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The Magazine of Effective Compartmentation



Life Safety DIGEST

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Effective Compartmentation Trends for 2013

Code Required Testing of Combination Fire and Smoke Dampers



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On the Cover:

Fire resistance glazing is used to provide an entry for natural light as well as pleasing aesthetics in a Healthcare Facility. Safiti First photo.

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Editor's Message

Healthcare occupancies are some of the most compartmented and regulated in the industry. With regulation from federal, state, provincial, local building and fire codes, all while keeping their accrediting organizations on their side, there is a lot to keep up with. This is all for good reason. The clientele they hold – patients – is not readily mobile, and needs proper safety precautions to protect them while in the facility.

In this issue of *Life Safety Digest*, you will find articles on Trends for Firestopping and Compartmentation, up-to-date fire statistics, Fire and Smoke Dampers, Fire-Rated Glazing, Fire-Rated Expansion Joints, and much more.

From the most recent American Society of Healthcare Engineers (ASHE) conference, we heard a call for better "barrier management systems" from The Joint Commission's George Mills. FCIA has answered

the call through a partnership with TJC, UL, and ASHE delivering the first healthcare focused "Barrier Management Symposium". The healthcare industry is constantly changing and improving. As this industry evolves, so must the life safety features within the building.

Please enjoy this issue of *Life Safety Digest*, and continue to further improve this vital industry. 🔥

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Protecting the Baby Boomer Generation - Fire-Rated Expansion Joint Assemblies for Senior Living Centers

By Steve Cooper

There will be an average of 10,000 Baby Boomers turning 65 years old every day for the next 20 years, according to a US News article dated March 23, 2012 (REF US News 1). So, there is no mystery why there are senior living centers popping up in every state of the US, and constantly appearing on bid lists every week. This is a niche in the healthcare industry. These facilities are far more service oriented than their predecessors.

Senior living centers are a full-service operation intended to facilitate those in need of care as well as family members, especially spouses of those needing care. These facilities have their own medical towers, including multi-level nursing stations to care for the residents on a full-time basis. Building design considerations are intended to provide a safe, functional and even home-oriented environment for the residents. You may have noticed the use of the term "residents" instead of occupants. It represents the overall intent of the new environment of a home rather than an extended stay at the hospital.

It is fitting that this generation has planned to care for themselves for their future, because they planned and created the products and services that we are privileged to have today. We have Internet, iPhones and computerized gadgets of all sorts due to the creativity of this generation. We also have building codes and life safety quality measures that will protect us for generations to come, thanks to the Baby Boomers.

Building a Better Fire Resistance Rated or Smoke Resistant Expansion Joint System

A fire resistance rated or smoke resistant barrier is simply an object intended to stop fire from progressing from one place to another. Fire or smoke barrier designs for senior living centers have the same basic requirements as other healthcare facilities.

However, some of the adjacent building components have nuances specifically related to accommodate the needs of the residents. The fire resistance rated or smoke resistant materials must become an integral part of the total system assembly in order to function safely. An assembly or system consists of elements of the building combined together to make a cohesive unit with the form and function needed for the particular location where it occurs.

A complete fire or smoke barrier is a rated system assembly consisting of building elements like concrete, fire-rated gypsum board, steel studs or other components. They become a fire resistance rated or smoke resistant system assembly once they have been tested by a certified laboratory and passed the requirements established by the particular building codes relevant to the building type, and local, state and federal regulations.



BALCO Photo.

The testing of a fire barrier as an assembly ensures that all building components work together, rather than each individual item working well on its own and then assumed to work together when they are used as adjacent parts of a fire barrier unit. However, they do not become a system until all components of the fire or smoke barrier and its features that protect the continuity of the assembly are installed to the many tested and listed system designs from the various nationally recognized testing laboratories and manufacturers installation instructions.

One such feature of a fire or smoke barrier system assembly is related to building expansion joint gaps. An expansion joint is a gap between building components to allow for movement such as thermal expansion and contraction, wind exerting forces on a building causing it to sway, and seismic motion due to earthquakes.

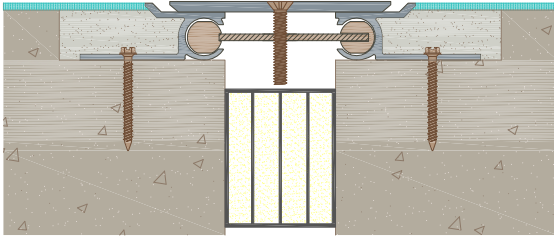
Rated Assemblies for Firestopping and Fire Barriers for Expansion Joints

All fire and smoke barrier expansion joint cover systems are not created equal. One reason is that they serve many different purposes aside from just fire resistance or smoke resistant properties. Some are static designs, some require periodic gradual movement and some are designed to withstand rigorous movements related to seismic and wind motions. Some are also water and smoke resistant.

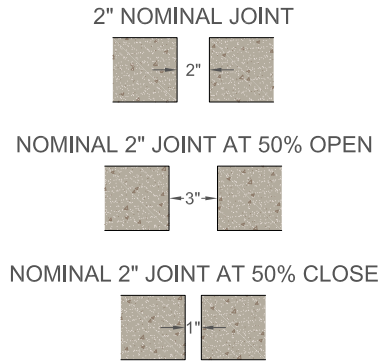
Picture being at a race track. You have one minute to complete three different courses. The first course is 100 yards long. That should be a simple stroll to complete in one minute. The second course is 1/4 mile long. That would take a trained athlete to complete in one minute. The last course is one mile. You would need an automobile to complete that course in one minute.

Now think of the race track analogy in terms of performance requirements for different fire and smoke barrier expansion joints. Some fire or smoke barrier expansion joint systems are designed for little or no movement at all.

Installing insulation alone in a joint area is a good example of this. The insulation product is not listed as a fire resistance rated expansion joint and does not pass



Detail for installed fire resistance rated expansion joint system. *BALCO Image.*



Percentage movement of joints shown in inches. *BALCO Image.*

the UL-2079, Tests for Fire Resistance of Building Joint Systems, fire test. Other fire and smoke barrier expansion joint materials such as sealant type firestop systems, are designed for minimal to medium range movement at a gradual pace. This type of movement is what might be found in thermal expansion and contraction of building components due to changes in temperature.

Fire and smoke barrier expansion joints that are designed as building expansion joints usually meet seismic and wind sway movement requirement as well as thermal expansion and contraction. These fire-rated and smoke resistant assemblies are like the third race, very fast over a long distance.

In fact, testing agencies like Underwriters Laboratories (UL) and other labs that test to ASTM Standards have established classifications such as ASTM E 1966, Standard Test Method for Fire-Resistive Joint Systems for various movements and the speed (or acceleration) of these movements.

UL's Standard UL-2079, for example, has three classes of movement. Class I is for thermal movement and it has a requirement of one cycle of movement in one minute. Class II, wind sway, has a requirement of 10 cycles of movement in one minute. Class III is the most extreme requiring 30 cycles per minute.

The definition of a cycle is a range of motion beginning with the initial building gap opening,



BALCO Photo.

then opening to its widest expected opening, then closing to its narrowest expected opening, then returning to its original position.

For example, if a building expansion joint gap is 2 inches wide and is expected to have plus and minus 50% of movement it will open to 3 inches, then close to 1 inch, then return to 2 inches for one full cycle.

Seismic joint openings can range from 2 inches to 30 inches or more. Generally speaking, all expansion joints in buildings are required to accommodate some form of seismic movement because all buildings in North America have some form of seismic code requirement. Even the small 2-inch gaps are required to be able to accommodate the rapid seismic movements of a Class III according to UL2079.

UL 2079 Cycling Requirements		
Class	Cycles Per Minute	Number of Cycles
Class I	1	500
Class II	10	500
Class III	30	100

BALCO Image.

It is up to manufacturers of fire resistance rated and smoke resistant products to test to suitable standards that can accommodate movements and conditions expected to occur in the actual building after construction. These materials are specified in designs as complete fire resistance rated or smoke resistant systems assemblies in order to establish a fire barrier system.

Fire barrier expansion joint systems are designed to work with an expansion joint cover system. There are as many variations of expansion joint cover systems as there are building types to put them in.

One of the primary considerations of selecting proper expansion joint covers for senior living centers is the floors of the building. Residents of senior living centers often have difficulty raising their feet off the floor surface when they take steps. They slide their feet and often use assisted walking devices.

Fire and smoke barrier expansion joint cover system selections that span a seismic gap in the floor of a senior living center must feature a "no bump" design application. These are systems designed to accommodate the movement requirements of a building, be able to work as a component of a fire resistance rated or smoke resistant assembly and to maintain a smooth and flush-to-the-floor surface so to minimize trip hazards. This requirement is more extreme than typical ADA requirements due to the special needs of senior citizens in a senior living center.

Proper selection of a "no bump" expansion joint cover coupled with a fire barrier expansion joint design that completes a fire resistance rated or smoke resistant system assembly are critical components to protecting our Baby Boomer generation in senior living centers everywhere. 🔥

Steve Cooper is Vice President Sales and Marketing for Balco, Inc. in Wichita, Kansas. He can be reached at scooper@balcousa.com.

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George Mills Outlines Top Joint Commission Citations and Tips on Compliance

By Deanna Martin

In the past few years, seven out of 10 top citations from Joint Commission surveys have stemmed from problems in the health care physical environment. George Mills, MBA, FASHE, CEM, CHFM, director of the Department of Engineering at the Joint Commission, recently spoke about these issues at the American Society for Healthcare Engineering (ASHE) Annual Conference, where he was one of three plenary speakers from accrediting organizations. ASHE will be running more articles about Mills' presentation and articles on the sessions given by the other two hospital accrediting agencies, DNV Healthcare Inc. (DNV) and the Healthcare Facilities Accreditation Program (HFAP), in upcoming editions of the *ASHE Insider*.

Mills said at the Annual Conference that—not surprisingly—means of egress citations are once again near the top of the list, coming in at number **two** on the overall list of citations and number **one** of the citations related to the health care physical environment. Means of egress citations include corridor clutter and issues with life safety drawings.

Facility managers are often frustrated by corridor clutter citations because it is not maintenance equipment left in corridors causing the problem, but items used by clinicians, including computers on wheels and IV poles, Mills said. The key for facility managers is to seek cooperation from nurses and other equipment users, stressing the importance of keeping hallways clear. Evacuation exercises and drills can help show clinicians why this is so important, Mills said, and making regular rounds to develop relationships with these equipment users is critical to lasting success.

"If you're satisfied sitting down in your office working with your contractors and your staff and you're not doing rounding and you're not out and about meeting your users, then you're never going to be successful in corridor clutter management," Mills said. "But when you start developing those relationships with users, that's when [you]'re going to be successful and get [your] corridors clear and clutter free."

