Campus Fire Safety e-NewZone Monthly Newsletter ... January 2015, Volume 4, Issue 1

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WE'RE GETTING READY FOR CAMPUS FIRE FORUM 2015.

Join us in Niagara Falls, New York, October 26 - 29. More information and registration coming soon!

2015 Forum (info to date)
Preliminary Forum Overview | **Exhibit Overview**

2014 Forum (Review)
Photos, Testimonials, Program Guides and more!

FROM THE PRESIDENT

36,000 -- That is the number of minutes we are already into 2015 as I write. Regardless of how much I want to believe that we were just together in sunny Florida at Campus Fire Forum, the weather outside this week provides a cold, harsh dose of reality. Most of us are NOT in Sunny Orlando!

Time continues to tick away – and at a pace much faster than I want to accept. Nevertheless the year is underway and I promise you that it is going to be another great year for our organization ... **MORE**

WELCOME LORRAINE CARLI TO OUR BOARD OF DIRECTORS ...

We are pleased to welcome Lorraine Carli to The Center's Board of Directors.

Lorraine has been a staunch supporters of The Center, our mission, and fire and life safety in general for many years. According to The Center's President, Paul D. Martin, "Lorraine brings valuable experience with non-profit organizations, membership development and of course - public relations, all making her a phenomenal asset for our organization".
Please join us as we welcome Lorraine to The Center's family.

More about Lorraine ... Lorraine is the vice president of Outreach and Advocacy for the National Fire Protection Association where she oversees all media and public affairs activities, editorial content for NFPA's Web sites, the organization's magazine *NFPA Journal*, NFPA's Wildland Fire Operations and Public Education Divisions. ... **MORE**

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Thank you to our New Sponsors in 2015

PREVENT-ZONE by AliveTek

OFF-CAMPUS, by Tim Knisely

HEATING SYSTEMS

Now that winter weather has taken a firm grip in many parts of the country there is an increased risk of a fire involving the heating systems in off-campus buildings. Every year we can find articles or reports from a number of fires that occur are related to the heating system itself, or the misuse of a system. Safety starts with the initial installation being proper and safe. Unfortunately, many of these systems are ancient and we must rely on the technicians being competent and properly trained to maintain these systems in proper working order ... **MORE**

THE INSPECTOR, by Phil Chandler

Baby it's cold outside!

Notwithstanding the raging debate over global warming, I know one thing: For most of us in these 50 states, this will be a winter to remember. In some parts of New York, recent snowfalls have been measured in yards, not feet. Likewise, throughout the country, communities previously exempt from the ravages of winter have had to deal with snow removal for the first time. My first reaction to freaky winter weather is simply put: Big deal. After 61 winters, I've personally become pretty inured to humongous snowfalls. However, professionally, I have learned that accumulations of snow in the wrong places represent genuine life ... **MORE**

WE'RE LOOKING FOR 2015 SPEAKERS!

If you are interested in speaking at our Niagara Falls Forum, and/or a webinar, simply let us know.

Webinar Presenters ... Please click and complete your info.

Forum Speakers ... Please click and complete your info.
(If approved, Forum speakers will receive free registration to the Forum)

If you have questions, please contact **SupportTeam@campusfiresafety.org**

TRAINING OPPORTUNITIES

Chubb Training - The 2015 schedule is now online...

Chubb Offers 30% discount to Members of The Center for Campus Fire Safety or 50% if you are also a Building and Fire Code official or firefighter... **MORE**

Cooking Fire Prevention Education Seminar - FREE!!! (by Guardian Safety Solutions and the Halligan Group)...

Attend this half-day seminar and have your campus, community and housing fire prevention team create an effective Cooking Fire Prevention Program for college students on or off campus as well as for residents in your community. This seminar will help you reduce cooking fires in your campus community.... **MORE**

Fire Smart Campus Training Opportunities ... The Center instructor(s) will come to your campus or town. Price varies depending upon location... **MORE**

Crowd Manager Training ... 2 hour online 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**

CENTER ACTIVITIES

STUDENT COMMITTEE ... **Meet The Center's Student Committee**.

