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Campus Fire Safety e-NewZone Monthly Newsletter ... July 2014, Volume 4, Issue 7

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Campus Fire Forum 2014 - Keynote Speaker

We are pleased to introduce our Keynote Speaker, Jenn Abelson, Investigative Reporter for The Boston Globe's Spotlight Team.

Jenn will discuss Shadow Campus ... a nine-month investigation by The Boston Globe's Spotlight Team, that exposed how a collision of greed, neglect, and mismanagement is endangering young people in America's college capital.

[Learn more about Jenn and other presentors](#)

CENTER ACTIVITIES

Reminder Election Notices ... **Deadline to submit your information is August 1, 2014.**

Would you like to be considered for a position on The Center's Board of Directors? Please see the notification that was sent to all members earlier this month. Candidate profiles & platforms & balloting instructions will be published in next month's issxue of this newsletter. **NOTIFICATION & INSTRUCTIONS**

From The President

Should I become a Member of The Center? ... Yes!

Given the number of responsibilities that we are all juggling on a daily basis, joining a professional organization may not be one of your top priorities. After all, who among us has time for more meetings and activities? But such thinking can cause you to miss out on the numerous benefits that membership in a professional association like The Center offers. Membership has incredible benefits for ambitious career-oriented safety professionals in a variety of ways ... **MORE**

About The Center for Campus Fire Safety

The Center is the Voice of over 4000 colleges and universities. As a nationwide non-profit, membership based, organization devoted to reducing the loss of life from fire at our nation's campuses, we offer an abundance of free resources to help fire and life safety officials working on college campuses and fire departments with responsibility for a college campus/university.

Leadership|Committees|Sponsors|Advisory Council|Members

Welcome to all of our New Center Members (month to date)

Our Off Campus Fire & Life Safety Alliance is growing. If you are a member and did NOT receive your invitation to join, contact: supportteam@campusfiresafety.org or [click to learn more](#)



The Inspector, by Phil Chandler

The Cop on the Beat!

As most of us are now knee-deep in preparations for welcoming students back to the campus, it should go without saying that one of the most important items on our agenda is preparing our residential assistants for the key role they play in assuring a fire-safe environment. RA's are the real front line of all of our efforts to keep students safe. As a cop on the beat, the RA sets the boundaries on the street between behavior that is acceptable and that which is not, what constitutes a fire hazard and what does not. At the end of the day ... **MORE**



Off-Campus, by Tim Knisely

False or Unwanted Alarms Part 3: Apathy among users and tenants

How do we overcome apathy with fire alarms? This could be the tenant or occupant ignoring an alarm thinking it is "just another false alarm". Or, a property manager or maintenance worker that silences or resets an alarm prior to investigating the cause. It could also be the alarm technician that fails to verify if the system is on "test" prior to testing, carelessly causing an unwanted interruption to the tenants as well as a response by the fire department ... **MORE**



Training Opps



Fire Smart Campus Training ... (Formerly FireWise Campus) ...

Fire Smart Campus Training is available! The Center instructor(s) will come to your campus or town. Price varies depending upon location.

Contact us for info.

Save the Date

NEW WEBINAR TRAINING SERIES

Code Requirements for Door Openings

Wednesday 9/17, 9/24, 10/1 and 10/8 (11AM - 12:30 PM EST)

The Center for Campus Fire Safety will be hosting a webinar with Lori Greene, Manager of Codes & Resources, Allegion. This 4-session webinar based on: International Building Code (IBC), NFPA 101 – The Life Safety Code, NFPA 80 – Standard for Fire Doors and Other Opening Protectives, ICC A117.1 – Standard for Accessible and Usable Buildings and Facilities. Registration will be posted on campusfiresafety.org soon and you will be notified!

Current Schedule | Download Archived Webinar Presentations (Free to all)

Crowd Manager Training ...

2 hour on line course @ \$19.95 ... Presented by ICC, NAFSM & CCFS, this course provides valid, credible training to those charged with crowd management at facilities including higher education. This meshes with The Center's mission of providing resources to our community. **MORE**



Codes, Standards & More



High-Rise Building Fire Safety on College Campuses by **Kristin Bigda, P.E., Senior Fire Protection Engineer, NFPA's Building Fire Protection and Life Safety Division.**

High-rise buildings present a unique set of challenges with regards to occupant and fire fighter safety, and high-rise buildings on college campuses are no different. Buildings on college campuses range in uses from classrooms, offices, laboratories, assembly, and residential (dormitories). Many of these uses are often located in building that ... **MORE**



909.9 Design Fire
IFC 2012

909.9 Design fire. The design fire shall be based on a rational analysis performed by the registered design professional and approved by the fire code official. The design fire shall be based on the analysis in accordance with Section 909.4 and this section... **MORE**



MEMBER NEWS, MAJOR FIRE LOSS, FIRE INCIDENT NEWS & MASS

NOTIFICATION INFO

FIRE NEWS

Food left on stove sparks Xavier dorm fire ... [MORE](#)

Building Fire at Temple University ... [MORE](#)

U. of U. lab fire quickly doused by Salt Lake City crews ... [MORE](#)

12-year-old charged in campus fires - Champaign/Urbana ... [MORE](#)

Fire Equipment Manufacturers' Association Selects Cleveland Division of Fire Battalion Chief for Fire and Life Safety Advocate of the Year (from Fire Engineering Magazine) ... [MORE](#)

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➔ MORE NEWS STORIES Hundreds of related stories + ability to search through years of our news archives.

MEMBER NEWS

Member News:

SimplexGrinnell

Tyco SimplexGrinnell Receives Dual Industry Awards for Overall Customer Satisfaction and Outstanding Use of Customer Feedback ... [MORE](#)



NEMA Library ... Life Safety Systems Guides and Manuals Fire Detection, Alerting and Signaling Ideal for Designers, Installers, Code Officials, Owners and Users of Fire and Life Safety Systems ... [MORE](#)

MASS NOTIFICATION TECHNOLOGY

North Orange County Community College District Selects Regroup ... [MORE](#)

Hoffner,Thorp receive Campus Leader Who Cares Award... [MORE](#)

3 Keys to Successful Notification Initiatives - Emergency Management ... [MORE](#)

Security 2014: Siemens Building Technologies to Present Latest ... [MORE](#)

➔ More MNS News and Articles

Job Opp: None submitted this month

➔ Submit Member News or Job Opps



Fire Fatality Statistics

The Center for Campus Fire Safety provides basic information about fire fatalities that occurred on a university or college campus, or that occurred within the town where the campus is located.

➔ Fatalities Defined | Fatality Statistics



Center Resources & Activities

(... more coming soon!)

- **Library** ... best practices, white papers, technology, codes,++
- **Data Collection** ... help us collect fire incident data here!
- **Membership** ... become a member or visit our member website!
- **Shopping** ... DVD's, Logo items + more. Members login for discounts!

➔ All Center Activities



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... (Shawn & Al)

Thanks to our Annual Sponsors for their support and dedication to campus fire and life safety.

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survivors, are lifetime members of The Center for Campus Fire Safety and have been with us for several years now. Many of you have met them at our annual Forum(s). Learn more about their experience and their willingness to speak at your campus.



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IN CASE OF FIRE

EXIT BUILDING BEFORE TWEETING ABOUT IT

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Member to Member Communications

Dear Member:

The election of the following Board positions will be held prior to the Annual Business Meeting of The Center for Campus Fire Safety which is scheduled for Thursday, November 13, 2014 in conjunction with Campus Fire Forum 2014 in Orlando, Florida.

Director (2 positions), each for a three year term.

Members who desire to be candidates and are qualified in accordance with Article III, Section 2 of the constitution, shall submit their name, office being sought, a profile of their qualifications, and their platform (not to exceed 500 words):

In writing by August 1, 2014 either by mail or email to:

Mail:

The Center for Campus Fire Safety
c/o Elections Committee
10 State Street
Newburyport, MA 01950,

EMail:

Jeff Pendley, Elections Committee Chair at: jpendley@campusfiresafety.org

Candidate profiles and platforms, and balloting procedures and instructions, will be published in the August 2014 issue of Campus Fire Safety e-Newzone and will be available on The Center's website in the member section.

We encourage members to participate in this opportunity to become part of The Center's leadership team.

Jeff Pendley
The Center for Campus Fire Safety
Elections Committee Chairman



The Center for Campus Fire Safety
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FROM THE PRESIDENT

By Paul D. Martin

July 2014

Should I become a Member of The Center?

Yes! Given the number of responsibilities that we are all juggling on a daily basis, joining a professional organization may not be one of your top priorities. After all, who among us has time for more meetings and activities? But such thinking can cause you to miss out on the numerous benefits that membership in a professional association like The Center offers.

Membership has incredible benefits for ambitious career-oriented safety professionals in a variety of ways. Professional organizations allow for a congregation of intelligent, like-minded professionals that are immersed in the inner workings of their industry to gather and provide participants with access to a variety of opinions and ideas.

Membership exposes you to new opportunities and people that could help you now and in the future. And in the process, you reap the benefits of: increased credibility, broadened knowledge, potential career opportunities, and last but certainly not least, lifelong friendships. It affords you an extensively developed network in which to meet people from other organizations that face similar challenges and who may be able to provide insights into solutions that have worked for them. You can also interact in other ways such as serving on committees and special task groups. These interactions can lead to a sense of accomplishment in changing the status quo, job offers, training, and more. Belonging to a group also increases the odds that you'll learn something you may need to know someday

or meet a person you can help or that will help you. You'll forge lasting ties with others who have common professional interests and similar business concerns. These relationships will be a rich, ongoing source of inspiration and ideas. And don't overlook the chances to take a prominent leadership role. ☺

The Center also has membership groups where you can post questions and our website has a "members-only" section that provide access to exclusive online resources, a variety of documents and message boards, as well as list-serv subscriptions so that you can be notified via e-mail about upcoming events and special activities that may not be open to the general public. Some feature content on a variety of topics, such as lesson plans, advancing your career or boosting your technology expertise. I must also mention the publication of The Center that is available. While reading publications such as Campus Firesafety e-Newzone, certainly gives you an advantage in your career, being a member allows you another place to publish your own works as well, which can have impacts far and wide within the life of your professional career.