Mills said facility staff should not be surprised by the requirement for life safety drawings that include boundaries, dimensions, and exits and clearly show:

- Fire safety features (Mills clarified that drawings and legends should be used to identify major systems and features, but that this does not have to be detailed enough to show every fire extinguisher)
- Areas of the building that are fully sprinklered (if a building is partially sprinklered)
- Locations of all hazardous storage areas
- Locations of all smoke barriers

- Suite boundaries, including the size of suites—both sleeping (maximum 5,000 square feet) and non-sleeping (maximum 10,000 square feet)
- Locations of designated smoke compartments
- Locations of chutes and shafts
- Locations for which the facility has received approval for equivalencies or waivers

The **third** issue most often cited by the Joint Commission is related to fire barrier penetrations, fire door issues, and duct issues. "Almost half the time we surveyed, we found problems with our barriers," Mills said.

The Joint Commission and ASHE are working with the firestop industry and others to use symposiums to educate facility staff about barrier management. "Because this has been such a longstanding finding for us...we really felt like we had to do something," Mills said. Watch the *ASHE Insider* and the ASHE website for more information about upcoming barrier management symposiums.

Number **five** on the Joint Commission's list of top citations is fire safety testing. This issue is often cited when facilities cannot provide documentation related to their testing. Mills said it is unacceptable to have a contractor inspect fire safety at a hospital and not provide a timely report. Instead of waiting five or six weeks for an overall report, he said, facility managers can require contractors to provide a daily punch list of anything that failed safety testing. Work orders can then be used to address those issues, providing documentation for corrected problems even before the contractor finishes a larger report.

Smoke barrier penetration problems came in as the **sixth** most cited issue. This problem is similar to the fire barrier problem, Mills said, and solutions will be discussed in upcoming barrier management symposiums.

The **seventh** most cited issue concerns unsafe patient care conditions, including unsecured oxygen cylinders and ventilation, temperature, and humidity issues. Mills said facilities can determine how often they monitor humidity and temperature, but documentation needs to be provided. If your facility monitors daily, the Joint Commission needs to see a daily log. If your facility monitors annually, you need to provide an annual log.

The **ninth** most common issue cited by the Joint Commission relates to problems with sprinklers, including the requirement to maintain 18 inches or more of open space from below the sprinkler deflector to the top of any storage located below. Just like

corridor clutter, Mills said, facility employees are likely not the ones stacking items on top of shelving. This is another instance where success comes by working with the users and educating them on the issue.

The **tenth** most common citation includes the related issues of improper system design; the inability of the mechanical system to achieve required results; the lack of written inspection, testing, and maintenance frequencies; and problems with appropriate air pressure relationships, air exchange rates, and filtration efficiencies. Mills said his top concern for the future of health care is the aging infrastructure of our building systems. His opinion is that facility managers need to discuss these issues with their leaders. Mills also cautioned against relying too heavily on building automation systems to ensure these systems are operating properly. "We still need to be walking around doing our physical checks and making sure these things are running the way [we] think they're running," he said.

Mills said health care facilities have done a good job in recent years of avoiding immediate-threat-to-life citations, which can eventually lead to losing reimbursement from the Centers for Medicare and

Medicaid Services. The following items can spur immediate-threat-to-life citations:

- A significantly compromised fire alarm system
- A significantly compromised sprinkler system
- A significantly compromised emergency power supply system
- A significantly compromised medical gas master panel
- Significantly compromised exits
- Other situations that place patients, staff, or visitors in extreme danger

To purchase Mills's full presentation with synchronized PowerPoint slides—or to buy any individual session or the full set of Annual Conference recordings, visit the ASHE Live Learning Center at <http://www.softconference.com/ashe/slist.asp?C=5179>. 🔥

Deanna Martin is a senior communications specialist for the American Society for Healthcare Engineering and can be reached at dmartin@aha.org.

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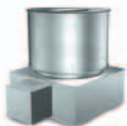
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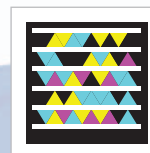
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Extract from a Report on Fires in Health Care Facilities

By Marty Ahrens

Editor's Note: Below is an excerpt from a report from the NFPA's Fire Analysis and Research Division. The report focuses on fires from 2006-2010 within healthcare occupancies. This is only a small section of the report. A full copy can be obtained from Nancy Schwartz, NFPA (nschwartz@NFPA.org).

Structure Fires in Health Care Facilities

6,240 structure fires were reported in these properties per year.

During the five-year period of 2006-2010, U.S. fire departments responded to an estimated average of 6,240 structure fires in health care facilities per year. These fires caused an annual average of six civilian deaths, 171 civilian fire injuries, and \$52.1 million in direct property damage. Figure 1 and Table A show that almost half (46%) of these fires were in nursing homes, while almost one-quarter (23%) were in hospitals. One in five (21%) were in mental health facilities.

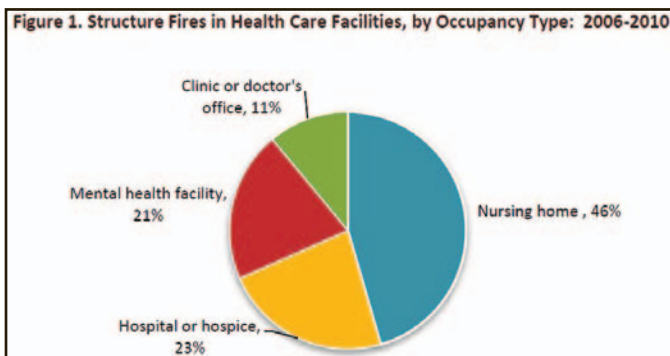


Figure 1 – NFPA Graphic.

Table A.
Structure Fires in Health Care Facilities, by Specific Occupancy
2006-2010 Annual Averages

Occupancy	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (In Millions)
Nursing home	2,840 (46%)	5 (88%)	110 (65%)	\$13.0 (25%)
Hospital or hospice	1,430 (23%)	0 (7%)	32 (19%)	\$7.5 (14%)
Mental health facilities	1,280 (21%)	0 (5%)	23 (13%)	\$4.9 (9%)
Clinic or doctor's office	690 (11%)	0 (0%)	6 (3%)	\$26.6 (51%)
Total	6,240 (100%)	6 (100%)	171 (100%)	\$52.1 (100%)

Table A – NFPA Graphic.

For this analysis the term “health care facilities” includes four broad categories of occupancies:

- 1) Hospitals or hospices;
- 2) Licensed nursing homes providing 24-hour care;
- 3) Mental health facilities providing 24-hour care to individuals with substance abuse issues, developmental disability or mental retardation or asylums or mental illness; and
- 4) Clinics, ambulatory care facilities, doctors’ or dentists’ offices or free-standing dialysis units.

This report includes an analysis of fires in health care properties overall and of fires in each of the four major categories. Note that there is some overlap between categories. Hospitals often have ambulatory clinics. A continuum exists from nursing homes and mental retardation or substance abuse facilities to residential board and care, assisted living, or rest homes. Residential board and care (1) or assisted living shares some traits with health care occupancies and others with residential. It is grouped with residential properties in the U.S. Fire Administration’s (USFA’s) National Fire Incident Reporting System (NFIRS).

Only fires reported to public fire departments are included in these statistics. Unclassified institutional properties are not included. Supporting tables are provided at the end of this section.

1.2% of all structure fires were in health care facilities

During 2006-2010, the 6,240 fires in health care properties accounted for 1.2% of the 506,400 structure fires, 0.2% of the 2,810 civilian structure fire deaths, 1.1% of the 14,960 civilian structure fire injuries, and 0.5% of the \$10.6 billion in direct property loss.

The average property loss per 1,000 fires was 61% lower when wet pipe sprinklers were present.

NFPA’s John Hall analyzed sprinkler performance in a variety of occupancies. 2 Table B shows that sprinkler systems were present in 55% of reported health care facility fires in 2006-2010. Fires in properties that were under construction or in which automatic extinguishment failed because it was not in the fire area are excluded from these statistics.

Table B.
Sprinkler Systems in Reported Health Care Structure Fires
Excluding Fires in Properties in Construction and
Fires in Which Automatic Extinguishing Equipment Was Present but Not in Fire Area
2006-2010 Annual Averages

Share of reported health care fires with sprinklers present	55%
When present, operated in fires large enough to activate*	88%
When operating, effective in controlling fire*	98%
When present and fire large enough, operated and effective*	86%
Average loss per fire	
Without automatic extinguishing equipment	\$13,000
When wet-pipe sprinklers were present regardless of operation	\$5,000
Percent reduction	61%

*Fires with confined fire incident types 113-118 were excluded from these calculations because of the small number with usable data.

Table B – NFPA Graphic.

When present in a fire large enough to expect a sprinkler to operate, the sprinklers operated 88% of the time. They were effective in controlling the fire in 98% of these fires in which they operated. This means that together, sprinklers operated and were effective in controlling the fire in 86% of the fires in which they were present and the fire was large enough for operation to be expected. The average loss per fire was 61% lower when wet pipe sprinklers were present than when no automatic extinguishment was present at all. This calculation is based on fires of all sizes.

Fire Causes and Circumstances in Health Care Structure Fires Overall

This section describes the causes and circumstances in all types of health care occupancies. Each occupancy is discussed separately in the sections that follow. Table numbering is consistent throughout, with different letters used for each specific occupancy. For example, Table 1 shows fire trend data for all health care occupancies, Table 1A has trend data for nursing homes, hospital and hospice fire trends are shown in Table 1B, etc.

Structure fires in these properties peaked between 9:00 a.m. and 6:00 p.m.

Tables 2, 3, and 4 show reported structure fires in these properties by month, day of week and alarm time, respectively. There is relatively little variation by month. These fires were more common during the week than on weekends. Patterns by day of week varied by occupancy. Fires in nursing homes and facilities caring for the mentally ill or people with substance abuse issues or mental retardation peaked on Saturday and Sunday, while fires in hospitals or hospices and doctors' offices or clinics were more common during the week. Fires in all of these occupancies were less common between 9:00 p.m. and 6:00 a.m.

Cooking was the leading cause of fires in health care occupancies.

Table 5 shows the leading causes of fires in these properties with data summarized from several NFIRS fields. In some cases, the equipment involved in

ignition is most relevant; heat source, the field "cause of ignition," and factor contributing to ignition also provide relevant information. The causes shown in this table are not mutually exclusive when they have been pulled from different fields. Only causes that describe a scenario are shown. More detailed information on equipment involved in ignition may be found in Table 6; more information on heat source is in Table 7.

Figure 2 shows that cooking equipment was listed as the equipment involved in ignition in three out of five (61%) structure fires in these properties. While the leading cause in all categories of health care properties, the share of cooking fires varied by specific occupancy from a low of one-third (35%) in doctors' offices or clinics to a high of three-quarters (74%) in facilities providing 24-hour care for people with developmental disabilities, mental retardation, mental illness or substance abuse issues.