We've identified a team of student from the University of New Haven Fire Science Club that will head our newly formed student committee.

Much more on this new team is coming soon

Off-Campus Fire & Life Safety Alliance is open to all and going strong. **Join us!**
We provide continual discussions about off-campus fire and life safety and we publish a monthly article on this topic that you can download free from our library.

Connect with us ... Join our social networks and discussions on fire and life safety.

LinkedIn | **FaceBook** | **Twitter** | Off-Campus Fire & Life Safety Alliance **Login** | **Join**

CenterNet (A social site for Members) **Login** | **Become a Member**

C+S and more — CODES, STANDARDS & MORE

NFPA 30 and MAQs for Storage of Containers of Flammable / Combustible Liquids
By Bob Benedetti, Principal Engineer, Flammable Liquids, NFPA

[*This is the fourth in a series of articles dealing with flammable and combustible liquids and NFPA 30, Flammable and Combustible Liquids Code. Prior articles are:* ***Safety Cans*** *(August 2011);* ***Flammable Liquids Storage Cabinets*** *(November 2011); and* ***Safe Handling of Flammable and Combustible Liquids*** *(February 2014)*]

The primary fire protection rules for flammable and combustible liquids are embodied in NFPA 30, Flammable and Combustible Liquids Code. The specific requirements that govern storage of containers of liquids can be found in Chapters 9 through 16 of the Code. However, the mere presence of minimal amounts of flammable or combustible liquids does not necessarily invoke NFPA 30's rules. The key here is what is known as the "maximum allowable quantity". The maximum allowable quantity, or MAQ, is a threshold amount of a liquid that marks the boundary between not applying the Code and applying it. Essentially, quantities up to the MAQ are below NFPA 30's ... **MORE**

SECTION 914, FIRE PROTECTION BASED ON SPECIAL DETAILED REQUIREMENTS OF USE & OCCUPANCY

914.1 General. This section shall specify where fire protection systems are required based on the detailed requirements of use and occupancy of the International Building Code.This section is intended to be a duplication of the fire protection system requirements included in Chapter 4 of the IBC located here in a single section ... **MORE**

News

FIRE INCIDENT NEWS | **BREAKING NEWS** | **MASS NOTIFICATION SYSTEMS IN THE NEWS** | **ARCHIVES**

We provide you with continual news updates when they happen .... Click on the links above to fire hundreds of higher education specific new stories ++ ability to search through years of our news archives.

BREAKING NEWS - Click here to Sign up**!**

The Center for Campus Fire Safety provides initial notification about fire fatalities that occur on a university or college campus, or that occurred within the town where the campus is located. This data is collected from news sources from around the country, and many times - around the world, and then emailed to you.

MEMBER NEWS & JOB OPPS .... Want to share? Send your news or job opps to:
SupportTeam@campusfiresafety.org

Job Opps: Fire Protection Specialist, University of Memphis ... **MORE**

Member News:

JENSEN HUGHES
Advancing the Science of Safety

Jensen Hughes Brand Launches after historic merger.

BALTIMORE, MD: Following the merger of Rolf Jensen & Associates (The RJA Group) and Hughes Associates on June 27, 2014, a new company name has emerged - JENSEN HUGHES - for what is now the largest and most experienced specialtyengineering consulting firm in the world. ... **MORE**

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.
Statistics

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**

The Center for Campus Fire Safety
10 State Street
Newburyport, Massachusetts 01950
US

FROM THE PRESIDENT

By Paul D. Martin

January 2015

36,000 -- That is the number of minutes we are already into 2015 as I write.

Regardless of how much I want to believe that we were just together in sunny Florida at Campus Fire Forum, the weather outside this week provides a cold, harsh dose of reality. Most of us are NOT in Sunny Orlando!

Time continues to tick away – and at a pace much faster than I want to accept. Nevertheless the year is underway and I promise you that it is going to be another great year for our organization.

Membership is at an all-time high thanks, in no small part, to the behind the scenes efforts of the headquarters team. I am thrilled to see how The Center is still gaining strength, interest and momentum every day.