In previous columns I have written about the benefit of attending Campus Fire Forum, but I'll mention again here, this conference can be one of the best ways to improve your technical career, hands down. That's because the conference is well organized, topically relevant and seamlessly executed. And when you attend with the proper preparation and intention



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of making it effective - while leveraging your Member discount - the conference can be worth joining the association all by itself.

But the education opportunities for members is not restricted to Campus Fire Forum, The Center offers our members the chance to update their knowledge of business and trade basics or acquire new skills through seminars, workshops, and webinars. Typical subject matter can run the gamut from focusing on specific code requirements to emerging technology and proven fire safety training programs.

As the old saying goes, "No man is an island." People do not thrive when they are isolated from colleagues. Regular interaction leads to learning, personal growth and career progression. The following career concerns can often be resolved through association membership:

Stuck in Limbo: Is your career making little or no progress? Interacting with others in your profession could be the answer. You can make connections through Center functions that could lead to a better position with a different entity.

No One to Ask: If you are a part of a small department at your workplace, or lost among the faces of a large office, there may be times when you would like to know the opinion of others in your position. Your employer and the public look to you as an expert in your field ... but there are times when even an expert can use some good

advice. The Center offers you a place where members can ask each other questions or discuss various important topics.

Reinventing the Wheel: Are you ever frustrated with ineffective or convoluted processes in your workplace? With time and patience, you might come up with an easier way - but why reinvent the wheel? By talking with peers from The Center, you can learn about solutions that others in our business have already discovered. The Center can provide educational opportunities to help you with difficulties in your workplace. You can also find answers simply by talking with other members at Center functions.

Is Anybody Out There?: Are there aspects of your job or the campus fire safety field in general that you wish you could change? If so, joining The Center can give you a forum for changing those unfavorable aspects. You may find that many others feel the same way as you, and when you unite and collaborate with them, your combined voices can make a difference.

The advantage of being a member is not a one-way street as The Center gains too through your membership. Because it is the collective wisdom, experience, dedication and passion of all of us that makes the organization fundamentally great. However, I will not deny there is also strength in numbers. The greater the number of members, the more influence the association will have. You may be just one person, but combining your membership with others leads to a bigger,



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stronger and more successful organization. Henry Ford said, “Coming together is a beginning; keeping together is progress; working together is success.”

Most of us can say easily that without the support of our peers and the professional organizations to which we belong, we would not be nearly as successful with our programs. I know I wouldn't be.

Enjoy the rest of your summer and I look forward to seeing you in Orlando.

Paul

Paul Martin, President

Paul D. Martin is Chief of Inspections and Investigations for the New York State Office of Fire Prevention and Control where he served as a principle architect of New York State's nationally acclaimed Campus Fire Safety Program.

Under Paul's leadership, the staff of the Inspections and Investigations Branch is responsible for: fire and life safety inspections in a very diverse collection of facilities throughout New York State, including all colleges and universities; performing fire investigations statewide of fatal, large loss or other significant fires; providing fire safety education and information dissemination intended to elevate the public's understanding of the danger of fire; and enforcement of the laws and regulations of the state regarding fire safety, including the world's first standard for reduce ignition propensity cigarettes.

Paul is active in the National Association of State Fire Marshals, where he serves as Vice-Chair of their Model Codes Committee and works on issues associated with fire and life safety for special needs occupancies. Additionally, he serves as co-chair of Prevention, Advocacy, Resource and Data Exchange (PARADE), a program of the United States Fire Administration designed to foster the exchange of fire-related prevention/ protection information and resources among Federal, State, and local levels of government.

He serves on the International Building Code - Means of Egress Committee for the International Code Council, where he is active in the development of the Codes promulgated under the auspices of the ICC. Additionally he is a principle member of the NFPA technical committee currently drafting a new standard on Fire Prevention Unit Organization and Deployment.

Paul holds an associate degree in fire science, a bachelor of science in public administration and has an extensive portfolio of professional development education. During his fire service career spanning more than thirty years, Paul has served in multiple line and administration positions and has received several awards of valor, including the 2000 Firehouse Magazine® national grand prize for heroism.



THE INSPECTOR

By Phil Chandler

July 2014

As most of us are now knee-deep in preparations for welcoming students back to the campus, it should go without saying that one of the most important items on our agenda is preparing our residential assistants for the key role they play in assuring a fire-safe environment. RA's are the real front line of all of our efforts to keep students safe. As a cop on the beat, the RA sets the boundaries on the street between behavior that is acceptable and that which is not, what constitutes a fire hazard and what does not. At the end of the day, peer influence trumps all else.

As I prepare to engage with many young residential professionals this summer, I am always looking for new important lessons to impart and fresh ways to deliver them. This year, I am guided by a personal experience I had not long ago while presenting material at a corporate

fire safety symposium, sharing the podium with other fire safety professionals. As is always the case, I get as much as I give at such events. This case is no exception. I was blown away by the message and delivery of another presenter—a towering FDNY veteran firefighter (yes a truckie for those who are wondering), with a towering stage persona.

While all the rest of us fiddled with our thumb drives before our presentation and tinkered with the audio visual equipment—all so distracting to the audience and presenter alike, the seasoned captain simply stepped in front of the crowd, sans podium, sans microphone, and without the aid of a stinkin' PowerPoint. Imagine that! All he had was a booming voice, confidence born of conviction, years of experience and a relocatable power tap dangling from his hand.

“Everything you need to know today about preventing fires is right heah!” He had my attention and that of everyone else in the room.

“Forget about all of your statistics—these dollar store power taps are our #1 enemy. The worst fires I have seen were caused by overloading these cheap knock-offs and the extension cords they are often plugged into. Electric heaters, microwaves, you name it, all going at the same time, is a fire waiting to happen. And if that's not bad enough, they usually buried under mountains of laundry and run under the rug, from one room to another. You wanna stop deadly fires—of course you do—that's why we're all heah—get the word out. Respect electricity!”

Of course we all know that on the campus, cooking, candles, smoking and plain old criminal mischief take their toll. But electrical fires are



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increasingly with us and often do more damage than other fires. Yet we still do not give electrical hazards the attention they deserve. Yes, we are constantly collecting extension cords and cube taps, replacing them with power taps. But are we making things better? In most cases, probably not!

The International Fire Code permits the use of relocatable power taps in situations where there are not enough outlets, but does so with two important caveats. They need to be listed in accordance with UL 1363 and they need to be equipped with overcurrent protection. The second requirement is the elephant in the room! UL 1363 does not require overcurrent protection. The vast majority of RPT's that I encounter, even the ones that bear the UL label, do not have overcurrent protection. Having a lighted switch is no indication of overcurrent protection.

Nor does surge suppression equal overcurrent protection. Who knew?

So what we often do and encourage RA's to do, is confiscate a heavy-duty, US made extension cord, UL listed, with 14/2

overload. I must admit, for years I would walk right by the hundreds of RPT's encountered each day of inspections. Rarely would I stop, get down on my hands and knees and turn the darn thing over and read the label. Mea culpa!



conductors and replace it with a \$5.00 dollar plastic device of questionable provenance. It may possibly be a legitimately listed device, although counterfeits are common, but more than likely it is not protected against

Moreover, RPT's encountered are often overloaded. Adding up the



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wattage used by the myriad appliances plugged into the strips (volts X amps = watts) will at times amount to two, three and even four thousand watts; the typical RPT is rated for 1800 watts. What we have everywhere on the campus are ticking time bombs!

Consider the time-honored adage: You get what you pay for. Do we really want to rely on a dollar store device, even in the unlikely case that it has overcurrent protection, to prevent a fire from ensuing in the case of a serious overload? How many times have we picked up a RPT that was too hot to handle, seriously discolored, yet still passing current? We need to take a closer look and encourage others, including RA's, to do so also.

RPT's were designed to operate computer peripheral devices and

workbench tools (operated one at a time), not electric heaters, portable grills, microwaves and an array of new fangled coffee makers operating simultaneously. Yet everywhere on campus, faculty lounges, staff break rooms and scariest of all, dorm rooms, we trust our lives and fortunes to a piece of plastic.

Let us not forget that most of the campus circuits are protected by 20 amp breakers in panels often quite remote from the receptacles. By the time the breaker gets around to tripping, the RPT and the combustibles that usually surround them may already be on fire. Unfortunately this scenario has repeated itself in recent months more than I can remember in past years. A word to the wise is sufficient.

Bottom line: We need to put electrical hazards, not

just dangerous RPT's, at the center of our radar screens and at the center of our fire safety training. Electrical hazards present an ever-increasing threat to our campus communities and we need to educate our residential assistants, along with all other stakeholders, on all of the particulars. And while I'm on the soapbox, ditch those PowerPoint presentations, especially when before students; they, like the rest of us are also in PowerPoint overload status. Get out there and speak from the heart.

Postscript: *We mourn the passing of Lieutenant Gordon Ambelas, FDNY, who perished fighting a fire July 6, 2014, caused by a damaged electrical cord.*

Philip Chandler is a long time firefighter and a fulltime government fire marshal working extensively in the college environment - from large



THE INSPECTOR

By Phil Chandler

July 2014

public university centers to small private colleges.

His primary responsibilities include code enforcement and education. Phil welcomes your comments, thoughts and opinions (whether in agreement or opposition) to his viewpoints. He may be reached at: <mailto:theinspector@campusfiresafety.org>

Ask the Inspector

Now Members can log onto the Member Website and have an online discussion with “The Inspector”.

Simply visit the [MEMBER LOGIN](#) section of our public website. Once logged in, look for the Town Hall Discussions and ask “The Inspector”.