Clothes dryers or washers were involved in 7% of the fires in overall health care properties and 10% of the fires in nursing homes. Six percent of structure fires in or at health care fires were intentionally set, but this jumps to 11% for facilities providing 24-hour care for people with developmental disabilities, mental retardation, mental illness or substance abuse issues. Smoking materials and heating equipment also were involved in 6% of health care structure fires.

The kitchen was the leading area of origin in all health care occupancies.

The leading areas of origin are related to the leading causes. Figure 3 and Table 10 show that the kitchen or cooking area was the leading area of origin for all health care occupancies, although these incidents accounted for only one-quarter (23%) of the fires in doctors' offices or clinics. Six percent of health care fires started in laundry rooms or areas and another 6% started in patient rooms or bedrooms. Eleven percent of the fires in doctors' offices or clinics started in offices.

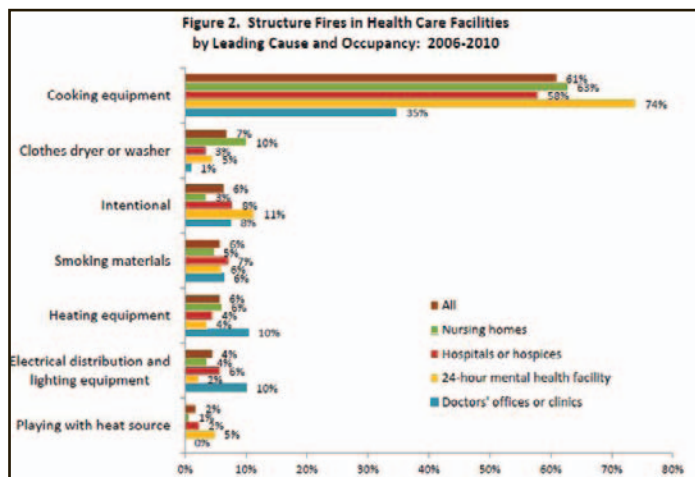


Figure 2 - NFPA Graphic.

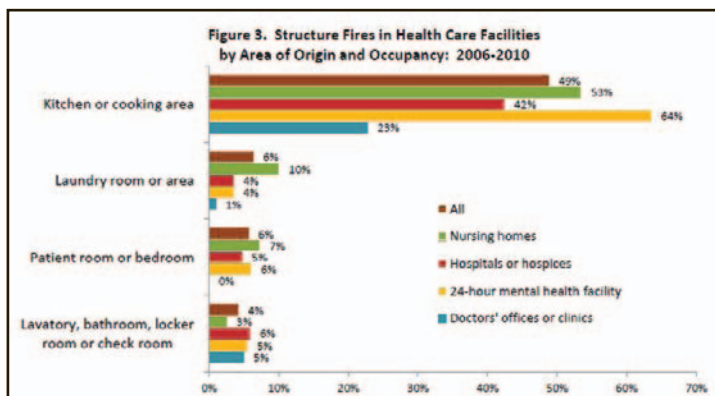


Figure 3 – NFPA Graphic.

Cooking materials, including food, led in items first ignited.

Figure 4 and Table 11 show that cooking materials, including foods, were the items first ignited in 40% of the reported structure fires in these properties. Electrical wire or cable insulation was first ignited in 7% of health care fires overall but 12% of the fires in doctors' offices or clinics. Rubbish, trash or waste was first ignited in 6% of the health care fires.

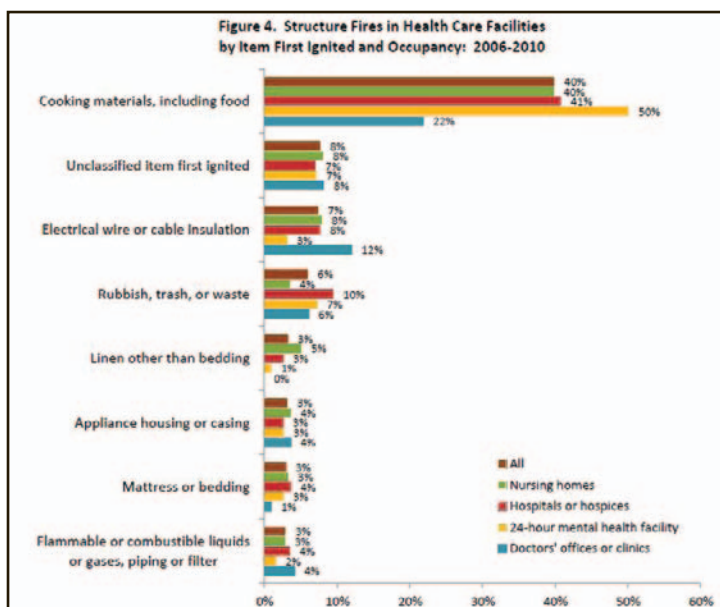


Figure 4 – NFPA Graphic.

Most fires in these properties were very small.

Two-thirds (68%) of the structure fires in or on health care properties had incident types that indicated they were confined or contained fires and assumed to have fire spread limited to the object or container of origin. As discussed earlier, Version 5.0 of NFIRS requires less detail about fires confined to a cooking vessel, chimney or flues, incinerators or compactors, or fuel burners or boilers; and contained or confined trash or rubbish fires in or on structures with no flame damage to the structure or other contents.

In addition to the 68% of health care fires with incident types indicating contained or confined fires, Table 12 shows that the fire did not spread beyond the object of origin in another 19% of reported health care structure fires. Only 4% spread beyond the room of origin. However, 16% of the fires in doctors' offices or clinics spread beyond the room of origin.

2,810 outside or unclassified fires, on average, were reported annually on these properties.

During 2006-2010, an estimated annual average of 2,810 outside and other fires on these properties caused an average of 15 civilian injuries and \$1.2 million in direct property damage per year. Deaths averaged less than one per year. An average of 540 vehicle fires reported on these properties caused an average of three civilian injuries and \$2.4 million in direct property damage per year. No civilian fire deaths resulted from any vehicle fires on these properties that were reported to NFIRS.

Additional information sources

A number of catastrophic hospital fires are summarized in NFPA's 2012 publication, *Major Hospital Fires*, by Marty Ahrens. NFPA members can download a number of investigation reports on health care fires at no cost from Fire Investigations on Health Care Facilities. Non-members may order these investigation reports through the NFPA library.

The chapter on "Health Care Occupancies" by Daniel J. O'Connor, found in the 20th edition of the NFPA *Fire Protection Handbook*, describes some of the special fire safety concerns for these properties. NFPA 99, *Health Care Facilities Code*, provides the minimum necessary criteria to install, maintain, test and use medical gases safely. This code also includes comparable requirements for performance, maintenance, and testing of electrical systems in health care facilities. 🔥

NFPA 101, *Life Safety Code*® also contains requirements that apply to these properties.

Marty Ahrens is the Manager of Fire Analysis Services in the Fire Analysis and Research Division of the National Fire Protection Association. In addition to her managerial responsibilities, she also analyzes fire data to provide national estimates of various aspects of the fire problem. She has written reports about candle fires, vehicle fires, smoke alarms, and fires in various occupancies, as well as chapters in several NFPA publications. Before joining NFPA in 1997, Marty spent 11 years as the research analyst/Fire Incident Reporting System Coordinator in the Massachusetts State Marshal's office.

Marty has an MSW from Boston University and spent a few years as a social worker in a chronic disease hospital. Marty can be reached at mahrens@nfpa.org.



Firestop Industry Conference and Trade Show Feature: Healthcare Industry Day

This year's FCIA's Firestop Industry Conference and Trade Show (FIC) features the Healthcare Focused Firestopping and Effective Compartmentation Day on Thursday, Nov. 7. **In addition to FCIA members and, as special guests, the FCIA Program Committee invites ASHE member facility engineers and ICC Governmental Members to the Healthcare Industry Day free of charge.**

The FIC, set for Nov. 5-8 at the beautiful Hyatt Tamaya Resort & Spa in Albuquerque, New Mexico, brings industry-leading speakers for a great industry discussion:

George Mills, MBA, FASHE, CEM, CHFM,



CHSP – George is the director of The Joint Commission's engineering department, and is a highly respected speaker in the healthcare industry. As a former healthcare facility manager, he has expertise in barriers and barrier management systems. George will speak on both as he joins FCIA in Albuquerque for the FIC. George manages those who survey healthcare facilities and strives to create a safe patient environment of care at organizations and occupancies that are Joint Commission accredited.

Jonathan Flannery, CHFM, FASHE, MHSA –



Jonathan is the senior associate director of advocacy for ASHE, and has a strong background with codes and standards, regulatory issues, state agency relations, and more. Attendees will benefit from John's 23 years of experience in healthcare engineering as a facility manager and an architect as well. Having served on many committees such as the ICC's Ad Hoc Committee on Healthcare, Jonathan will certainly have a "can't miss" presentation.

Peter Whiteman –



Peter is the incoming president of the Canadian Healthcare Engineering Society (CHES). Peter and CHES make it their mission to better manage the healthcare industry, and make it a safe and serviceable environment for patients and workers. Peter will be bringing his vast experience and a Canadian perspective to the importance of maintenance of

healthcare occupancies patient safety.

Luke Woods, PE –



Luke is the principle development engineer at Underwriters Laboratories for fire-resistance-rated products that become systems after installation. Luke will speak at the FIC on the existing and future firestopping and fire resistance test standards. A veteran in the world of firestopping and construction, Luke shares his passion for the industry with the

FIC. Luke will be talking about firestopping standards and will educate attendees on firestop systems and fire-resistance-rated assemblies that better adhere to these standards. He's also challenging us about how to further improve current standards to improve life safety.