Our membership comprises an irrefutably amazing talent pool and it is time for me to tap into it with my annual call for committee volunteers.

I encourage you to step forward and serve – a list of our standing committees and their focus can be found on our website. Working on a committee is a wonderful way to share your knowledge and experience with friends and colleagues from across the country while advancing the mission and impact of The Center.

In furtherance of our mission to provide educational opportunities, we have a great line-up of webinars taking shape for 2015. A solid hit since we first launched them, our webinar series is a cost effective, yet powerful tool that will provide the campus fire safety community a means to remain engaged and up to date on the latest issues, codes and technology necessary to remain success in our dynamic field of work. CCFS webinars are generally interactive where audience members can ask questions with the presenter or other attendees and because they are digital, participants have access to the presentations and materials to review and/or refer to at a later date. I encourage you to check our website often to stay on top of this fabulous educational benefit.

Planning is already underway for our flagship educational event, Campus Fire Forum. Coming to the Great Empire State of New York, I am honored to be hosting the conference this year in beautiful Niagara Falls, October 26-29. So please stay tuned, but plan your travel now, because we're working overtime already to assure that we continue to provide the most informative and exciting campus fire safety conference anywhere. And for those of you who

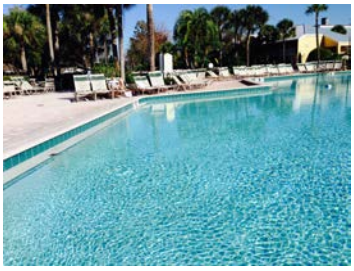
FROM THE PRESIDENT

By Paul D. Martin

January 2015

were in Florida with us --- I haven't forgot my promise!

As I close this month's column, I do so on the eve of my departure for a midwinter vacation.



But as I leave, I do so knowing that our organization is in the very capable, professional and competent hands with the rest of our great Leadership Team and Headquarters staff.

Will be back in late-February (with a tan!)

Paul

Paul Martin, President

Paul D. Martin is Deputy State Fire Administrator 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.

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OFF-CAMPUS

By Tim Knisely

January 2015

Heating Systems:

Now that winter weather has taken a firm grip in many parts of the country there is an increased risk of a fire involving the heating systems in off-campus buildings. Every year we can find articles or reports from a number of fires that occur are related to the heating system itself, or the misuse of a system.

Safety starts with the initial installation being proper and safe. Unfortunately, many of these systems are ancient and we must rely on the technicians being competent and properly trained to maintain these systems in proper working order.

Heating systems, much like other appliances in a dwelling rely on the tenants to understand the operating instructions, as well as the limits of the system. This starts with the landlord properly explaining these instructions. Some may seem simple, such as providing details on how the thermostat works. Or, not to use the furnace room as a storage area to help reduce the risk.

Most heating appliances are designed to withstand a mechanical failure or breakdown without causing a fire. This is done through safety sensors or even the housing of the appliance. Many times when you have a fire caused by a heating system there is typically a secondary contributing factor. These other factors may be storage in close proximity to the furnace. Or, improper clearances of exhaust pipes within the structure. For example, when a gas-fired boiler malfunctions and overheats the exterior housing is designed to contain this heat until the unit shuts down. If there is storage placed up against this exterior housing, the heat can conduct through the housing to the combustible storage causing the fire.

Supplemental heating equipment can also be a concern. First, is this permitted in the lease? Or, are space heaters permitted or limited by the local codes? If space heaters are permitted, landlords must provide instructions on how to safely use the heater, especially how to maintain clearances. Chances are, this is the first time a tenant has used this type of appliance. If space heaters are able to be used only allow the use of electric space heaters. And, prohibit the use of fuel-fired space heaters such as kerosene or wood-burning appliances. These appliances create an unnecessary risk in student housing. For other types of supplemental heating systems refer to the manufacturer's instructions for safe use and maintenance.