Note: The viewpoints expressed in The Inspector are those of the author alone. They are offered to initiate thought and debate, however, they do not necessarily represent the views or opinions of The Center for Campus Fire Safety, its officers, directors or its editorial staff.



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OFF-CAMPUS

By Tim Knisely

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False or Unwanted

Alarms Part 3: Apathy among users and tenants

How do we overcome apathy with fire alarms? This could be the tenant or occupant ignoring an alarm thinking it is “just another false alarm”. Or, a property manager or maintenance worker that silences or resets an alarm prior to investigating the cause. It could also be the alarm technician that fails to verify if the system is on “test” prior to testing, carelessly causing an unwanted interruption to the tenants as well as a response by the fire department. There are many other examples, but some can and have had unintended consequences.

If a system is not operating properly or sounds frequently for unknown reasons it must be properly evaluated to identify why. Too often, we see these systems just reset and in some cases turned off to “solve” the immediate problem of the blaring horns. Other times some of the required elements are replaced with a different

type of device to make the problem go away. This may take care of the immediate problem, but what happens when a fire occurs?

In 2011 a freshmen student was killed while staying over at a friend’s off-campus apartment. At the time of the early morning fire not only was the sole apartment smoke alarm recently disabled by a tenant, but the building fire alarm was turned off at the breaker - in a padlocked closet. Tenants trying to escape through the smoke filled stairways reportedly pulled the fire alarms, but nothing happened. The fire had already grown undetected due to the inoperable smoke alarm, now the next level of notification has also been defeated. The cause of the fire was never determined, but was ruled as accidental according to media reports. This is what happens when untrained and uninformed people make poor decisions, especially for the building rep to turn off the alarm at the breaker. It will never be known if either of the alarms functioning properly would have had

an impact on the outcome of this fire, but I’m sure the family would have liked her to have the chance.

Upgrades to Existing Systems:

When called to make upgrades to an existing system or to replace an aging system it is helpful for the designer to understand the original intent or purpose of that system. This is also important when providing ITM and understanding why some components may be missing. Were there components designed in initially to address student housing issues? Were components eliminated legally through the building code or local requirements? Was the system oversized for a specific purpose? Always take the extra effort to determine these answers before proposing a design, and always obtain approval from the AHJ before modifying an existing system or installing new. Asking a few of these questions may help the situation make more sense and give you some idea on how to proceed. Take a few extra minutes to discuss the system with building



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By Tim Knisely

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staff to make sure they understand how the system operates and the proper method of investigating and resetting the activations.

Education and Response:

When students live on-campus there are rules regarding response to alarms. Quite simply, if the alarm sounds you must evacuate. Period! One of the benefits to living off-campus is that there aren't any rules, right? But, how do we reach the students and let them know that they should always evacuate when the alarm sounds? Work with the fire department or local AHJ to identify any educational materials that may be available. This includes general fire safety or "Cooking 101" info, as well as details about the alarm systems. Or, you can custom design these to identify special features for each of your buildings. If we have installed a common sense system or made improvements to an existing system the unwanted responses should be limited. Management must respond promptly to all alarm activations and identify

what caused the alarm, not just silence and reset. Keep records of the activations and the location of the devices so these events may be tracked easier. Also utilize the tenant's experiences - what do they remember when the alarm sounded, what did they see or hear?

Putting all of these efforts together will help to reduce the unwanted response and increase the likelihood that the systems will operate as designed and the tenants will evacuate when the alarm sounds, and not treat this as "just another false alarm."

Tim Knisely

Tim Knisely is on the Board of Directors for The Center and the Senior Fire Inspector for the Centre Region Code Administration in State College, PA. In this position he manages the Existing Structures Division that administers the fire and property maintenance code in all existing commercial and

residential rental properties, and coordinates the life safety education for the community including off-campus and Greek housing.

Tim has been active with The Center for Campus Fire Safety since its inception and served as treasurer from 2007 to 2010.

He is a frequent presenter at Campus Fire Forum, an instructor for the Fire-Wise Campus program and served as project manager for Campus Fire Data.



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CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

High-Rise Building Fire Safety on College Campuses*

High-rise buildings present a unique set of challenges with regards to occupant and fire fighter safety, and high-rise buildings on college campuses are no different.

Buildings on college campuses range in uses from classrooms, offices, laboratories, assembly, and residential (dormitories). Many of these uses are often located in building that is classified as high-rise. The National Fire Protection Association defines a high-rise building as a “building where the floor of an occupiable story is greater than 75 ft (23 m) above the lowest level of fire department vehicle access.”

Some of those challenges associated with high-rise buildings include large numbers of occupants to evacuate, long evacuation times and extended distances to travel to get to the outside. In addition, firefighting strategies for high-rise buildings can be completely different than those for non-high-rise buildings as the height and size of the building requires a different firefighting tactic to ensure both occupant and fire fighter safety.

NFPA 101, *Life Safety Code*®, provides a package of protection criteria required for all new high-rise buildings, and many existing high-rise buildings if required by the specific occupancy, that address these many challenges. While the requirements in NFPA 101 are written with the primary goal of occupant life safety from fire, it should be recognized that these many features may also benefit the safety of occupants or firefighters during a non-fire event as well. The following fire safety features are required by NFPA 101 for high-rise buildings:

1. **Automatic Sprinkler System.** First, high-rise buildings must be provided with an automatic sprinkler system throughout the building. The sprinkler system must be approved, supervised, and must have a control valve and water-flow device provided for each floor. Among other benefits, sprinkler systems help confine the fire and allow for the greater evacuation time necessary in high-rise buildings.
2. **Standpipe System.** In addition to the sprinkler system for extinguishment, a Class I standpipe should be provided throughout the building. Standpipe systems assist fire



CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

fighters by providing a fire hose connection and allowing the manual application of water on a fire.

3. **Fire Alarm and Communication System.** A fire alarm system using a voice/alarm communication system and provided two-way telephone service for fire department use is required as part of the high-rise package. This telephone system is required to operate between the emergency command center and every elevator car, elevator lobby, and at each floor level of exit stairs. This fire alarm systems assists with both occupant notification as well as firefighting operations.
4. **Standby Power.** High-rise buildings contain many types of building systems, both emergency and non-emergency, for everyday functions of the building. It is important that most of these systems stay up and running during an emergency, thus, standby power is required. The standby power system must be connected to a variety of systems including but not limited to the fire pumps, sprinkler system components, emergency lighting, and at least one elevator. This ensures, that upon loss of power, a standby power system will maintain the necessary systems for emergency use and occupancy evacuation.
5. **Emergency Command Center.** Because of the large size and complexity of high-rise buildings, an emergency command center is required. This central location in the building contains a variety of panels and instruments that notify the staff of fire alarms, location of the alarm, elevator operation and recall, sprinkler impairments, emergency generator status, and additional necessary functions of the building system. This allows for a faster response to a building emergency, a greater level of safety for occupants in the building, and more efficient firefighter operations.
6. **Emergency Plans.** Emergency plans are a critical component to high-rise building safety for both occupants and fire fighters, and are required as part of the protection package in NFPA 101. Emergency plans include information for building occupants such as appropriate procedures for reporting emergencies, staff and occupant responsibilities during emergencies, evacuation procedures and strategies, use of elevators, conduct of fire drills, and information on the buildings layout and fire protection systems. Emergency plans contain vital information that can assist occupants on what to look for and how to act in an emergency. These plans are useful in all types of occupancies whether in a residential building, an office building, or a classroom building. One resource that is available for developing these plans in high-



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rise office buildings is NFPA's "[Guidelines to Developing Emergency Action Plans for All-Hazard Emergencies in High-Rise Office Buildings.](#)"

Whether a dormitory, classrooms, laboratories, or offices, high-rise buildings come with challenges during emergency events. However, with the right protection and awareness, these challenges can be addressed and occupants and firefighters can remain safe during a fire or other emergency event.

*For additional information on high-rise building safety, visit www.nfpa.org/highrise

Sources: NFPA 101 *Life Safety Code*®, 2012 edition. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169.



Kristin Bigda, P.E. is a Senior Fire Protection Engineer in NFPA's Building Fire Protection and Life Safety Division. She is staff liaison to four Building Code and Life Safety Code technical committees as well as NFPA 80, NFPA 105, and various other NFPA technical committee projects. She serves as co-editor of the NFPA 1 Handbook.



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909.9 Design fire. The design fire shall be based on a rational analysis performed by the registered design professional and approved by the fire code official. The design fire shall be based on the analysis in accordance with Section 909.4 and this section.

◆ The design fire is the most critical element in the smoke control system design. The fire is what produces the smoke to be controlled by the system; thus, the size of the fire directly impacts the quantity of smoke being produced. This section ensures that the design fire be determined through a rational analysis by a registered design professional with knowledge in this area. Such professionals should have experience in the area of fire dynamics, fire engineering and general building design, including mechanical systems. When determining the design fire the designer should work with various

stakeholders to determine the types of hazards and combustible materials (fire scenarios) on a permanent as well as temporary basis (i.e., Christmas/holiday decorative materials or scenery, temporary art exhibits) that may be present throughout the use of the building once occupied. Those hazards then need to be translated to potential design fires to be used when determining the smoke layer interface height for the duration as determined by Section 909.4.6. See the commentary for Section 909.3 for potential sources when determining design fires.

This section also does not mandate the type of fire (i.e., steady versus unsteady). A steady fire assumes a constant heat release rate over a period of time, where unsteady fires do not. An unsteady fire includes the growth and decay phases of the fire, as well as the peak heat release rate. An unsteady

fire will hit a peak heat release rate when burning in the open, like an axisymmetric fire. An unsteady fire is a more realistic view of how fires actually burn. It should be noted that fires can be a combination of unsteady and steady fires when the sufficient fuel is available. In other words, the fire initially grows (unsteady) then reaches a steady state and burns for sometime at a particular heat release rate before decay occurs.