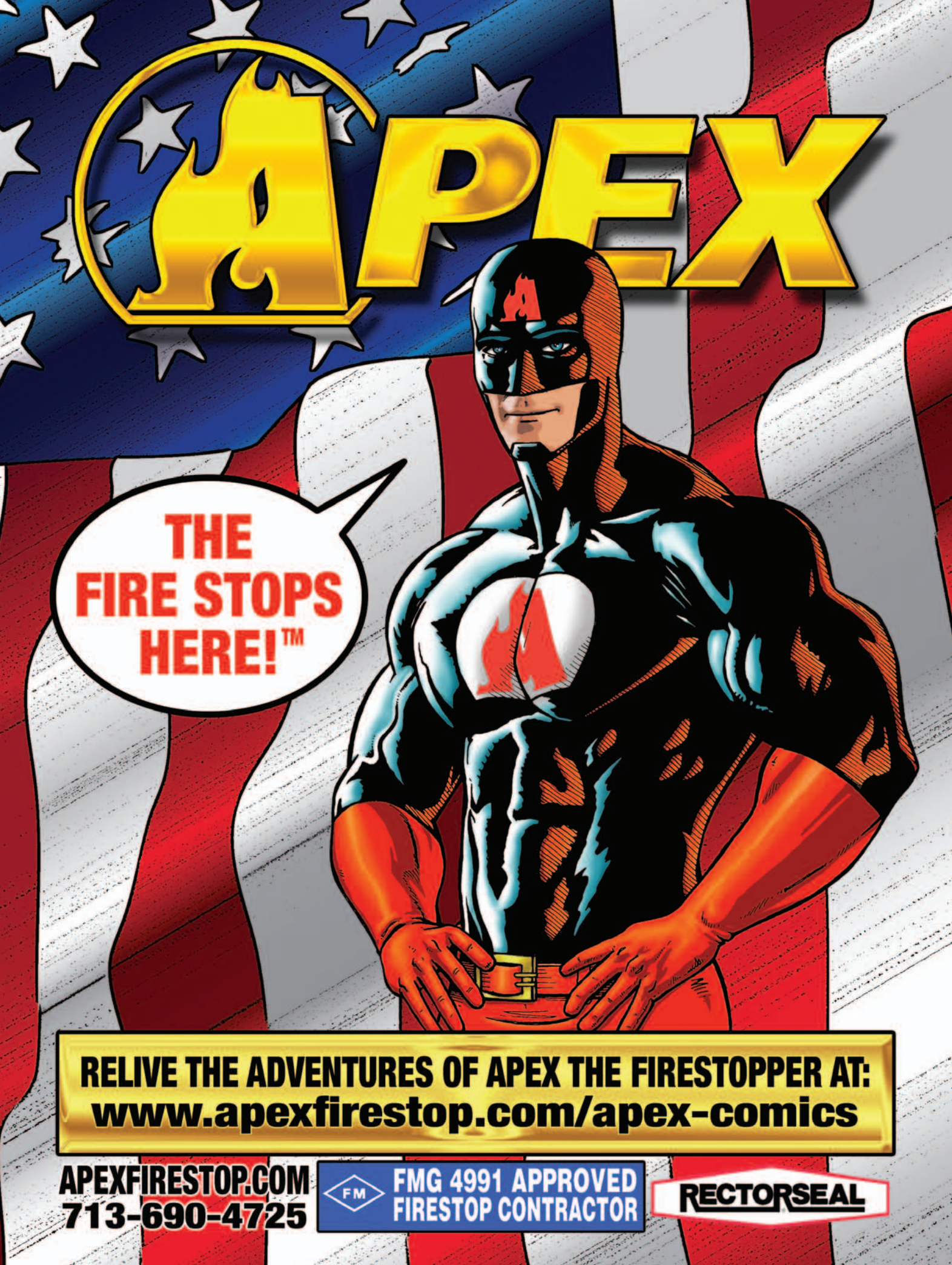
Although not presenting on Thursday, FCIA's code consultant Bill Koffel, Koffel Associates, will also cover much in the code development arena on Wednesday morning. For information and to register for the FIC or ASHE Member and AHJ Special Guest Passes, please visit <http://www.fcia.org/articles/events.htm> or contact Evie Caprel at the FCIA office at 708-202-1108. 🔥



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Attendees at the 2012 FIC.



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Effective Compartmentation Trends for 2013

By Bill McHugh

Effective Compartmentation Designs Now...and the Future

Fire-resistance-rated construction in buildings contains many components. Fire-rated walls and floors start the "six-sided box" that creates effective compartmentation. The features of fire protection that provide continuity to the fire-resistance rated wall and floor assemblies include installed firestop systems, fire and smoke dampers, fire-rated glazing and both rolling and swinging doors and hardware.

The effective compartmentation industry has been working to improve on the installed product reliability from many perspectives. Each industry has been working to build better systems, focusing on the proper DIIM - Design, installation, Inspection and Maintenance of each effective compartmentation continuity component. This is the future of effective compartmentation. In the first component, tested and listed systems, manufacturers submit products to testing at labs such as Underwriters Laboratories, LLC (UL/ULC), FM Approvals (FM), and others to provide suitability for use statements for products in specific applications through fire testing. Testing continues by manufacturers of all types of effective compartmentation products.

Effective Compartmentation – The "IIM" in "DIIM"

The big differences are in the rest of the story. Testing provides suitability for use of products. However, how do the products get handled once they leave the factory or manufacturer's/distributor's warehouse?

That's where the rest of the story starts...the "IIM" of the "DIIM." "IIM" means the Installation, Inspection, and Maintenance of these fire-resistance rated and smoke-resistant assemblies.

Study of the effective compartmentation industries found the some addressing the "IIM" of "DIIM" by the firestopping, fire and smoke damper, fire-rated glazing, rolling fire door and swinging fire doors and hardware industries. Below is a summary by industry:

Firestop Systems – This industry has focused on all parts of the DIIM. For the "D," firestop products become systems after they have been tested to ASTM E 814 and/or UL 1479 for penetrations, ASTM E 1966 and/or UL 2079 for joints and ASTM E 2307 for Perimeter Fire Containment and installed to the system parameters. In Canada, ULC S-115 incorporates all of UL 1479 and UL 2079. ASTM E 2307 may be recognized by AHJ's and architects in Canada for perimeter fire containment.



Firestop systems can be identified through labels. This sets up easier verification of the system during the maintenance of the building. PPMI Photo.

FCIA has given particular focus to the Installation and Inspection part of "IIM" for firestopping through third-party company-based management system audits for contractors and special inspection agencies and apprenticeship education for the workforce of those contractors or even inspection agency firms.

The FCIA collaborated with FM Approvals to build FM 4991, Standard for the Approval of Firestop Contractors in 1999-2000. FCIA also collaborated with UL to build the UL/ULC Qualified Firestop Contractor Program. Both programs provide general contractors, building owners and managers and AHJ's a way to quantifiably differentiate installing contractor companies that have invested in their companies' understanding of the zero tolerance quality installation process for firestopping.

FM 4991 Approved or UL/ULC Qualified Firestop Contractors become Approved or Qualified after a company and on-site audit of their management systems. A person who has passed a rigorous FM or UL firestop industry exam based on FCIA's Firestop Manual of Practice and firestop systems selection is appointed by the company a "Designated Responsible Individual" after the firm is FM 4991 Approved or UL/ULC Qualified. Education for those taking the FM or UL Firestop Exam is offered by FCIA as well.

For the second "I," Inspection, the 2012 International Building Code now has a requirement for third-party inspection of new construction firestop installations to ASTM E 2174 and ASTM E 2393 Standards for the Inspection of Installed Penetration (2174) and Joint (2393) firestops. FCIA was the code proponent for this new requirement in the Building Code. Buildings where ASTM E 2174 or ASTM E 2393 is now required where municipalities adapt the 2012 IBC include those structures 75 feet and higher above fire department access and critical occupancies found in IBC's table 1604.5. Buildings such as education, assembly and other occupancies may be subject to these firestop inspections.

FCIA also built through participation at the accreditation criteria confirmation process at International Accreditation Services (IAS) the firestopping requirements in IAS Accreditation Criteria AC 291

– Accreditation for Special Inspection Agencies. The individual at the firestop special inspection agency that provides the knowledge needed to manage the operation must pass either the FM or UL/ULC Firestop Exam.

As an industry, the firestopping industry supported the National Association of State Fire Marshals to bring importance to maintenance of all the fire protection features that keep fire-resistance-rated and smoke-resistant systems continuous in buildings slowing fire spread. The maintenance language is stated in the International Fire Code section 703.1 and NFPA 101.

As an industry, the FCIA has moved forward quickly with the DIIM message.

Fire & Smoke Dampers – The fire and smoke damper industry tests its products suitability for use using UL Standards 555 and 555S. UL 555S focuses on smoke dampers. There are also combination fire and smoke dampers that have passed testing for both. As an industry, the damper groups have focused on installation, inspection or testing during the building life cycle for ongoing reliability.

In general, fire and smoke damper inspections are required every four years in most occupancies. Healthcare occupancies are inspected every six years. According to the healthcare industry, this is due to the very high degree of maintenance and management that takes place in these structures.



Fire dampers provide continuity to fire-resistance rated walls and floors. *Greenheck Photo*

For installation, the National Energy Management Institute developed a program for contractors who are signatory to and use the workforce supplied by the Sheet Metal Workers International Association, a nationally known Union. Union signatory contractors who install fire and/or smoke dampers can be audited by the National Energy Management Institute for a fee. Fire and smoke dampers are included in the fire-resistance-rated system maintenance requirements in the International Fire Code 703.1.

Fire-Rated Glazing – The industry does have the “D” in Design from the DIIM covered. However, research shows that there currently are no unique organized installation programs for the “I.” Inspection is not formalized. However, inspection has been made more uniform through a new labeling format as specified by the 2012 International Building Code (IBC-see article on fire-rated glazing in this issue). Fire-rated glazing is also included as a fire-resistance-rated construction maintenance item in the International Fire Code 703.1.

Swinging Fire Doors and Hardware – From the “D” part of the DIIM, manufacturers test their products to Standards UL 10B and UL 10C and other standards. Both are fire tests of swinging doors. Manufacturers



Swinging fire doors with rated builders hardware and rated frames installed to the tested system protect occupants. *DHI Photo*

provide installation instructions and there is available training for the workforce from organizations such as the carpenters, laborers and locksmiths. The Door and Hardware Institute’s Door Security and Safety Foundation has built a very credible Fire Door Assembly Inspection program to qualify individuals to perform inspections in existing buildings. Additionally, DHI’s relationship with Warnock Hersey has produced an Intertek Certified Fire Door Inspector Professional company certification as well.

The DHI’s Foundation efforts nationwide have been well received as ways to increase the reliability of installed swinging fire doors through “maintenance” practices that reside in NFPA 80.

Rolling Fire Doors – Rolling fire doors are the largest opening creating a very big hole in a fire-resistance-rated assembly in a building. From the “D” Design perspective, the rolling fire door industry tests their products to UL 10B and UL 10C and other standards similar to swinging fire doors. For the “I” Installation, The Institute of Door Dealer Education and Accreditation Programs provides a certification for rolling fire door installation workers. The individual certification is a knowledge-based program where those with a minimum of two years experience in the field must pass an industry exam. NFPA 80 specifies drop testing frequency for these assemblies. Maintenance is covered under the International Fire Code 703.1 as well.

Walls and Floors – Inspections of fire- and smoke-resistant assemblies finds that walls and floors may have large holes with no penetrating items such as pipes, cables, etc. Those walls need to have their continuity restored through reconstruction of the wall.



Fire-resistance rated walls must be installed to the tested system limitations to function as intended. *FCIA Photo*

Structural Steel Fireproofing – In the steel fireproofing industry, testing takes place to ASTM E 119 and UL 263. This fireproofing industry has seen several changes the past few years in products and code requirements.