Reminder about smoke and CO alarms:

This time of year is also a good time to remind

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By Tim Knisely

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property managers and tenants to test their smoke and carbon monoxide alarms. If maintenance staff are visiting properties to perform maintenance or preventive maintenance, have them test the alarms at this time and make any necessary repairs. Verify the manufacturer date of each alarm and replace as recommended or required by your local codes.

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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THE INSPECTOR

By Phil Chandler

January 2015

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Notwithstanding the raging debate over global warming, I know one thing: For most of us in these 50 states, this will be a winter to remember. In some parts of New York, recent snowfalls have been measured in yards, not feet. Likewise, throughout the country, communities previously exempt from the ravages of winter have had to deal with snow removal for the first time. My first reaction to freaky winter weather is simply put: Big deal. After 61 winters, I've personally become pretty inured to humongous snowfalls. However, professionally, I have learned that accumulations of snow in the wrong places represent genuine life safety hazards.

Every college campus I visit deploys all hands to tackle every snow and ice accumulation. Avoiding schedule disruption is the top priority, followed by concerns for public safety—slip and fall accidents are inconvenient and costly. But mainly, the show must go on. It is, therefore, pretty common to see snow plows on the lacrosse field even as walkways and stairs remain untouched.

More significantly, even the most comprehensive snow removal operations fail to adequately identify and prioritize removing snow from our paths of emergency egress. It is easy to remove snow from around hydrants; they are clearly visible to all.

Likewise, fire department access roads are usually not a problem; after all, they are generally shared roadways and are promptly cleared. But exits—they are a different story.

Many exits, especially those from below grade locations, are simply not on anyone's map. To the

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groundskeeper with shovel in hand, there is no way to know that an infrequently used basement stairwell may one day be the only viable way out of a basement auditorium filling with dense black smoke. Grounds staff are simply that, they spend their days in the great outdoors. They cannot be expected to know the varied interior space utilization of campus buildings. For this snow removal crews need to be guided by detailed plans crafted with the significant input of campus fire protection specialists.

Not only do snow removal plans need to identify paths of egress, they need to assign to them the highest priority. Even if classes and sporting events (less likely) are cancelled for the day, there are still people living on campus, and they need to be able to get out quickly in the event of fire. Let's not forget, fire does not discriminate. It doesn't care if a snow day is an inconvenient time for a surprise visit.

Speaking of subterranean exits; they need to be on the grounds department radar year round, not just in winter. Even moist leaves at the bottom of the stairwell, while always a slip hazard, become as hard as cement when the mercury drops, preventing the opening of exit doors. They need to be regularly swept, and the drain kept open, always.

Similarly, most buildings have above ground doors that are important means of egress, clearly identified on the inside with signage and egress hardware while completely anonymous on the building exterior. There is nothing about a grey slab door without any hardware on the side of a building that indicates that at any moment 500 people might emerge, running for their lives. In many instances these doors are rarely touched in a snowstorm. Even if they were to open, where would the surging mob end up? The whole

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concept of an exit discharge as a safe and unobstructed pathway leading to a public way is not fully understood.

The above problem was not created by the site services department. Often times building designers fail to give exits the respect they deserve. They may provide a skimpy concrete pad barely larger than the door swing at rear and side exits while omitting a paved surface leading evacuees away from a burning building to an area of safety. Designers often assume that all occupants are young and spry, able to navigate all terrain. They also fail to understand that during a fire, glass and other debris often rain down on everybody near the building. We teach everyone to leave the building at the first hint of smoke and fire and to assemble on the outside, well away from danger. We need to make this a possibility.

And let us not forget the constant neglect of fire escapes. Not only do we frequently ignore their regular maintenance year round but we especially turn our backs to them in winter. Yes, they are dinosaurs, relics of a bygone era, but nonetheless, where they are found, they are often the only means of escape when smoke and fire fill interior stairwells and corridors.

Let's face it, where do you think the fire might be, next time? In the brand new Type II fully sprinklered building with multiple vertical exit enclosures, or in the 100 year old balloon construction building with multi- generational wiring—you know, the residence halls valued equally by artists and frat members?