Design fire information should therefore typically include growth rate, peak heat release rate, duration and decay as well as information related to fire locations and products of combustion yield (CO, smoke, etc.) that are produced by the various design fires that are deemed credible for the space.

To provide an order of magnitude of fire sizes obtained from various combustibles, the following



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data from fire tests is provided. The following heat release rates, found in Section 3, Chapter 3-1 of the 2nd edition of the SFPE Handbook of Fire Protection Engineering, are peak heat release rates:

Plastic trash bags/paper trash:
114-332 Btu/sec (120-350 kw)

Latex foam pillow: 114
Btu/sec approximately (120 kw)

Dry Christmas tree: 475-618
Btu/sec (500-650 kw)

Sofa: 2,852 Btu/sec
approximately (3,000 kw)

Plywood wardrobe: 2,947-
6,084 Btu/sec (3,100-6,400 kw)

909.9.1 Factors considered.

The engineering analysis shall include the characteristics of the fuel, fuel load, effects included by the fire, and whether the fire is likely to be steady or unsteady.

◆ This section simply provides more detail on the factors that should be taken under consideration when determining the design fire size. To determine the appropriate fire size, an engineering analysis is necessary that takes into account the following elements:

fuel (potential burning rates), fuel load (how much), effects included by the fire (smoke particulate size and density), steady or unsteady (burn steadily or simply peak and dissipate) and likelihood of sprinkler activation (based on height and distance from the fire).

909.9.2 Design fire fuel.

Determination of the design fire shall include consideration of the type of fuel, fuel spacing and configuration.

◆ The design fire size may also be affected by surrounding combustibles, which may have the effect of

increasing the fire size. More specifically, there is concern that if sufficient separation is not maintained between combustibles, then a larger design fire is likely. The code does not provide extensive detail on this as such determination is left to the rational analysis undertaken by the design professional. NFPA 92B provides one method in which you determine the critical separation distance, R. This is based upon fire size and the critical radiant heat flux for nonpiloted ignition. Nonpiloted ignition means the radiated heat from the fire without direct flame contact will ignite adjacent combustibles.

909.9.3 Heat-release assumptions.

The analysis shall make use of best available data from approved sources and shall not be based on excessively stringent limitations of combustible material.

◆ This section is merely



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stressing the fact that data obtained for use in a rational analysis needs to come from relevant and appropriate sources. Data can be obtained from groups such as the NIST or from Annex B of NFPA 92B. Data from fire tests is available and is a good resource for such analysis. As noted earlier, such data is not prevalent (see also Chapter 8, Analysis of Design Fires of the Guide to Smoke Control in the 2006 IBC and Section 3, Chapter 3-1 of the SFPE Handbook of Fire Protection Engineering).

909.9.4 Sprinkler effectiveness assumptions.

A documented engineering analysis shall be provided for conditions that assume fire growth is halted at the time of sprinkler activation.

◆ This section raises a few questions regarding activation of sprinklers and their impact on the fire both in terms of their ability to “control” as well as “extinguish” a fire. The first

is concerning an assumption that sprinklers will immediately control the fire as soon as they are activated (i.e., control results in limiting further growth and maintaining the heat release rate at approximately the same fire size as when the sprinklers activated). This assumption may be true in some cases, but for high ceilings the sprinkler may not activate or may be ineffective. Sprinklers may be ineffective in high spaces, since by the time they are activated the fire is too large to control. Essentially, the fire plume may push away and evaporate the water before it actually reaches the seat of the fire.

Additionally the fire may be shielded from sprinkler spray so that insufficient quantities of water reach the fuel. These are common problems with high-piled storage as well as other fires including retail and has been shown in actual tests. Also, if the fire

becomes too large before the sprinklers are activated, the available water supply and pressure for the system may be compromised.

Additionally, based on the layout of the room and the movement of the fire effluents, the wrong sprinklers could be activated, which leads to a larger fire size and depletion of the available water supply and pressure.

Another issue is whether the sprinklers “control” or “extinguish” the fire. Typical sprinklers are assumed only to control fires as opposed to extinguishing them. Sprinklers may be able to extinguish the fire, but it should not automatically be assumed. A fire that is controlled will achieve steady state and maintain a certain fire size, which is very different from a fire that is actually extinguished.

Based upon these concerns, each scenario needs to be looked at individually to



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determine whether sprinklers would be effective in halting the growth or extinguishing the fire. More specifically, the evaluation should include droplet size, density and area of coverage and should also be based on actual test results.

909.10 Equipment.

Equipment including, but not limited to, fans, ducts, automatic dampers and balance dampers shall be suitable for their intended use, suitable for the probable exposure temperatures that the rational analysis indicates, and as approved by the fire code official.

◆ Section 909.10 and subsequent sections are primarily related to the reliability of the system components to provide a smoke control system that works according to the design. One of the largest concerns when using smoke control provisions is the overall reliability of the system. Such systems have

many different components, such as smoke and fire dampers; fans; ducts and controls associated with such components.

The more components a system has, the less reliable it becomes. In fact, one approach in providing a higher level of reliability is utilizing the normal building systems such as the HVAC to provide the smoke control system. Basically, systems used every day are more likely to be working appropriately, since they are essentially being tested daily; however, there are many components that are specific to the smoke control system, such as exhaust fans in an atrium or the smoke control panel.

Also, there is not a generic prescriptive set of requirements as to how all smoke control system elements should operate, since each design may be fairly unique. The specifics on operation of such a system

need to be included within the design and construction documents. Most components used in smoke control systems are elements used in many other applications such as HVAC systems; therefore, the basic mechanisms of a fan used in a smoke control system may not be different, although they may be applied differently.

909.10.1 Exhaust fans.

Components of exhaust fans shall be rated and certified by the manufacturer for the probable temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c / mc) + (T_a)$$

(Equation 9-3)

where:

c = Specific heat of smoke at smokelayer temperature,

Btu/lb°F · (kJ/kg · K).

m = Exhaust rate, pounds per second (kg/s).

Q_c = Convective heat output



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of fire, Btu/s (kW).

T_a = Ambient temperature,
°F (K).

T_s = Smoke temperature, °F
(K).

Exception: Reduced T_s as
calculated based on the
assurance of adequate
dilution air.

◆ Fans used for smoke
control systems must be able
to tolerate the possible
elevated temperatures to
which they will be exposed.
Again, like many other
factors this depends upon the
specifics of the design fire.

Essentially, Equation 9-3
requires the calculation of the
potential temperature rise.
The exhaust fans must be
specifically rated and
certified by the manufacturer
to be able to handle these
rises in temperature. There is
an exception that allows
reduction of the temperature
if it can be shown that
adequate temperature
reduction will occur. In many

cases if the exhaust fans are
near the ceiling, the smoke
will be much cooler than the
value resulting from Equation
9-3 since the smoke may cool
considerably by the time it
reaches the ceiling. Also,
sprinkler activation will assist
in cooling the smoke further.

909.10.2 Ducts. Duct
materials and joints shall be
capable of withstanding the
probable temperatures and
pressures to which they are
exposed as determined in
accordance with Section
909.10.1. Ducts shall be
constructed and supported in
accordance with the
International Mechanical
Code. Ducts shall be leak
tested to 1.5 times the
maximum design pressure in
accordance with nationally
accepted practices. Measured
leakage shall not exceed 5
percent of design flow.
Results of such testing shall
be a part of the
documentation procedure.

Ducts shall be supported
directly from fire-resistance-

rated structural elements of
the building by substantial,
noncombustible supports.

Exception: Flexible
connections (for the purpose
of vibration isolation)
complying with the
International Mechanical
Code and which are
constructed of approved fire
resistance-rated materials.

◆ The next essential
component of a smoke
control system is the integrity
of the ducts to transport
supply and exhaust air. The
integrity of ducts is also
important for an HVAC
system, but is more critical in
this case since it is not simply
a comfort issue but one of life
safety. The key concern with
ducts in smoke control
systems is that they can
withstand elevated
temperatures and that there
will be minimal leakage. The
concern with leakage is the
potential of leaking smoke
into another smoke zone or
not providing the proper
amount of supply air to



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support the system.

More specifically, all ducts need to be leak tested to 1.5 times the maximum static design pressure. The leakage resulting should be no more than 5 percent of the design flow. For example, a duct that has a design flow of 300 cubic feet per minute (cfm) (0.141 m³/s) would be allowed 15 cfm (0.007 m³/s) of leakage when exposed to a pressure equal to 1.5 times the design pressure for that duct. The tests should be in accordance with nationally accepted practices.

This criterion will often limit ductwork for smoke control systems to lined systems, since the amount of leakage in such systems is much less.

As part of the concern for possible exposure to fire and fire products, the ducts are required to be supported by way of substantial noncombustible supports connected to the fire-resistance-rated structural

elements of the building. As noted, the system needs to be able to run for 20 minutes starting from the detection of the fire. The supports are allowed to be other than noncombustible when they are flexible connections provided to mitigate the effects of vibration, perhaps as part of a building exposed to seismic loads.

The flexible connections still need to be constructed of approved fire-resistance-rated materials.

NFPA 92B also references NFPA 90A for ducts conveying smoke and is part of the design requirements for exhaust systems.

As part of the concern for possible exposure to fire and fire products, the ducts are required to be supported by way of substantial noncombustible supports connected to the fire-resistance-rated structural elements of the building. As noted, the system needs to

be able to run for 20 minutes starting from the detection of the fire. The exception to this section is really more of an acknowledgement that flexible connections for vibration isolation are acceptable when constructed of approved fire-resistance-rated materials.

More specifically, it is often necessary to use such connections for connecting the duct to the fan. These connections cannot necessarily meet the requirements of the main section, but are a minimal part of the ductwork and as long as they perform adequately with regard to fire resistance they are permitted. Note that the term “approved” is used to determine the required fire resistance, therefore, flexibility is provided.

The code does not specifically address this determination but perhaps a relationship to the duration of operation and these flexible



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connections could be made to determine the necessary performance.