At the International Code Council's past two code development cycles, increased density and inspection frequencies have taken place in buildings 420 feet and higher. UL has a Qualified Fireproofing Contractors Program similar to the firestopping industry. The National Fireproofing Contractors Association provides education to those seeking an individual certification as well. The heart of the NFCA program is an individual personnel examination on NFCA manuals and education. CEUs are required as part of the program. With a minimum two years experience and member in good standing status at NFCA, the company gets recognized for the individual certification as well.

More about the "M" – The International Fire Code, NFPA 101

For the "M," Maintenance of Firestopping, the industry relies on various fire and smoke barrier management initiatives that provide compliance proof to the International Fire Code's 703.1 – Maintenance section.

The International Fire Code (IFC) is adapted widely in many jurisdictions. NFPA 101 is also used as a fire code in some states and also in all healthcare occupancies. In healthcare, NFPA 101-2000 version and the International Fire Code are both adapted by jurisdictions locally.

The 2012 IFC 703.1 states that "the required fire-resistance rating of fire-resistance-rated construction shall be maintained." This includes all the fire and smoke protection features in effective compartmentation. Further, the code states that "such elements shall be visually inspected by the owner annually and properly repaired, restored, or replaced when damaged, altered, breached or penetrated." An exception exists for concealed spaces unless there is movable entry into the space. Openings are to be protected by self or automatic closing doors meeting assembly fire ratings.

In 703.2 of the IFC, smoke barriers and smoke partitions require maintenance to NFPA 105. Fire walls, fire barriers and fire partitions further state that openings including fire doors, fire dampers, fire-rated glazing are to be maintained in accordance with NFPA 80.

Additionally, NFPA 101, The Life Safety Code, in section 4.5.8, sets the requirements for Maintenance, Inspection, and Testing of various devices, including fire-resistive construction. Section 4.5.8.1 goes even further, stating "such device, ... shall thereafter be continuously maintained" ... in accordance with NFPA requirements, performance based design or AHJ. Section 4.5.8.5 then states that such maintenance, inspection and testing "shall be performed under the supervision of a responsible person who shall ensure that testing, inspection, maintenance" is made at specific intervals.

Where the International Fire Code states a frequency for building owners to "inspect" their fire-resistance-rated assemblies, the NFPA 101 does not.

The Real Trend – Building Reliability for Effective Compartmentation

The various industries that are part of the fire- and smoke-resistant-rated effective compartmentation systems such as fire and smoke barriers, fire walls, fire and smoke partitions are working to build better reliability of their installed systems.

For building owners and managers, building occupants...that's you and me...it is important that the systems work when called upon by fire or smoke. Much has changed the past 10 years to build better reliability at the end construction so the building owner and manager can start to maintain the structure correctly.

In the future, look for more industries to jump on the "IIM" theme and build programs for installation, inspection and maintenance. By focusing on the actual in-place performance of each effective compartmentation component, reliability gets better. Let's keep working together to make the next 10 years of effective compartmentation even better. 🔥

Bill McHugh is the Executive Director of FCIA. He may be reached at bill@fcia.org.



For more info visit <http://qrs.ly/uc3ljce>

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NFPA 285: Flame Propagation in Exterior Walls 2012

International Building Code

By Ronald L. Geren, AIA, CSI, CCS, CCCA, SCIP

Late morning on a winter day, a contracting crew was up on the roof of a building performing welding and cutting on a steel fabrication that was to become a catwalk for a window washing system. The hot work, unfortunately, ignited adjacent polyurethane-coated foam plastic trim and the fire spread laterally and vertically down the exterior face of the building. The outcome of the Jan. 25, 2008, fire at the Monte Carlo Resort and Casino in Las Vegas, Nevada, was a \$100 million price tag for damage and lost business. Fortunately there were no deaths, but 17 people were sent to hospitals for injuries.

The Monte Carlo fire illustrates the growing problem with incorporating combustible foam plastics within exterior wall assemblies. Large continuous planes of combustible material allow a fire to spread quickly horizontally and vertically to other areas of a building. Due to this fire propagation potential, the International Building Code (IBC) requires wall assemblies that integrate combustible plastics and most recently combustible water-resistive barriers be tested in accordance with the National Fire Protection Association's (NFPA) standard 285, *Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components*.

NFPA 285 and the IBC

Even though the standard's scope applies to nonload-bearing walls as its title implies, the IBC's requirements for testing does not differentiate between load-bearing and nonload-bearing walls—all wall assemblies with combustible materials (with some exceptions) are required to be tested. The 2012 IBC includes six provisions where NFPA 285¹ testing is specifically required:

Section 1403.5: For combustible water-resistive barriers in buildings over 40 feet in height of Type I, II, III, or IV construction. This is a new requirement in the 2012 IBC.

Section 1407.10.4: For metal composite materials (MCM) used on buildings of Type I, II, III, and IV construction. Section 1407.11 of the IBC provides alternate conditions that do not require compliance with NFPA 285, such as using MCM not higher

than 40 feet and having a fire separation distance² of more than 5 feet. If the fire separation distance is 5 feet or less, then only 10% of the wall area can include MCM.

Section 1409.10.4: For high-pressure decorative exterior-grade compact laminates (HPL) exterior wall coverings used on buildings of Type I, II, III, and IV construction. Section 1409.11 of the IBC provides alternate conditions that do not require compliance with NFPA 285, such as using HPL not higher than 40 feet and having a fire separation distance of more than 5 feet. If the fire separation distance is 5 feet or less, then only 10% of the wall area can include HPL. These are new requirements in the 2012 IBC.

Section 1509.6.2: Combustible mechanical equipment screens used on buildings of Type I, II, III, and IV buildings.

Section 2603.5.5: Exterior walls of buildings of Type I, II, III, and IV construction of any height incorporating foam plastic insulation, except for one-story sprinklered buildings.

Section 2612.5: For fiberglass-reinforced polymer (FRP) exterior wall coverings. This section references Section 2603.5, which means NFPA 285 is required for Type I, II, III, and IV buildings that are more than two stories and higher. However, this section does offer two exceptions that would not require NFPA 285 testing.

Noticeably missing in the list of requirements above are exterior insulation and finish systems (EIFS). That is because EIFS were not directly addressed in the IBC until the 2009 edition. Prior to the 2009 IBC, EIFS were regulated by the foam plastic insulation requirements of Chapter 26. In the 2009 IBC, EIFS were directly incorporated into the code in Section 1408, which requires compliance with ASTM E 2586, *Standard Specification for PB Exterior Insulation and Finish Systems*. Since ASTM E 2586 requires EIFS to pass NFPA 285, Section 1408 essentially supplants the foam insulation requirements of Chapter 26 for EIFS.

The IBC has always referenced NFPA 285 for foam plastic insulation; however, *Uniform Building Code* (UBC) Standard 26-4, *Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-Bearing Wall Panel Assemblies Using Foam Plastic Insulation*, was permitted

¹ Although the latest edition of NFPA 285 is the 2012, the 2006 edition is the one referenced in the 2012 IBC. However, the first and second printings of the 2012 IBC indicate a "NFPA 285-11" edition, but an errata dated 02-27-13 was issued correcting the edition to the 2006.

² Fire separation distance is the distance measured between the face of the building and the closest interior lot line, the centerline of a street, alley, or public way, or to an imaginary line between two buildings on the same property. The distance is measured at right angles to the face of the wall.

by the 2000 IBC and, prior to the IBC, the UBC.³ The 1997 UBC introduced UBC Standard 26-9, *Method of Test for the Evaluation of Flammability Characteristics of Exterior, Nonload-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-scale, Multistory Test Apparatus*, which eventually became NFPA 285. The significant difference between UBC Standards 26-4 and 26-9 was that 26-4 was based on a full-scale mockup of the wall assembly, whereas 26-9 (and subsequently NFPA 285) is based on a smaller, intermediate-scale mockup.

Impact of NFPA 285 on Building Design

Since some form of fire propagation requirements for combustible materials in exterior walls have been in the code for over 30 years, why is it that design professionals are just now learning about NFPA 285? The answer is rather simple: energy codes are requiring higher performance from building envelopes, and the best method to improve thermal performance is providing continuous insulation. Continuous insulation interrupts the thermal bridging created by common exterior wall construction. When EIFS were introduced in the 1970s, they were the only foam plastic insulations used in this manner. When the codes caught up with the new technology in the 1980s and developed testing standards, EIFS manufacturers immediately sought testing for their systems. However, with few manufacturers and a limited number of common substrates, it was easier to test most, if not all, of the typical EIFS assemblies at the time.

It is important to stress that the NFPA 285 test is an assembly test and not a material component test. With the constant introduction of new exterior wall coverings, the implementation of the “rain screen principle,” and the increasing requirements for improved thermal performance, the building exterior envelope suddenly became a very complex assembly with thousands of possible combinations, thereby making it cost prohibitive for a manufacturer to test every probable wall assembly. If an assembly can be found that has passed the NFPA 285 test, then the assembly must be designed and built exactly as it was tested. Therefore, the designer must use all of the proprietary products that are indicated in the tested assembly—any change in the assembly, regardless of how minor, will require a new test.

With this wide variety of potential exterior wall assemblies to choose from, the design professional must now consider one of the following options to remain compliant with the building code:

- Design a building using Type V construction;
- Design a sprinklered building with only one story above grade plane;
- Design an exterior wall assembly that has no combustible materials;
- Design a building using MCM and HPL that is more

³ In UBC editions prior to the 1994 edition, the standard referenced was UBC Standard 17-6. The number change was the result of chapter restructuring in response to the efforts of the Council of American Building Officials' (CABO) Board for Coordination of Model Codes (BCMC) to standardize the organization of the three model building codes.

than 5 feet from the lot line and is less than 40 feet in height and includes no foam insulation or combustible water-resistive barrier;

- Select a tested wall assembly from the few assemblies that are available; or,
- Design a wall assembly and have it tested.

Some of the options mentioned above may not be immediately available to the design professional due to a building's design program (i.e. size and types of spaces required), available site area, or project budget. For example, designing a 100,000 sq. ft. office building on a tight urban site will likely eliminate the first two options. The third option, although achievable, will require some additional research time on part of the design team; however, to obtain equal energy performance using noncombustible materials (e.g. mineral wool insulation) will require thicker wall assemblies that may pose some design challenges. The fourth option is probable, but the use of foam plastic insulation or combustible water-resistive barriers (both are common with these exterior wall coverings) may require testing anyway. Resorting to the fifth option will limit the number of material and assembly options on a designer's palette. Lastly, the project budget may eliminate the sixth option, since project-specific testing can be very expensive.

The NFPA 285 Test

As mentioned earlier, the NFPA 285 test is conducted on an intermediate-scale mockup. A mockup is an exact fabrication of a proposed assembly. For the NFPA 285 test, the mockup is attached to a test apparatus that consists of a three-walled, two-story structure with an overall height of 15 feet- 8 inches. Each story contains a test room—each having dimensions of 10 feet wide by 10 feet deep by 7 feet high. The apparatus is constructed of steel, concrete, and concrete masonry units. The interior wall and ceiling surfaces of the first story are covered with a layer of Type X gypsum board over ceramic fiber insulation. The floor of the first story is covered by two layers of gypsum board.

