brice Miller. It was an opportunity for FCIA to focus on the “IIM” of “DIIM” story in addition to products, testing and plan review.

ICC’s Annual Luncheon and Banquet were very well attended, with about 1,500 people attending each event. As a member of the International Accreditation Services (IAS) Board of Directors, a subsidiary of the ICC, we had a great seat to view the Chapter and Awards Ceremonies and Host Chapter Recognition that took place at the ICC Annual Conference. 🔥

Life Safety Digest 2013 Industry Calendar

January 7 to 11

Building Innovation 2013 – The National Institute of Building Sciences Conference & Expo, Washington, DC
www.nibs.org

Feb. 24 to 27

American Society of Healthcare Engineers Planning, Design and Construction, San Francisco
www.ashe.org

March 11 to 15

EduCode International 2013, Las Vegas
www.iccsafe.org/educate/

March 18 to 22

AWCI Conference & INTEX Expo, San Antonio
www.awci.org

April 14 to 17

ASTM E06 Meetings, Indianapolis
www.ASTM.org

April 17 to 20

National Insulation Association Annual Convention, Tuscon

April 21 to 28

ICC Code Development Hearings, Dallas
www.iccsafe.org

April 30 to May 3

FCIA Education and Committee Action Conference
www.fcia.org

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