909.10.3 Equipment, inlets and outlets. Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

◆ The intent of this section is to minimize the likelihood of smoke being reintroduced into the building due to poorly placed outdoor air inlets and exhaust air outlets; therefore, placing one right next to another on temperature rise to which the components will be exposed. This temperature rise shall be computed by:

$$T_s = (Q_c / mc) + (T_a)$$

(Equation 9-3)

where:

c = Specific heat of smoke at smoke layer temperature,

Btu/lb°F · (kJ/kg · K).

m = Exhaust rate, pounds per second (kg/s).

Q_c = Convective heat output of fire, Btu/s (kW).

T_a = Ambient temperature, °F (K).

T_s = Smoke temperature, °F (K).

Exception: Reduced T_s as calculated based on the assurance of adequate dilution air.

◆ Fans used for smoke control systems must be able to tolerate the possible elevated temperatures to which they will be exposed. Again, like many other factors this depends upon the specifics of the design fire.

Essentially, Equation 9-3

requires the calculation of the potential temperature rise. The exhaust fans must be specifically rated and certified by the manufacturer to be able to handle these rises in temperature. There is an exception that allows reduction of the temperature if it can be shown that adequate temperature reduction will occur. In many cases if the exhaust fans are near the ceiling, the smoke will be much cooler than the value resulting from Equation 9-3 since the smoke may cool considerably by the time it reaches the ceiling. Also, sprinkler activation will assist in cooling the smoke further.

909.10.2 Ducts. Duct materials and joints shall be capable of withstanding the probable temperatures and pressures to which they are exposed as determined in accordance with Section 909.10.1. Ducts shall be constructed and supported in accordance with the International Mechanical



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Code. Ducts shall be leak tested to 1.5 times the maximum design pressure in accordance with nationally accepted practices. Measured leakage shall not exceed 5 percent of design flow. Results of such testing shall be a part of the documentation procedure.

Ducts shall be supported directly from fire-resistance-rated structural elements of the building by substantial, noncombustible supports.

Exception: Flexible connections (for the purpose of vibration isolation) complying with the International Mechanical Code and which are constructed of approved fire resistance-rated materials.

◆ The next essential component of a smoke control system is the integrity of the ducts to transport supply and exhaust air. The integrity of ducts is also important for an HVAC system, but is more critical in

this case since it is not simply a comfort issue but one of life safety. The key concern with ducts in smoke control systems is that they can withstand elevated temperatures and that there will be minimal leakage. The concern with leakage is the potential of leaking smoke into another smoke zone or not providing the proper amount of supply air to support the system.

More specifically, all ducts need to be leak tested to 1.5 times the maximum static design pressure. The leakage resulting should be no more than 5 percent of the design flow. For example, a duct that has a design flow of 300 cubic feet per minute (cfm) (0.141 m³/s) would be allowed 15 cfm (0.007 m³/s) of leakage when exposed to a pressure equal to 1.5 times the design pressure for that duct. The tests should be in accordance with nationally accepted practices.

This criterion will often limit

ductwork for smoke control systems to lined systems, since the amount of leakage in such systems is much less.

As part of the concern for possible exposure to fire and fire products, the ducts are required to be supported by way of substantial noncombustible supports connected to the fire-resistance-rated structural elements of the building. As noted, the system needs to be able to run for 20 minutes starting from the detection of the fire. The supports are allowed to be other than noncombustible when they are flexible connections provided to mitigate the effects of vibration, perhaps as part of a building exposed to seismic loads.

The flexible connections still need to be constructed of approved fire-resistance-rated materials.

NFPA 92B also references NFPA 90A for ducts conveying smoke and is part



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of the design requirements for exhaust systems.

As part of the concern for possible exposure to fire and fire products, the ducts are required to be supported by way of substantial noncombustible supports connected to the fire-resistance-rated structural elements of the building. As noted, the system needs to be able to run for 20 minutes starting from the detection of the fire. The exception to this section is really more of an acknowledgement that flexible connections for vibration isolation are acceptable when constructed of approved fire-resistance-rated materials.

More specifically, it is often necessary to use such connections for connecting the duct to the fan. These connections cannot necessarily meet the requirements of the main section, but are a minimal part of the ductwork and as long as they perform

adequately with regard to fire resistance they are permitted. Note that the term “approved” is used to determine the required fire resistance, therefore, flexibility is provided.

The code does not specifically address this determination but perhaps a relationship to the duration or operation and these flexible connections could be made to determine the necessary performance.

909.10.3 Equipment, inlets and outlets. Equipment shall be located so as to not expose uninvolved portions of the building to an additional fire hazard. Outside air inlets shall be located so as to minimize the potential for introducing smoke or flame into the building. Exhaust outlets shall be so located as to minimize reintroduction of smoke into the building and to limit exposure of the building or adjacent buildings to an additional fire hazard.

◆ The intent of this section is to minimize the likelihood of smoke being reintroduced into the building due to poorly placed outdoor air inlets and exhaust air outlets; therefore, placing one right next to another on the exterior of the building would be inappropriate.

Additionally, wind and other adverse conditions should be considered when choosing locations for these inlets and outlets. Particular attention should be paid to introducing exhausted smoke into another smoke zone. Also, smoke should be exhausted in a direction that will not introduce it into surrounding buildings or facilities. Within the building itself, the supply air and exhaust outlets should also be strategically located. The exhaust inlets and supply air should be evenly distributed to reduce the likelihood of a high velocity of air that may disrupt the fire plume and also push smoke back into occupied areas. See



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the commentary for Section 909.8 for discussion on avoiding plugholing.

909.10.4 Automatic dampers. Automatic dampers, regardless of the purpose for which they are installed within the smoke control system, shall be listed and conform to the requirements of approved recognized standards.

◆ This section addresses the reliability of any dampers used within a smoke control system. This particular provision requires that the dampers be listed and conform to the appropriate recognized standards.

More specifically, Section 717 of the IBC contains more detailed information on the specific requirements for smoke and fire dampers. Smoke and fire dampers should be listed in accordance with UL 555S and 555, respectively. Also, remember that each smoke control design is unique and

the sequence and methods used to activate the dampers may vary from design to design. This information needs to be addressed in the construction documents.

Another factor to take into account, with regard to timing of the system, is the fact that some dampers react more quickly than others, simply due to the particular smoke damper characteristics. Additionally, during the commissioning of the system, the damper is going to be exposed to many repetitions. These repetitions need to be accounted for in the overall reliability of the system.

909.10.5 Fans. In addition to other requirements, belt-driven fans shall have 1.5 times the number of belts required for the design duty with the minimum number of belts being two.

Fans shall be selected for stable performance based on normal temperature and,

where applicable, elevated temperature.

Calculations and manufacturer's fan curves shall be part of the documentation procedures. Fans shall be supported and restrained by noncombustible devices in accordance with the structural design requirements of Chapter 16 of the International Building Code.

Motors driving fans shall not be operated beyond their nameplate horsepower (kilowatts) as determined from measurement of actual current draw and shall have a minimum service factor of 1.15.

◆ Part of the overall reliability requires that fans used to provide supply air and exhaust capacity will be functioning when necessary; therefore, a safety factor of 1.5 is placed upon the required belts for fans. All fans used as part of a smoke control system must provide



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1.5 times the number of required belts with a minimum of two belts for all fans.

This section also points out that the fan chosen should fit the specific application. It should be able to withstand the temperature rise as calculated in Section 909.10.1 and generally be able to handle typical exposure conditions, such as location and wind. For instance, propeller fans are highly sensitive to the effects of wind. When located on the windward side of a building, wall-mounted, nonhooded propeller fans are not able to compensate for wind effects.

Additionally, even hooded propeller fans located on the leeward side of the building may not adequately compensate for the decrease in pressure caused by wind effects. In general, when designing a system, it should be remembered that field conditions might vary from the calculations; therefore,

flexibility should be built into the design that would account for things, such as variations in wind conditions.

Finally, this section stresses that fan motors not be operated beyond their rated horsepower.

909.11 Power systems. The smoke control system shall be supplied with two sources of power. Primary power shall be from the normal building power systems. Secondary power shall be from an approved standby source complying with Section 604 and NFPA 70. The standby power source and its transfer switches shall be in a room separate from the normal power transformers and switch gears and ventilated directly to and from the exterior. The room shall be enclosed with not less than 1-hour fire barriers constructed in accordance with Section 707 of the International Building Code or horizontal assemblies constructed in accordance

with Section 711 of the International Building Code, or both. The transfer to full standby power shall be automatic and within 60 seconds of failure of the primary power.

◆ As with any life safety system, a level of redundancy with regard to power supply is required to enable the functioning of the system during a fire. The primary source is the building's normal power system. The secondary power system is by means of standby power. One of the key elements is that standby power systems are intended to operate within 60 seconds of loss of primary power. It should be noted that the primary difference between standby power and emergency power is that emergency power must operate within 10 seconds of loss of primary power versus 60 seconds. This section also requires isolation from normal building power systems via a 1-hour fire



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barrier or 1-hour horizontal assembly or both depending upon the location within the building. This increases the reliability and reduces the likelihood that a single event could remove both power supplies.

909.11.1 Power sources and power surges. Elements of the smoke control system relying on volatile memories or the like shall be supplied with uninterruptible power sources of sufficient duration to span 15-minute primary power interruption.

Elements of the smoke control system susceptible to power surges shall be suitably protected by conditioners, suppressors or other approved means.

◆ Smoke control systems have many components, sometimes highly sensitive electronics, that are adversely affected by any interruption in or sudden surges of power. Therefore, Section 909.11.1 requires that any components

of a smoke control system, such as volatile memories, be supplied with an uninterruptible power system for the first 15 minutes of loss of primary power. Volatile memory components will lose memory upon any loss of power no matter how short the time period. Once the 15 minutes elapses, these elements can be transitioned to the already operating standby power supply.