The mockup test specimen is constructed on the open face of the test apparatus or on a portable frame that is moved into place and attached to the test apparatus. The size of the mockup is 17 feet-6 inch high by 13 feet-4 inch wide and must include a window opening approximately 30 inches high by 78 inches wide that is centered horizontally in relation to the first story test room's side walls. The sill height of the window opening must be 30 inches. Thermocouples, which are used to measure temperature, are attached to the exterior face of the mockup, the interior of the mockup assembly, and the interior face of the mockup at the locations indicated in the test standard. Thermocouples are also attached to the ceiling of the first-story test room.

The test procedure includes two burners: a fixed gas burner in the center of the first-story test room and a portable gas burner that is placed in the window

opening. The room burner is ignited and must achieve a first-story room temperature of 1,151 deg. F within the first 5 minutes. At that time, the window burner is ignited and both continue to burn for another 25 minutes for a total 30-minute test period and achieving an average first-story room temperature of 1,648 deg. F.

After the test, the mockup is dismantled and visually observed. The assembly fails if flame propagation exceeds the limits indicated in the standard. Flame propagation is determined in three locations of the mockup: the exterior face of the assembly, core components of the assembly, and the areas beyond the first-story test room.

- *Exterior face of assembly:* Flame propagation is determined 1) if the flames reach a height of 10 feet or greater above the window opening, 2) if the flames extend laterally a distance of 5 feet or greater from the centerline of the window opening, or 3) if any of the thermocouples at the roof line record a temperature of 1,000 deg. F or higher.
- *Core components of assembly:* Assemblies with wall coverings greater than ¼ inch thick, or ¼ inch thick or less with no air cavity, cannot have combustible components that exceed 750 deg. F at thermocouples near the assembly perimeter at the second-story test room. Assemblies with wall coverings ¼ inch thick or less and having an air space cannot have temperatures in the air cavity exceeding 1,000 deg. F or in the insulation exceeding 750 deg. F at thermocouples near the assembly perimeter at the second-story test room.
- *Areas beyond the first-story test room:* Flame propagation is determined if flames on the exterior surface extend beyond the side walls of the apparatus or flames occur beyond the intersection of the wall assembly and the side walls of the apparatus. Assemblies with wall coverings greater than ¼ inch thick, or ¼ inch thick or less with no air cavity, cannot have combustible components that exceed 750 deg. F at thermocouples located in line with side walls. Assemblies with wall coverings ¼ inch thick or less and having an air space cannot have temperatures in the air cavity exceeding 1,000 deg. F or in the insulation exceeding 750 deg. F at thermocouples located in line with side walls.

There are two other conditions that will also warrant a failing report for a NFPA 285 test. The first condition is when any thermocouple that is located within 1 inch of the interior wall surface at the second-story test room exceeds 500 deg. F. The second condition is when flames occur in the second-story test room.

The Future of NFPA 285 in the IBC

The 2015 IBC will likely include a reference to the 2012 edition of NFPA 285. There are some changes in the 2012 edition, which include expanded conditions of acceptance that may impact some assemblies previously tested under the 2006 edition.

For water-resistive barriers, the 2015 IBC

will include some changes that will help relax the requirement for NFPA 285 testing for combustible barriers. Based on a public comment during the IBC final action hearings in 2012, Section 1403.5 will add the following three exceptions:

- *Exception 1:* "Walls in which the water-resistive barrier is the only combustible component and the exterior wall has a wall covering of brick, concrete, stone, terra cotta, stucco, or steel with thicknesses in accordance with Table 1405.2."
- *Exception 2:* "Walls in which the water-resistive barrier is the only combustible component and the water-resistive barrier has a Peak Heat Release Rate of less than 150 kW/m², a Total Heat Release of less than 20 MJ/m² and an Effective Heat of Combustion of less than 18 MJ/kg as determined in accordance with ASTM E 1354 and has a flame spread index of 25 or less and a smoke-developed index of 450 or less as determined in accordance with ASTM E 84 or UL 723. The ASTM E 1354 test shall be conducted on specimens at the thickness intended for use, in the horizontal orientation and at an incident radiant heat flux of 50 kW/m²."
- *Exception 3:* "Windows and doors and flashing for windows and doors shall not be considered to be part of a water resistive barrier for purposes of this section."

Unfortunately, the publication of the 2015 IBC is still a couple of years away with many jurisdictions likely not adopting it until a few years after that. However, using Section 104.11 for alternative materials, designs, and methods, a design professional could request a code modification allowing the use of the approved exceptions prior to the publication and adoption of the 2015 IBC.

Unlike assemblies tested by Underwriters Laboratories, which are included in its online certifications directory, the reports for successful NFPA 285-tested assemblies are retained solely by the manufacturer. Therefore, the design professional must seek out tested assemblies through manufacturers without the convenience of a directory of approved assemblies. Hopefully, some form of directory for NFPA 285-tested assemblies will be compiled by a professional, manufacturer, or trade association. With a consolidated directory of NFPA 285-tested assemblies, design professionals could easily select code-compliant exterior wall assemblies, thereby avoiding incidents such as the Monte Carlo fire, which, as it turns out, was not constructed of foam plastic materials tested per UBC Standard 26-4, the applicable standard at the time of its construction. 🔥

Ronald L. Geren, AIA, CSI, CCS, CCCA, SCIP, is an ICC Certified Building Plans Examiner, and is the principal of RLGA Technical Services located in Scottsdale, Arizona, which provides specifications and code consulting services to architects, engineers, owners, and product manufacturers. A 1984 graduate of the University of Arizona, Ron has nearly 30 years of experience with military, public, and private agencies. You can contact Ron Geren at ron@specsandcodes.com.

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#CONSTRUCT

Code Required Testing of Combination Fire and Smoke Dampers

By Larry Felker

Various codes and referenced standards require periodic testing of life safety systems and dampers. There is some confusion among the various applications and codes that requires clarification. Once the damper type and application is identified, a periodic testing schedule can be established that ensures code conformance.

Dampers required by Chapter 7 of the International Building Code (IBC)

Chapter 7 of the IBC¹ regulates fire resistive construction. Fire, smoke, and combination dampers that are required by Chapter 7 are installed in walls, barriers, and partitions. They are meant to resist the passage of flames and smoke particulates.

Most fire dampers have fusible links that generally melt at 165°F (74°C) allowing gravity or a shaft spring to close the damper. Fire dampers are rarely actuated in the Americas although they are regularly actuated in Europe so that they can be automatically tested. See Figure 1.

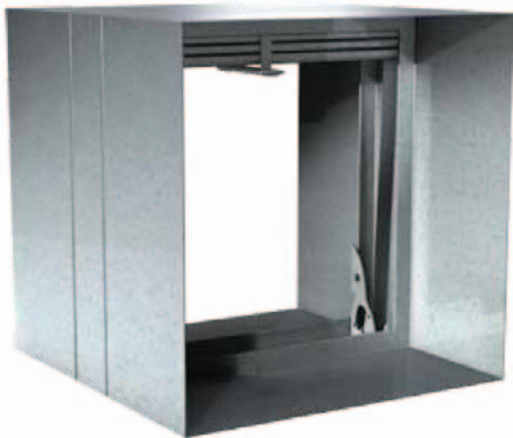


Figure 1 Curtain fire damper (Photo courtesy of Greenheck Fan Corporation.)

A smoke damper is connected to a duct smoke detector, or to a relay from the fire alarm or smoke control panel. In event of a fire and concomitant smoke, an actuator springs closed to close the damper and prevent smoke movement from one area to another. All smoke dampers are actuated since there is no method to physically sense smoke, and electrical control is required.

A combination fire and smoke damper looks very similar to a smoke damper, but has a high temperature sensor to close the damper from heat. Also, some smoke

dampers are aluminum, whereas fire smoke dampers are galvanized or stainless steel only.

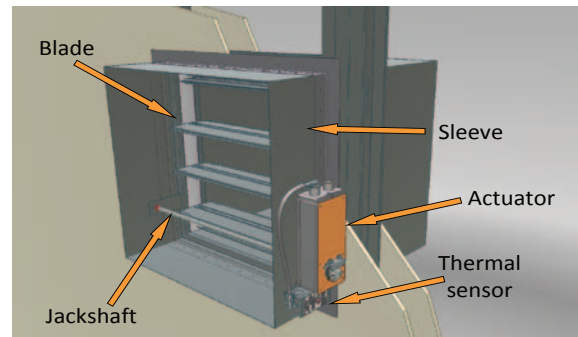


Figure 2 Combination fire and smoke damper (Drawing courtesy of Ruskin Company.)

Combination fire and smoke dampers can be controlled several ways. Most commonly on modern dampers is use of an electrical temperature activated sensor-switch. When the contacts are closed, the actuator is powered and drives the damper open. When fire/heat is detected, the contacts open and the damper shuts. See Figure 2. In addition, a smoke detector or relay contact from the area smoke detection system panel is wired in series with the temperature switch. If smoke is detected, the contact opens and the actuator springs the damper closed. See Figure 3. The smoke detector is installed within 5 ft. of the damper or an area smoke detection system may control the damper's closing.

Though not required in Chapter 7, in order to automatically test these dampers, position indication switches are necessary to ensure a complete cycle is made. These dampers are best referred to as *containment* or *compartmentation* dampers as that is their function. They are often referred to as “passive” protection although they are active in as much as they move to close holes in fire or smoke walls, barriers, and partitions.

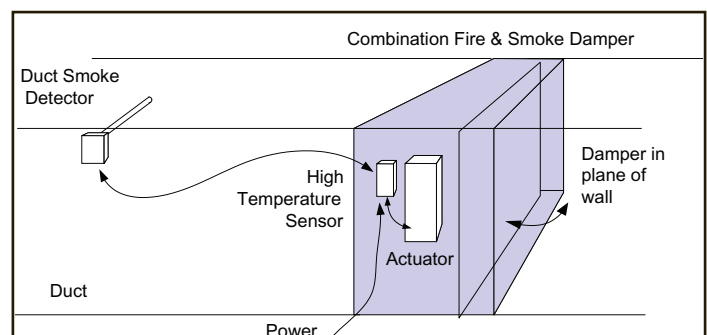


Figure 3 Containment fire and smoke damper with smoke detector

¹ International Building Code, 2012, International Code Council, Inc., Country Club Hills, IL 60478-5795

Dampers required by Chapter 9 of the International Building Code (IBC)

Chapter 9 of the IBC regulates engineered smoke control systems (as well as alarms and sprinklers). In order to remove smoke or prevent the movement of smoke into protected spaces, dampers, fans, architectural reservoirs, and smoke chimneys may be employed. These are considered active systems.