Baby, it's cold outside! But we can't let a long and harsh winter cause us to lose sight of our number one priority on the campus: Assuring that everyone graduates—and gets to go home. If we are to be successful in our mission, it will only be if we guarantee that there are always two ways out of every emergency.

THE INSPECTOR

By Phil Chandler

January 2015

Philip Chandler is a long time firefighter and a fulltime government fire marshal working extensively in the college environment – from large 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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CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

NFPA 30 and MAQs for Storage of Containers of Flammable / Combustible Liquids

By Bob Benedetti, Principal Engineer, Flammable Liquids, NFPA

[This is the fourth in a series of articles dealing with flammable and combustible liquids and NFPA 30, *Flammable and Combustible Liquids Code*. Prior articles are: *Safety Cans* (August 2011); *Flammable Liquids Storage Cabinets* (November 2011); and *Safe Handling of Flammable and Combustible Liquids* (February 2014)]

The primary fire protection rules for flammable and combustible liquids are embodied in NFPA 30, *Flammable and Combustible Liquids Code*. The specific requirements that govern storage of containers of liquids can be found in Chapters 9 through 16 of the *Code*. However, the mere presence of minimal amounts of flammable or combustible liquids does not necessarily invoke NFPA 30's rules. The key here is what is known as the "maximum allowable quantity". The maximum allowable quantity, or MAQ, is a threshold amount of a liquid that marks the boundary between not applying the *Code* and applying it. Essentially, quantities up to the MAQ are below NFPA 30's radar; these quantities can be present without having to apply the provisions of the

Code. (Although, presumably, the safe handling procedures described in the February 2014 article are used.).

The MAQs are given in two tables in Section 9.6 of NFPA 30: Table 9.6.1 for mercantile, industrial, and storage occupancies; and Table 9.6.2.1 for all other occupancies. Both are shown below. The tables give the MAQs for the several classes of flammable and combustible liquids. For simplicity's sake, the tables do not show sub-classes of Class I.

Abridged Version of Table 9.6.1

	Liquid Class	Flash Point Range	MAQ per Control Area
Flammable Liquids	I	below 100°F / 38°C	120 gal.
Combustible Liquids	II	100°F up to 140°F/ 38°C to 60°C	120 gal.
	IIIA	140°F up to 200°F/ 60°C to 93°C	330 gal.
	IIIB	200°F / 60°C and higher	13,200 gal.

CAMPUS FIRE SAFETY CODE TALK

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Table 9.6.2.1

Liquid Class	MAQ per Control Area
I and II	10 gal.
IIIA	60 gal.
IIIB	120 gal.

For Table 9.6.1, the following adjustments to the MAQs can be made:

- Each MAQ can be doubled if all liquids are stored in safety cans or in flammable liquids storage cabinets.

- Each MAQ can be doubled if the building is protected throughout with an automatic sprinkler system compliant with NFPA 13, *Standard for the Installation of Sprinkler Systems*.

- These two doubling factors can be applied accumulatively.

For Table 9.6.2.1, adjustments work differently:

- The MAQs for Classes I and II liquids and for Class IIIA liquids can be increased if the liquids are stored in flammable liquids storage cabinets. However, the total aggregate amount cannot exceed 180 gallons.

- For ambulatory health care, day care, educational, and health care occupancies, the MAQ for Class IIIB liquids can be increased 100 percent, if the building is protected throughout with an automatic sprinkler system installed in accordance with NFPA 13.

Consider a maintenance building on a university campus. Such a building would be classified as an industrial occupancy and Table 9.6.1 would govern. The building is not attached to any other building and is not sprinklered, but the solvents, cleaning agents, paints, etc. are kept in flammable liquids storage cabinets, so the doubling factor is in play. Table 9.6.1, therefore, allows storage of 240 gallons each of Classes I and II liquids and 660 gallons of Class IIIA.