With regard to components sensitive to power surges, they need to be provided with surge protection in the form of conditioners, suppressors or other approved means.

909.12 Detection and control systems. Fire detection systems providing control input or output signals to mechanical smoke control systems or elements thereof shall comply with the requirements of Section 907. Such systems shall be equipped with a control unit complying with UL 864 and listed as smoke control

equipment.

Control systems for mechanical smoke control systems shall include provisions for verification. Verification shall include positive confirmation of actuation, testing, manual override, the presence of power downstream of all disconnects and, through a preprogrammed weekly test sequence, report abnormal conditions audibly, visually and by printed report.

◆ This section is focused upon two main elements. The first is the proper operation and monitoring of the fire detection system that activates the smoke control system through compliance with Section 907 and UL 864. This requires a specific listing as smoke control equipment. UL 864 has a subcategory (UUKL) specific to fire alarm control panels for smoke control system applications.

The second aspect is related



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to the mechanical elements of the smoke control system once the system is activated. In particular, there is a focus upon verification of activities. Verification would include the following two aspects according to the second paragraph of this section:

1. The system is able to verify actuations, testing, manual overrides and the presence of power downstream. This would require information reported back to the smoke control panel, which can be accomplished via the weekly test sequence or through full electronic monitoring of the system.

2. Conduct a preprogrammed weekly test that simulates an actual (smoke) event to test the components of the system. These components would include elements such as smoke dampers, fans and doors. Abnormal conditions need to be reported in three ways:

- a. Audibly;
- b. Visually; and
- c. Printed report.

It should be noted that electrical monitoring of the control components is not required (supervision).

Such supervision verifies integrity of the conductors from a fire alarm control unit to the control system input. The weekly test is considered sufficient verification of system performance and is often termed end to end verification. In other words the control system input provides the expected results. Verification can be accomplished through any sensor that be calibrated to distinguish between the difference between proper operation and a fault condition. For fans, proper operations mean that the fan is moving air within the intent of its design. Fault conditions include power failure, broken fan belts, adverse wind effects, a

locked rotor condition and/or filters or large ducts that are blocked causing significantly reduced airflow.

In addition to differential pressure transmitters and sail switches this can be accomplished by the present state of the current sensors. More discussion on verification for elements such as ducts and fire doors is discussed in Chapter 9 of A Guide to Smoke Control in the 2006 IBC.

Also, the fact that a smoke control system is nondedicated (integrated with an HVAC system) does not mean that it is automatically being tested on a daily basis. It is cautioned that simply depending upon occupant discomfort, for example, is sometimes an insufficient indicator of a fully functioning smoke control system. There may be various modes in which the HVAC system could operate that may not exercise the smoke control features and the



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sequence in which the system should operate. An example is an air-conditioning system operating only in full recirculating mode versus exhaust mode. This failure will likely not affect occupants and will not exercise the exhaust function. Plus, doors, which may be part of the smoke barrier, may not need to be closed in normal building operations but would need to be closed during smoke control system operation. This is why this section does not necessarily differentiate between dedicated and nondedicated smoke control systems and requires the system components to be tested.

It is important to note that this weekly test sequence is not an actual smoke event and is only intended to activate the system to ensure that the components are working correctly.

Although NFPA 92B is only referenced for design Sections 7.3.1 and 7.3.8 of

that standard coordinate with this section. More specifically, Section 7.3.8 also requires the weekly test but as provided for by the UL864-UUKL-listed smoke control panel. NFPA 92B Section 7.3.6.2 requires off-normal indication at the smoke control panel within 200 seconds when a positive confirmation is failed to be achieved. Section 909.12 only requires that abnormal conditions be reported weekly.

909.12.1 Wiring. In addition to meeting requirements of NFPA 70, all wiring, regardless of voltage, shall be fully enclosed within continuous raceways.

◆ Wiring is required to be placed within continuous raceways which provides an additional level of reliability for the system. The definition of the term “raceway” in NFPA 70 lists several acceptable types of complying raceway that can be used, however

manufactured cable assemblies such as metal-clad cable (Type MC) or armored cable (Type AC) are not included.

909.12.2 Activation. Smoke control systems shall be activated in accordance with this section.

◆ The activation of a smoke control system is dependent on when such a system is required. Mechanical smoke control systems, which could include pressurization, airflow or exhaust methods, require an automatic activation mechanism. When using a passive system, which depends upon compartmentation, spot-type detectors are acceptable for the release of door closers and similar openings. Whereas with more complex mechanical system such activation needs to go beyond single station detectors and be part of an automatic coordinated system.

909.12.2.1 Pressurization,



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airflow or exhaust method.

Mechanical smoke control systems using the pressurization, airflow or exhaust method shall have completely automatic control.

◆ Automatic activation of such systems is especially critical as tenability is much more difficult to achieve if a delay occurred waiting for manual activation of the system. See Sections 909.6 for the pressurization method, 909.7 for the airflow design method and 909.8 for the exhaust method.

909.12.2.2 Passive method.

Passive smoke control systems actuated by approved spot-type detectors listed for releasing service shall be permitted.

◆ This section recognizes that a passive system does not address smoke containment through mechanical means; therefore, it does not need to be “automatically activated” except in cases where smoke barriers have openings. These

openings would be required to have smoke detectors to close openings where required by the design. Although spot type detectors are technically automatic they are not part of a more coordinated system of activation as needed for mechanical smoke control systems. Such detectors are simply standalone devices that fail in the fail safe position. In other words if the power were lost a door on a magnetic hold would simply close.

909.12.3 Automatic control.

Where completely automatic control is required or used, the automatic-control sequences shall be initiated from an appropriately zoned automatic sprinkler system complying with Section 903.3.1.1, manual controls that are readily accessible to the fire department, and any smoke detectors required by the engineering analysis.

◆ When automatic activation is required, it must be

accomplished by a properly zoned automatic sprinkler system and, if the engineering analysis requires them, smoke detectors. Manual control for the fire department needs to be provided. An important point with this particular requirement is that smoke control systems are engineered systems and a prescribed smoke detection system may not fit the needs of the specific design. Other types of detectors, such as beam detectors (within an atrium), may be used and could be more useful and be more practical from a maintenance standpoint. Also, it may not be practical or appropriate for the building’s fire alarm system to activate such systems as it may alter the effectiveness of the system by pulling smoke through the building versus removing or containing the smoke.

For example, a building with an atrium may have several



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floors below the space. If a fire occurs in one of the floors not associated with the atrium the atrium smoke control system could possibly pull smoke throughout the building if the detection is zoned incorrectly.

909.13 Control air tubing.

Control air tubing shall be of sufficient size to meet the required response times. Tubing shall be flushed clean and dry prior to final connections and shall be adequately supported and protected from damage. Tubing passing through concrete or masonry shall be sleeved and protected from abrasion and electrolytic action.

◆ Control tubing is a method that uses pneumatics to operate components such as the opening and closing of dampers. Due to the sophistication of electronic systems today, control tubing is becoming less common.

These particular requirements

provide the criteria for properly designing and installing control tubing.

Essentially, it is up to the design professional to determine the size requirements and to properly design appropriate supports. This information needs to be detailed within the construction documents.

Additionally, due to the effect of moisture and other contaminants on control tubing, it must be flushed clean then dried before installation.

909.13.1 Materials. Control air tubing shall be hard drawn copper, Type L, ACR in accordance with ASTM B 42, ASTM B 43, ASTM B 68, ASTM B 88, ASTM B 251 and ASTM B 280. Fittings shall be wrought copper or brass, solder type, in accordance with ASME B 16.18 or ASME B 16.22. Changes in direction shall be made with appropriate tool bends. Brass compression-

type fittings shall be used at final connection to devices; other joints shall be brazed using a BCuP5 brazing alloy with solidus above 1,100°F (593°C) and liquidus below 1,500°F (816°C). Brazing flux shall be used on copper-to-brass joints only.

Exception: Nonmetallic tubing used within control panels and at the final connection to devices, provided all of the following conditions are met:

1. Tubing shall comply with the requirements of Section 602.2.1.3 of the International Mechanical Code .

2. Tubing and the connected device shall be completely enclosed within a galvanized or paint-grade steel enclosure having a minimum thickness of 0.0296 inch (0.7534 mm) (No.22 gage). Entry to the enclosure shall be by copper tubing with a protective grommet of neoprene or Teflon or by suitable brass compression to male-barbed



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adapter.

3. Tubing shall be identified by appropriately documented coding.

4. Tubing shall be neatly tied and supported within enclosure. Tubing bridging cabinet and door or moveable device shall be of sufficient length to avoid tension and excessive stress. Tubing shall be protected against abrasion. Tubing serving devices on doors shall be fastened along hinges.

◆ This section addresses the materials allowed for control air tubing along with approved methods of connection.

All of this information needs to be documented, as it will be subject to review by the special inspector.

909.13.2 Isolation from other functions. Control tubing serving other than smoke control functions shall be isolated by automatic isolation valves or shall be an

independent system.

◆ This section requires separation of control tubing used for other functions through the use of isolation valves or a completely separate system. This is due to the difference in requirements for control tubing used in a smoke control system versus other building systems. The isolation of the control air tubing for a smoke control system needs to be specifically noted on the construction documents.

909.13.3 Testing. Control air tubing shall be tested at three times the operating pressure for not less than 30 minutes without any noticeable loss in gauge pressure prior to final connection to devices.

◆ As part of the acceptance testing of the smoke control system, the control air tubing will be pressure tested three times the operating pressure for 30 minutes or more. The

performance criteria as to whether the control tubing is considered a failure is when there is any noticeable loss in gauge pressure prior to final connection of devices during the 30-minute duration test.

909.14 Marking and identification. The detection and control systems shall be clearly marked at all junctions, accesses and terminations.