Some of the occupancies where smoke control systems are required are in atria, stairwells, underground buildings, large spaces like malls and auditoriums, and anywhere the smoke will typically gather preventing occupants from exiting easily and quickly.

The dampers employed for smoke control are of the same physical construction as those for containment. However, the control capability of the systems is more sophisticated and requires coordination among alarms, sprinklers, fans, doors, and dampers.

In particular, smoke control dampers are connected to the fire fighters' smoke control system panel for manual override control and position indication and verification. These dampers are sometimes referred to as "re-openable" since they can be manually opened or closed, although they are normally in automatic mode. See Figure 4. Figure 5 shows the controls for override and position indication.



Figure 4 Smoke control system damper with sensors (Photo courtesy of Pottorff.)

The construction of the actuated dampers is the same for Chapter 7 and Chapter 9 with the exception being the containment damper has only a local duct smoke detector (smoke) and in the case of the combination fire and smoke damper, a single high temperature sensor (fire). The detector can be mounted at the factory or field installed. UL555S requires that both the primary sensor and actuator to be factory installed.

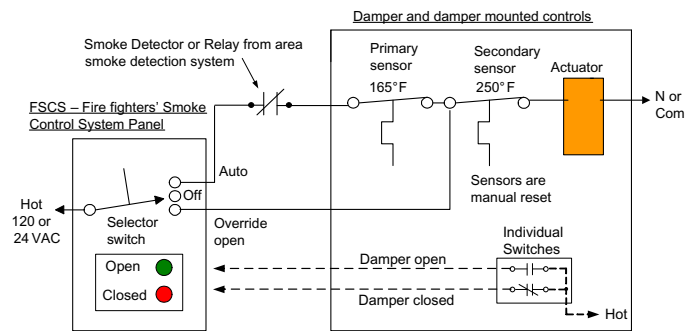


Figure 5 Auto-Off-Manual switch and re-openable damper with sensors and actuator

Testing Requirements

The reason why such careful explanation of the damper types and controls is made above is that the testing requirements for the two types of dampers are different. There is some confusion among the trades and building owners about the two types of applications, and the tendency is to consider all dampers to have the same requirements.

Chapter 7 dampers must be commissioned and tested after installation, and should again be inspected and tested one year later. Experience shows that during construction, and the first year of operation, there is a high probability that changes could occur. Debris could block the closing of the damper, or other interference with the damper's operation could transpire. The damper must be tested every 4 years thereafter except in hospitals where testing must take place every 6 years.

Although all Chapter 9 dampers are used in engineered smoke control systems, there are two types of systems – dedicated and non-dedicated. A dedicated system is used for no other purpose than smoke control. For example, an atrium make-up air damper and atrium smoke exhaust fan damper are not used in day to day operation. A non-dedicated system is used for normal HVAC or ventilation and is operated on a regular basis. If it fails, a service call would be generated and it would require repair.

The smoke control system and its dampers must be tested at commissioning by a special inspector and a report verifying code compliance submitted.

After initial commissioning, dedicated smoke control systems must be tested twice a year. This includes functional tests of all controls (including FSCS panel indication), fans, and dampers as well as doors and any window control. By operating the system, the dampers are tested to the degree that they go to the position needed to remove or stop smoke. However, it is not known that they return to their normal position, and as such needs to be verified separately.

Non-dedicated systems must be tested once a year. The same provisions exist with their dampers – return to normal must be confirmed. So the damper must be tested individually.

Chapter 9 dampers do not fall under the 4 year rule. Chapter 7 dampers do not fall under the annual or semiannual rule.

Curtain and other fusible link fire dampers are not part of the smoke control system except in rare occurrences, although they may help with smoke containment. They almost always fall in the 4 year rule.

Codes and Standards

The various codes do not give all of the periodic testing requirements. Rather, they refer to the NFPA standard that regulates the damper type. This is the same for most other life safety systems and their required testing. The standards become part of the code, and thus law, by reference. These requirements are not all shown in one place.

Damper testing requirements or references can be found in:

- Chapters 9 and 17 of the IBC
- Sections 107 and 909 of the International Fire Code² (IFC)
- NFPA 80³ (fire)
- NFPA 105⁴ (smoke)
- Section 703 of both the IFC and International Mechanical Code⁵ IMC
- NFPA 101 Life Safety Code⁶
- NFPA 90A⁷
- NFPA 92A⁸ and NFPA 92B⁹

When all is said and done, it is the IFC that references NFPA 80 and NFPA 105 and these are the referenced standards that apply to periodic testing of containment dampers. The requirements are:

Each damper shall be tested and inspected one year after installation. (NFPA 105, 6.5.2, NFPA 80 19.4.1)

Each damper shall be tested and inspected every 4 years thereafter, except in hospitals where the frequency shall be every 6 years. (NFPA 105 6.5.2.1 and 2. NFPA 80 19.4.1.1)

A summary of the code required periodic testing is shown in Figure 6. Once analyzed, the requirements are clear. 🔥

² International Fire Code 2012, International Code Council, Inc., Country Club Hills, IL 60478-5795

³ NFPA 80 Standard for Fire Doors and Other Opening Protectives, National Fire Protection Association, NFPA, 1 Batterymarch Park, Quincy, MA 02169-7471

⁴ NFPA 105 Standard for the Installation of Smoke Door Assemblies and Other Opening Protectives, *ibid.*

⁵ International Mechanical Code 2012, International Code Council, Inc., *op.cit.*

⁶ NFPA 101 Life Safety Code, National Fire Protection Association, *op.cit.*

⁷ NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems, *ibid.*

⁸ NFPA 92A Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences, *ibid.*

⁹ NFPA 92B Standard for Smoke Management Systems in Malls, Atria, and Large Spaces, *ibid.*

Chapter 7 “Containment Dampers”

Commissioning
End of first year
Every 4 years except in hospitals every 6 years

Chapter 9 “Smoke Control Dampers”

Dedicated	Non-dedicated
Commissioning	Commissioning
Every 6 months	Every year

Figure 6 Summary of periodic testing requirements

Larry Felker is a mechanical engineer and a fire and smoke product manager for Belimo Americas. He has extensive experience in code related issues and application and repair of fire and smoke dampers. Previously he was VP Engineering for a Chicago controls distributor and was a field electrician and mechanical contractor before that. He is a member of ICC and NFPA and a life member of ASHRAE where he has served on TC1.4 (controls) and TC5.6 (smoke control). He is the co-author of the book *Dampers and Airflow Control*, ASHRAE Special Publications. Larry can be reached at larry.felker@us.belimo.com.



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Industry News

Group B Public Comment Hearings Begin Oct. 2–

The 2013 Group B Public Comment Hearings will open up on Oct. 2 in New Jersey at the Atlantic City Convention Center. For a full schedule, head over to the ICC Code Development website (<http://www.iccsafe.org/cs/codes>). Hearings take place for Fire, Energy, Existing Buildings, Admin, and much more. Tentative completion for the event is planned around Oct. 10. Visit <http://www.iccsafe.org> during the hearings to view the debates live via webcast.



In addition to the Group B Public Hearings, the ICC Conference kicks off on Sept. 29 with Membership Council Meetings. From Sept. 30 – Oct. 2 there are plenty of educational sessions to attend as well. For a schedule of events on the conference, head over to <http://www.iccsafe.org/icc/annual/2013/index>.

ASHE Annual Conference – Thousands of American Society of Healthcare Engineer members made their way to Atlanta for the 50th ASHE Annual Conference. FCIA's Marketing Committee chair Don Murphy and co-chair



Mike Pautsch worked together to plan a great ASHE Convention. Thanks to Randy Bosscawen, Tracy Smith and Gus Mancini for working the booth while Bill McHugh worked with George Mills at The Joint Commission Booth.

IAS Accreditation Meetings – The International Accreditation Services subsidiary of the International Code Council held its Accreditation Committee Meeting in Los



Angeles recently. The most contentious of all Accreditation Criteria was the "Commissioning" Document. The committee conducted an open hearing to hear industry feedback about the program. Visit www.iasonline.org to follow the process.

FCIA at CONSTRUCT2013/CSI & SCIP in Nashville, Tennessee – Sept. 24 – 27 brings this year's CONSTRUCT/CSI show at the Music City Center in Nashville, Tennessee. Registration is still available (<http://www.constructshow.com>). The keynote speaker at this



year's CONSTRUCT is Ira Blumenthal, the president of CO-OPPORTUNITIES, Inc. FCIA will be at CONSTRUCT this year at booth #348. Stop by to learn more about the organization's efforts to build industry for effective compartmentation!

FCIA Speaks at SCIP - FCIA speaks to the Specifications Consultants in Independent Practice (SCIP) Conference again, the first time since 2004. When we presented in 2000-2004, FCIA was just introducing the FM 4991 and UL Qualified Firestop Contractor Programs as well as ASTM E 2174, ASTM E 2393 Special Inspection Standards. We received great feedback from this group which has always been valuable to the industry. We look forward to presenting more info about International Accreditation Services' IAS AC 291 Accreditation of Special Inspection Agency companies at this SCIP program.

FCIA Speaks at Leading Age – Leading Age is the association of not-for-profit long-term care facilities. FCIA's executive director Bill McHugh spoke at its summer education session recently about the very technical firestop industry protocol, "SYSTEMS" selection and analysis. Great

questions resulted about how to treat older existing facilities. It seems regulators are going to expect "firestop systems" in older structures similar to new construction.



FCIA FIC Speakers Announced – Expect a great program at this year's Firestop Industry Conference and Trade Show (FIC), with speakers like George Mills of the Joint Commission; ASHE's code leader Jon Flannery; Peter Whiteman, the Canadian Healthcare Engineering Society (CHES) president; UL's Engineer for Fire Resistance Luke Woods and FCIA Code Consultant Bill Koffel of Koffel Associates. The healthcare focus at this year's FIC will certainly warrant a lot of attention. Check out the article about the conference in this issue of *Life Safety Digest*. Registration is now open at <http://www.fcia.org/articles/events.htm>.

FM and UL Firestop Exams on Nov 5 in Albuquerque, New Mexico – The FM 4991 Approved

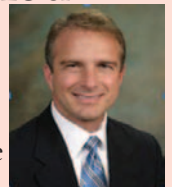
Contractor as well as the UL/ULC Qualified Contractor Programs as well as IAS AC 291 Accreditation of Special Inspection Agencies continue to grow in demand. The FM, UL/ULC Firestop Examinations used for all three programs take place at this year's FCIA Firestop Industry Conference and Trade Show on Nov. 5 in Albuquerque, New Mexico. There is still time to register! Contact Evie Caprel (evie@fcia.org) or call the FCIA office at +1 (708) 202-1108 for complete info.