◆ This section requires that all portions of the fire detection system that activate the smoke control system be marked and identified appropriately. This includes all applicable fire alarm-initiating devices, the respective junction boxes, all data-gathering panels and fire alarm control panels. Additionally, all components of the smoke control system, which are not considered a fire detection system, are required to be properly identified and marked. This would include all applicable junction boxes, control



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tubing, temperature control modules, relays, damper sensors, automatic door sensors and air movement sensors.

909.15 Control diagrams.

Identical control diagrams showing all devices in the system and identifying their location and function shall be maintained current and kept on file with the fire code official, the fire department and in the fire command center in a format and manner approved by the fire chief.

◆ The purpose of control diagrams is to provide consistent information on the system in several key locations, including the building department, the fire department and the fire command center. If a fire command center is not required or provided, the diagrams need to be located such that they can be readily accessed during an emergency. Some possible locations may be the security

office, the building manager's office or, if possible, within the smoke control panel. This information is intended to assist in the use and operation of the smoke control system. The format of the control diagram is as approved by the fire chief. This is necessary since the fire department is the agency that will be using such a system during a fire and when the system is tested in the future. The more clearly the information is communicated, the more effective the smoke control system will be.

It should be noted that the fire department may want all smoke control systems within a jurisdiction to follow a particular protocol for control diagrams. Generally, the control diagrams should indicate the required reaction of the system in all scenarios. The status or position of every fan and damper in every scenario must be clearly identified.

909.16 Fire-fighter's smoke control panel. A fire-fighter's smoke control panel for fire department emergency response purposes only shall be provided and shall include manual control or override of automatic control for mechanical smoke control systems. The panel shall be located in a fire command center complying with Section 508 in high-rise buildings or buildings with smoke-protected assembly seating.

In all other buildings, the fire-fighter's smoke control panel shall be installed in an approved location adjacent to the fire alarm control panel. The fire-fighter's smoke control panel shall comply with Sections 909.16.1 through 909.16.3.

◆ One of the elements that makes a smoke control system effective is that its activity is successfully communicated to the fire department and the fire department is able to



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manually operate the system. The following sections provide requirements for a control panel specifically for smoke control systems. This panel is required to be located within a fire command center when it is located in a high-rise building or there is smoke-protected seating. Section 403.4.5 of the IBC would require a fire command center for high-rise buildings. Smoke-protected seating does not require a fire command center in Chapter 10 but this provision would ensure that one exists and contains the smoke control panel. Facilities with smoke-protected seating tend to be larger facilities that, at the very least, would already have a central security center if not a fire command center as required by the jurisdiction.

All other locations would only need to provide the panel in an approved location as long as it is located with the fire alarm panel. The

specific location will depend on the needs of the fire department in that jurisdiction. The reason not all fire-fighter smoke control panels need to be located in a fire command center is that many smoke control systems are located in a building containing an atrium that may only be three stories in height. A 200-square-foot (19 m²) fire command center would be excessive for such buildings.

There are two components that include the requirements for the display and for the controls. This control panel will provide an ability to override any other controls whether manual or automatic within the building as they relate to the smoke control system.

Note that the publication *Guide to Smoke Control* in the 2006 IBC goes into more detail about the fire fighter smoke control panel requirements.

909.16.1 Smoke control systems. Fans within the building shall be shown on the fire-fighter's control panel. A clear indication of the direction of airflow and the relationship of components shall be displayed. Status indicators shall be provided for all smoke control equipment, annunciated by fan and zone and by pilot-lamp-type indicators as follows:

1. Fans, dampers and other operating equipment in their normal status—WHITE.
2. Fans, dampers and other operating equipment in their off or closed status—RED.
3. Fans, dampers and other operating equipment in their on or open status—GREEN.
4. Fans, dampers and other operating equipment in a fault status—YELLOW/AMBER.

◆ This section denotes what should be displayed on the control panel. The display is



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required to include all fans, an indication of the direction of airflow and the relationship of the components. Also, status lights are required, and this section sets out specific standardized colors to indicate normal status, closed status, open status and fault status. A standardized approach increases the likelihood that the fire department will be able to quickly become familiar with a system. Since the fire department has the ability to override the automatic functions of the system, this information is critical.

909.16.2 Smoke control panel. The fire-fighter's control panel shall provide control capability over the complete smoke-control system equipment within the building as follows:

1. ON-AUTO-OFF control over each individual piece of operating smoke control equipment that can also be controlled from other sources

within the building. This includes stairway pressurization fans; smoke exhaust fans; supply, return and exhaust fans; elevator shaft fans; and other operating equipment used or intended for smoke control purposes.

2. OPEN-AUTO-CLOSE control over individual dampers relating to smoke control and that are also controlled from other sources within the building.

3. ON-OFF or OPEN-CLOSE control over smoke control and other critical equipment associated with a fire or smoke emergency and that can only be controlled from the fire-fighter's control panel.

Exceptions:

1. Complex systems, where approved, where the controls and indicators are combined to control and indicate all elements of a single smoke zone as a unit.

2. Complex systems, where approved, where the control is accomplished by computer interface using approved, plain English commands.

◆ This section sets the requirements as to which controls need to be provided for the fire department on the control panel.

There are two aspects to the controls. The controls will include on-auto-off and open-auto-close settings or will be strictly on-off or open-close. If the system or component can be set on automatic (auto), it can be controlled from other locations beyond the fire command center. This would include an automatic smoke detection system or by manual activation. If a control only contains on-off or open-close settings, the only way the system component can be controlled is in the fire command center.

It should be noted that components such as fans are



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usually associated with on-off-type controls, whereas components such as dampers are associated with open-close-type controls.

909.16.3 Control action and priorities. The fire-fighter's control panel actions shall be as follows:

1. ON-OFF and OPEN-CLOSE control actions shall have the highest priority of any control point within the building. Once issued from the fire-fighter's control panel, no automatic or manual control from any other control point within the building shall contradict the control action. Where automatic means are provided to or produce a specific result to safeguard the building or equipment (i.e., duct freezestats, duct smoke detectors, high-temperature cutouts, temperature-actuated linkage and similar devices), such means shall be capable of being overridden by the fire-fighter's control panel.

The last control action as indicated by each firefighter's control panel switch position shall prevail. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

Exception: Power disconnects required by NFPA 70.

2. Only the AUTO position of each three-position firefighter's control panel switch shall allow automatic or manual control action from other control points within the building. The AUTO position shall be the NORMAL, nonemergency, building control position. Where a fire-fighter's control panel is in the AUTO position, the actual status of the device (on, off, open, closed) shall continue to be indicated by the status indicator described above. When directed by an automatic signal to assume an emergency condition, the

NORMAL position shall become the emergency condition for that device or group of devices within the zone. In no case shall control actions require the smoke control system to assume more than one configuration at any one time.

☑ This section clarifies that when a component of the system is placed in an on-off or open-close configuration, no other control point in the building, whether automatic or manual, can override the action established in the fire command center. If a system component is configured in auto mode, it can be controlled from locations within the building beyond the fire command center. Some controls are specifically designed to only allow an action from the fire command center.

909.17 System response time. Smoke-control system activation shall be initiated immediately after receipt of an appropriate automatic or



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manual activation command. Smoke control systems shall activate individual components (such as dampers and fans) in the sequence necessary to prevent physical damage to the fans, dampers, ducts and other equipment.

For purposes of smoke control, the fire-fighter's control panel response time shall be the same for automatic or manual smoke control action initiated from any other building control point. The total response time, including that necessary for detection, shutdown of operating equipment and smoke control system startup, shall allow for full operational mode to be achieved before the conditions in the space exceed the design smoke condition. The system response time for each component and their sequential relationships shall be detailed in the required rational analysis and verification of their installed

condition reported in the required final report.

◆ This particular section provides the criteria as to when the smoke control system is required to begin operation. Whether or not the activation is manual or automatic, this criteria clarifies that the system be initiated immediately. Also, it requires that components activate in a sequence that will not potentially damage the fans, dampers, ducts and other equipment.

Unrealistic timing of the system has the potential of creating an unsuccessful system. Delays in the system can be seen in slow dampers, fans that ramp up or down, systems that poll slowly and intentional built-in delays. These factors can add significantly to the reaction time of the system and may hamper achieving the design goals.

The key element is that the system be fully operational

before the smoke conditions exceed the design parameters. The design should include these possible delays when analyzing the smoke layer interface location. The sequence of events need to be justified within the design analysis and described clearly in the construction documents.

909.18 Acceptance testing.

Devices, equipment, components and sequences shall be individually tested. These tests, in addition to those required by other provisions of this code, shall consist of determination of function, sequence and, where applicable, capacity of their installed condition.

◆ In order to achieve a certain level of performance, the smoke control system needs to be thoroughly tested.

Section 909.18 requires that all devices, equipment components and sequences be individually tested.



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909.18.1 Detection devices.

Smoke or fire detectors that are a part of a smoke control system shall be tested in accordance with Chapter 9 in their installed condition. When applicable, this testing shall include verification of airflow in both minimum and maximum conditions.

◆ Detection devices are required to be tested in accordance with the fire protection requirements found in Chapter 9. Also, since such detectors may be subject to higher air velocities than typical detectors, their operation needs to be verified in the minimum and maximum anticipated airflow conditions.

909.18.2 Ducts. Ducts that are part of a smoke control system shall be traversed using generally accepted practices to determine actual air quantities.

◆ This section requires ducts that are part of the smoke

control system to be tested to show that the proper amount of air is flowing. It should be noted that Section 909.10.2 requires that the ducts be leak tested to 1.5 times the maximum design pressure. Such leakage is not allowed to exceed 5 percent of the design flow.

909.18.3 Dampers. Dampers shall be tested for function in their installed condition.

◆ This section notes that all dampers need to be inspected to meet the function for which they are installed. For instance, a damper that is to be open when the system is in smoke control mode should be verified to be open when testing the system. Also, a damper may have a specific timing associated with its operation that would need to be verified through testing 909.18.4 Inlets and outlets. Inlets and outlets shall be read using generally accepted practices to determine air quantities.