As a service to Specifiers with Design Firms, Authorities Having Jurisdiction (AHJs), FCIA offers a FREE PDF Firestop Manual of Practice so they may learn the industry in depth. UL also offers its examination for free to AHJs. Are you an AHJ? Check out www.fcia.org for ordering information or contact chris@fcia.org.

Dominic Sims Announced as New CEO of International Code Council – The ICC

announced Dominic Sims as its new CEO in late July. A graduate of Palm Beach Atlantic University, Dominic has been part of ICC for many years as a building code official and recently as acting CEO. He will lead the Code Council and management team as the ICC works globally for safer buildings.



Expected Increase in Healthcare Construction Spending – The AIA (American Institute of Architects) is anticipating a bigger and brighter 2014. The healthcare industry is set to grow by 7.7% in 2014. According to the forecast, all aspects of construction are set to increase as well. For more information and detailed articles, visit the www.AIA.org.

International Symposiums for FCIA Members – With over 25%, international FCIA members make up a great deal of the organization. The planning process is still underway for 2014. However, another FCIA event in the Middle East is being set tentatively over the next eight months. Stay tuned to www.FCIA.org for more information.



2013 ICC Excellence in Fire & Life Safety Award to Sean DeCrane – Sean DeCrane, a Cleveland Battalion Chief, was awarded the ICC Excellence in Fire & Life Safety



Award. This award, sponsored by the International Code Council (ICC) and the International Association of Fire Chiefs (IAFC), helps recognize individuals who have devoted their lives to keeping the lives and property of others safe. Sean has been a friend to the firestopping industry for many years. Congrats on a well-deserved award from ICC and IAFC.

ICC Building Valuation Data (BVD) Released– The second half of 2013 saw the release of ICC's BVD. The table provides average construction costs, and offers the BVD as a resource to its members. Head over to <http://www.iccsafe.org/cs/pages/bvd> to access the most recent release.

ICC Announces the "Design and Construction Week" – ICC announced the first-ever "Design and Construction Week" being held in Las Vegas, Nevada from Feb. 4-6, 2014. This event will revolve around residential construction and will educate participants about safety, product evaluations, and more.

FCIA Elections Starting Soon – FCIA will be electing new members to its Board of Directors at its Firestop Industry Conference and Trade Show. Contractor voting members will cast their ballots for directors of the 2014 Board. If interested in membership to the FCIA, contact Evie Caprel at +1 (708) 202-1108 or evie@fcia.org.



NFPA Making Push to Educate Children on Fire Safety – The NFPA has released a free fire safety app and eBook for kids. By publically educating youth early and often, the hope of this program is to install a sense of life safety responsibility in generations to come. Teachers and firefighters can use this new tool in their classrooms. Visit www.sparkyschoolhouse.org for more information.



Shayne Mintz Announced as New Canadian Regional Director for NFPA – Shayne Mintz has been added as the regional director for Canada at the NFPA.



Mintz has worked as a fire chief for cities in southern Ontario, and was the assistant deputy fire marshal for the Office of the Ontario Fire Marshal in charge of fire protection services. Mintz brings over 35 years of experience and will support research and education to further the life safety mission.

Peak Season for Fires in College Housing – Following the most recent issue of Life Safety Digest focusing on educational buildings, it is important to note that the NFPA has found the months when students return to campus are also the ones when students are most at risk for fires. NFPA has compiled a list of safety tips for college students to keep in mind with information and resources set up at www.nfpa.org/campusafety. 🔥

Barrier Management Symposium a Success – TJC & ASHE, FCIA & UL Announce Barrier Management Symposium – FCIA teamed up with The Joint Commission (TJC), the American Society for Healthcare Engineering (ASHE) and Underwriters Laboratories (UL) to bring the first of many planned Barrier Management Symposiums to the Colorado Association of Healthcare Engineers and Directors, an ASHE chapter. With over 150 facility management professionals in attendance in Steamboat Springs, Colorado, educational content was aimed at the healthcare facility engineer and staff with industry leading speakers covering the design/testing, installation, inspection and maintenance of the barrier:

- Fire and Smoke Barriers
 - Definitions in ICC's IBC and NFPA 101 – Bill Koffel, Koffel Associates, representing FCIA
- Gypsum or Concrete Block Walls – Bob Grupe, Gypsum Consulting and Bruce Otten, Best Block, representing National Concrete Masonry Association
- Fire & Smoke Dampers – Marc Sorge, Greenheck
- Fire Rated Glazing – Zach Passman, TGP
- Fire Doors for Fire and Smoke Applications – Keith Pardoe, Door and Hardware Institute
- Firestop Systems for Fire and Smoke applications – Bill McHugh, FCIA
- Managing the Barrier for the Life Cycle of the Building – Bill McHugh, FCIA and George Mills, The Joint Commission
- Tested and Listed Systems of Classified Products - Rich Walke, UL Regulatory Services

Each of these components is an important aspect of the Life Safety Plan in healthcare structures where evacuation of occupants is horizontal moving behind smoke barriers.

Why a Barrier Management Symposium? Barriers and those items that cause holes, specifically penetrations and doors, have been mentioned by TJC the last three years running at ASHE's Annual Conference in the top 10 violations. FCIA partnered with the healthcare leaders to educate about the importance of building right the first time and the keys to success for ASHE member facility engineers and Authorities Having Jurisdiction involved in the process.

TJC's George Mills opened and closed the Barrier Management Symposium stating, "Barriers are a SYSTEM of very detailed products that must be installed to the UL or other test laboratory designs. You heard the word SYSTEMS throughout the symposium because that's the focus of this fire-resistance and smoke-resistant SYSTEMS discipline. As healthcare professionals, if we maintain the barriers well, we will accomplish our goal of creating a safe environment for the patients."



Pardoe, McHugh, Walke, Sorge, Grupe, Mills, Passman, McCarty
The Barrier Management Team Thanks CAHED President Jerry McCarty and Donna Howard for hosting the event



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Code Corner

FCIA Involved in Code Development- The efforts of the FCIA in the code arena are more crucial than ever. FCIA and FCIA's code consultant Bill Koffel, Koffel Associates, submitted four public comments refining effective compartmentation, and gained wide support prior to submission. FCIA is working hard to have compartmentation recognized as a vital part of life safety in buildings through the value it brings to fire and life safety.

FCIA Works With ASHE on Code Proposals- FCIA's president and code co-chair Tracy Smith, FCIA code consultant Bill Koffel and Bill McHugh met with ASHE advocacy leader Jon Flannery about public comments for the International Fire Code hearings coming up in October. It seemed that each group, FCIA and ASHE, are after the same thing...a fire and smoke safe facility for patients. Initial comments from the Code Technology Committee on several public comments are supportive for one of the proposals. FCIA will provide more information as we learn it in October.

Committee Evaluating Comments on ICC-500 on Sept. 24 – The ICC Consensus Committee on Storm Shelters will meet on Sept. 24 via teleconference. On the docket are revisions to the ICC 500-2008, and public comments on the first Public Comments Draft for the development of ICC 500-2013. Contact David Bowman (dbowman@iccsafe.org) for the required dial-in information if you plan on participating.



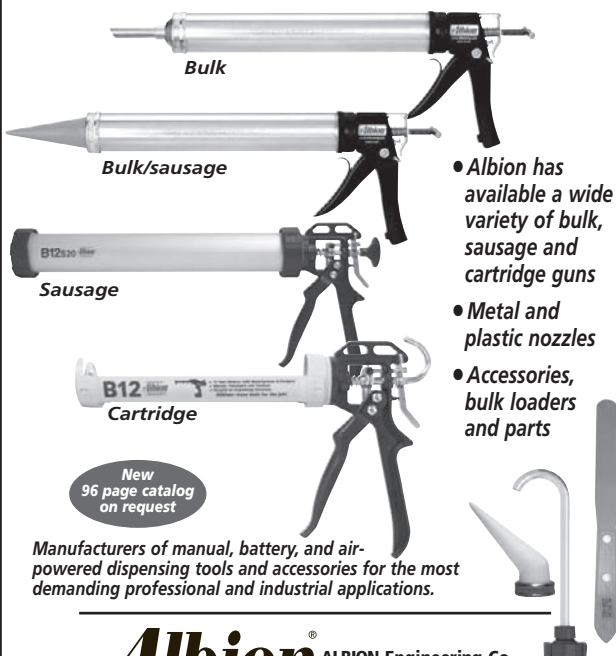
NFPA 70: National Electrical Code 2014 Available in Oct.

4 - The NFPA will be releasing the 2014 NEC Code Book on Oct. 4. Some major NEC revisions have been made. For more information visit the NFPA website at www.NFPA.org.



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Life Safety Digest Summer 2013 Industry Calendar

Sept. 25 to 27

CONSTRUCT2013 and CSI Convention, Nashville, TN (FCIA @ Booth #348)
www.csinet.org

Oct. 27 to Nov. 1

Society of Fire Protection Engineers Annual Meeting, Austin, TX
www.sfpe.org

Sept. 29 to Oct. 2

ICC Annual Conference & Expo, Atlantic City, NJ
www.iccsafe.org

Nov. 5 to 8

FCIA Firestop Industry Conference and Trade Show, Albuquerque, NM
www.FCIA.org

Oct. 3 to 5

Insulation Contractors Association of America Convention, Tucson, AZ
www.insulate.org

Dec 4 to 6

Construct Canada, Toronto
www.constructcanada.com

Oct. 2 to 9

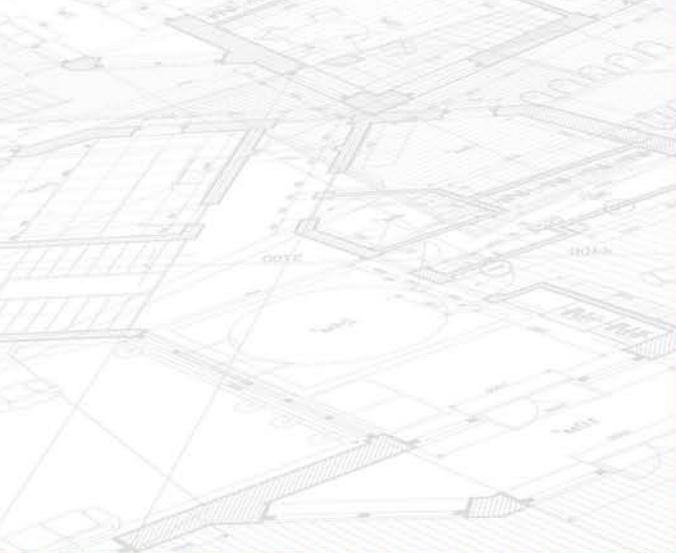
ICC Group B Final Action Hearings, Atlantic City, NJ
www.iccsafe.org

Dec. 9 to 12

ASTM E05 Meetings, Jacksonville, FL
www.astm.org

Oct. 20 to 23

ASTM E06 Meetings, Jacksonville, FL
www.astm.org



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