◆ Similar to ducts, the appropriate amount of air that is entering or exiting the inlets and outlets, respectively, must be checked.

909.18.5 Fans. Fans shall be examined for correct rotation.

Measurements of voltage, amperage, revolutions per minute and belt tension shall be made.

◆ This section requires the testing of fans for the following: correct rotation, voltage, amperage, revolutions per minute and belt tension. These features are key in having the system run as designed.

A common problem with fans is that they are often installed in the reverse direction. Also, to verify the reliability of the fans, elements such as the appropriate voltage and belt tension need to be tested.

909.18.6 Smoke barriers. Measurements using inclined manometers or other



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approved calibrated measuring devices shall be made of the pressure differences across smoke barriers.

Such measurements shall be conducted for each possible smoke control condition.

◆ As discussed in Section 909.5.1, the testing of pressure differences across smoke barriers needs to be measured in the smoke control mode. As noted in Section 909.18.6, such testing is to be performed for every possible smoke control condition, and the measurements will be taken using an inclined manometer or other approved methods. Electronic devices are also available. Qualified individuals must calibrate these types of devices. Additionally, before using an alternative method of testing, the fire code official needs to approve such a method.

909.18.7 Controls. Each smoke zone equipped with an

automatic-initiation device shall be put into operation by the actuation of one such device. Each additional device within the zone shall be verified to cause the same sequence without requiring the operation of fan motors in order to prevent damage.

Control sequences shall be verified throughout the system, including verification of override from the fire-fighter's control panel and simulation of standby power conditions.

◆ This section requires the overall testing of the system. More specifically, each zone needs to individually initiate the smoke control system by the activation of an automatic initiation device. Once that has occurred, all other devices within each zone need to be verified that they will activate the system, but to avoid damage, the fans do not need to be activated.

In addition to determining that all the appropriate

devices initiate the system, it must also be verified that all of the controls on the fire-fighter control panel initiate the appropriate aspects of the smoke control system, including the override capability.

Finally, the initiation and availability of the standby power system need to be verified.

909.18.8 Special inspections for smoke control. Smoke control systems shall be tested by a special inspector.

◆ Smoke control systems require special inspection since they are unique and complex life safety systems.

Section 1704.16 of the IBC provides the same requirements for special inspection as presented in Sections 909.18.8.1 and 909.18.8.2.

909.18.8.1 Scope of testing. Special inspections shall be conducted in accordance with



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the following:

1. During erection of ductwork and prior to concealment for the purposes of leakage testing and recording of device location.

2. Prior to occupancy and after sufficient completion for the purposes of pressure-difference testing, flow measurements, and detection and control verification.

◆ Special inspections need to occur at two different stages during construction to facilitate the necessary inspections. The first round of special inspections occurs before concealment of the ductwork or fire protection elements. The special inspector needs to verify the leakage as noted in Section 909.10.2. Additionally, the location of all fire protection devices needs to be verified and documented at this time.

The second round of special inspections occurs just prior to occupancy. The

inspections include the verification of pressure differences across smoke barriers as required in Sections 909.18.6 and 909.5.1, the verification of appropriate volumes of airflow as noted in the design and finally the verification of the appropriate operation of the detection and control mechanisms as required in Sections 909.18.1 and 909.18.7. These tests need to occur just prior to occupancy, since the test result will more clearly represent actual conditions. This also makes a robust design and quality assurance during construction critical as it is very costly and difficult in most cases to make changes at this stage. Note that the test does not actually place smoke into the space and demonstrate the smoke layer interface location. Instead, the testing is focused on all the elements of the design such as airflow and duct closure as prescribed by the specific design.

909.18.8.2 Qualifications. Special inspection agencies for smoke control shall have expertise in fire protection engineering, mechanical engineering and certification as air balancers.

◆ As noted in Section 909.3, special inspections are required for smoke control systems. This means a certain level of qualification that would include the need for expertise in fire protection engineering, mechanical engineering and certification as air balancers.

909.18.8.3 Reports. A complete report of testing shall be prepared by the special inspector or special inspection agency. The report shall include identification of all devices by manufacturer, nameplate data, design values, measured values and identification tag or mark. The report shall be reviewed by the responsible registered design professional and, when satisfied that the design intent has been achieved, the



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responsible registered design professional shall seal, sign and date the report.

◆ Once the special inspections are complete, documentation of the activity is required. This documentation is to be prepared in the form of a report that identifies all devices by manufacturer, nameplate data, design values, measured values and identification or mark.

909.18.8.3.1 Report filing.

A copy of the final report shall be filed with the fire code official and an identical copy shall be maintained in an approved location at the building.

◆ The report needs to be reviewed, approved and then signed, sealed and dated. This report is to be provided to the building official and a copy is also to remain in the building in an approved location. When a fire command center is required this is the best location for such documents.

Otherwise, a location such as the security office or building manager's office might be appropriate.

909.18.9 Identification and documentation. Charts, drawings and other documents identifying and locating each component of the smoke control system, and describing their proper function and maintenance requirements, shall be maintained on file at the building as an attachment to the report required by Section 909.18.8.3. Devices shall have an approved identifying tag or mark on them consistent with the other required documentation and shall be dated indicating the last time they were successfully tested and by whom.

◆ Additional documentation that needs to be maintained includes charts, drawings and other related documentation that assists in the identification of each aspect of the smoke control system.

This documentation is where information, such as the last time a device or component was successfully tested and by whom, is recorded. This will serve as the main documentation for the system. Again, the fire command center, if required, is the most appropriate location for such information (see commentary, Section 909.18.8.3.1).

909.19 System acceptance.

Buildings, or portions thereof, required by this code to comply with this section shall not be issued a certificate of occupancy until such time that the fire code official determines that the provisions of this section have been fully complied with and that the fire department has received satisfactory instruction on the operation, both automatic and manual, of the system and a written maintenance program complying with the requirements of Section 909.20.1 has been submitted



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and approved by the fire code official.

Exception: In buildings of phased construction, a temporary certificate of occupancy, as approved by the fire code official, shall be allowed, provided that those portions of the building to be occupied meet the requirements of this section and that the remainder does not pose a significant hazard to the safety of the proposed occupants or adjacent buildings.

◆ This section stipulates that the certificate of occupancy cannot be issued unless the smoke control system has been accepted. It is essential that the system be inspected and approved since it is a life safety system. There is an exception for buildings that are constructed in phases where a temporary certificate of occupancy is allowed. For example, a building where the portion requiring smoke control is not yet occupied so egress concerns through that

space are not relevant. This space needs to be separated by smoke barriers (different smoke zone). The code also requires a maintenance program for smoke control systems since the long-term success of such systems depends heavily on proper maintenance in addition to rigorous acceptance testing. The IBC simply provides a reference to that section of the code.

909.20 Maintenance.

Smoke control systems shall be maintained to ensure to a reasonable degree that the system is capable of controlling smoke for the duration required. The system shall be maintained in accordance with the manufacturer's instructions and Sections 909.20.1 through 909.20.5.

◆ Routine maintenance and testing of smoke control systems is essential to ensure their performance, as designed, under fire conditions. Maintenance

practices must be consistent with the manufacturer's recommendations and as indicated in Sections 909.20.1 through 909.20.5. Note that Section 909.12 requires weekly preprogrammed tests which report abnormal conditions.

909.20.1 Schedule. A routine maintenance and operational testing program shall be initiated immediately after the smoke control system has passed the acceptance tests. A written schedule for routine maintenance and operational testing shall be established.

◆ Operational testing and maintenance must be performed on the smoke control system periodically to verify that it still operates as required by the approved design. A written schedule complying with Section 909.12.2 must be maintained.

909.20.2 Written record. A written record of smoke control system testing and



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maintenance shall be maintained on the premises. The written record shall include the date of the maintenance, identification of the servicing personnel and notification of any unsatisfactory condition and the corrective action taken, including parts replaced.

◆ This section prescribes the desired content of the written record for the smoke control testing and maintenance program. Test results and maintenance activities should be clearly documented. The written record should be available for inspection and reviewed by the fire code official.

909.20.3 Testing.

Operational testing of the smoke control system shall include all equipment such as initiating devices, fans, dampers, controls, doors and windows.

◆ Smoke control systems are made up of components and equipment that are an integral

part of other building systems such as fire alarm systems, heating, ventilating and air-conditioning (HVAC) equipment and automatic sprinkler systems. For this reason, operational testing of all related system components must ensure that the system as a whole will perform as intended.

909.20.4 Dedicated smoke control systems. Dedicated smoke control systems shall be operated for each control sequence semiannually. The system shall also be tested under standby power conditions.

◆ Because dedicated smoke control systems are designed for smoke control only, the operation of these systems does not adversely affect other building systems or operations. The control sequence for these systems must be tested semiannually to check for system component failures that may not get noticed because dedicated smoke control

systems are independent of building HVAC systems.

909.20.5 Nondedicated smoke control systems.

Non-dedicated smoke control systems shall be operated for each control sequence annually. The system shall also be tested under standby power conditions.

◆ Contrary to dedicated smoke control systems identified in Section 909.20.4, smoke control systems that are not dedicated share system components with other building systems including the HVAC system.

Consequently, testing of the control sequence of systems that are not dedicated can be done annually, rather than semiannually, because equipment failures related to other building systems would most likely be noticed and corrected when those other systems were tested or maintained.

Simply because a system is



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nondedicated does not guarantee that failures will be detected easier. This relates to the fact that when a system is in smoke control mode it may have very different demands than when simply

operating as a traditional HVAC system (see commentary, Section 909.12).

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910 SMOKE AND HEAT



The International Code Council, a membership association dedicated to building safety and fire prevention, develops the codes used to construct residential and commercial buildings, including homes and schools. Most U.S. cities, counties and states that adopt codes choose the International Codes developed by the International Code Council.



The Center for Campus Fire Safety

978.961.0410

SupportTeam@campusfiresafety.org