Now consider a single story administration building on the same campus. Table 9.6.2.1 above rather severely restricts the quantities of liquids, unless all are kept in flammable liquids storage cabinets. The difference between the two examples reflects two things: the maintenance building is a more controlled environment and

has fewer occupants than is and does the administration building. Evacuating the former is not as great an issue as the latter. And, the personnel in the maintenance building are knowledgeable in the handling and use of the liquids therein. For these reasons, it is appropriate and reasonable that the more restrictive of the two tables applies to the administration building.

Note that the MAQs given in the tables above are for each individual *control area* of the building. In our examples above, each building is a single control area. A control area is a building or portion of a building that contains certain materials, like flammable and combustible liquids, in quantities that do not exceed the MAQ. Think of a control area as a special type of fire area. Section 9.7 of NFPA 30 sets the rules for applying the concept of control area to MAQs for liquids. It stipulates that each control area must be separated from adjacent areas by a fire barrier. The number of control areas allowed for each story of a building and the required hourly rating of the separating fire barriers are governed by Table 9.7.2 of the *Code*, which is identical to Table 34.2.5.1.1 of NFPA 5000™. The fire barrier is a complete envelope around the control area; it includes the walls and floor/ceiling assemblies. A variation of Table 9.7.2 is shown below.

CAMPUS FIRE SAFETY CODE TALK

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Abridged Version of Table 9.7.2

Floor Level	Percent of MAQ given in 9.6	Control Areas per Floor	Hourly Rating for Fire Barriers, hr.
>9	5	1	2
7 – 9	5	2	2
4 – 6	12.5	2	2
3	50	2	1
2	75	3	1
1 (grade)	100	4	1
(levels below grade)			
1		3	1
2		2	1

Class II and III liquids are prohibited from below grade levels lower than Level 2. Flammable liquids are prohibited from any basement area. See Subsections 9.3.6, 9.3.7, and 9.3.8 of the *Code*.

CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

Let's return to our university campus and look at a six-story administration building, apply Tables 9.6.2.1 and 9.7.2, and create a *new* table that shows how much of each class of liquid is allowed in each control area. In the following table, the quantities for the classes of liquid are for a single control area. The "Total Quantity" is the aggregate gallons of *all* the liquids — all classes, all control areas.

Floor Level	Control Areas per Floor	Fire Separation, hrs.	No. of Control Areas	%age Factor	Quantity Classes I & II, gal.	Quantity Class IIIA, gal.	Quantity Class IIIB, gal.	Total Quantity on Floor, gal.
4 – 6	2	2	2	0.125	1.25	7.5	15	47.5
3	2	1	2	0.5	5	30	60	190
2	3	1	3	0.75	7.5	45	90	427.5
1	4	1	4	1.00	10	60	120	760

The arithmetic is straightforward. For floors 4 through 6, the total gallons allowed for each floor is the sum of the MAQs for each liquid class multiplied by the percentage factor multiplied by the number of control areas:

CAMPUS FIRE SAFETY CODE TALK

Campus Fire Safety e-NewZone

(10 + 60 + 120) **X** 0.125 **X** 2 = 47.5 gallons

Although some of the numbers for total quantity look formidable, it is highly unlikely these limits would actually be required.

The concepts of the maximum allowable quantity and control areas were introduced with the 2008 edition of NFPA 30, with the objective of correlating with the use of these concepts in NFPA 1, *Fire Code*™, NFPA 5000™, *Building Construction and Safety Code*™, and other building and fire prevention codes.

The Center for Campus Fire Safety 978.961.0410 SupportTeam@campusfiresafety.org

ICC CODE CORNER
2012 IFC Code & Commentary

SECTION 914

FIRE PROTECTION BASED ON SPECIAL DETAILED

REQUIREMENTS OF USE AND OCCUPANCY

914.1 General. This section shall specify where fire protection systems are required based on the detailed requirements of use and occupancy of the International Building Code.

◆This section is intended to be a duplication of the fire protection system requirements included in Chapter 4 of the IBC located here in a single section of the code for ease of access by the user. It is organized based on the type of facility rather than the type of fire protection system required. Frequently, reference is made to other sections of the code where the requirements are to be found. Occasionally, administrative requirements are noted that do not appear in other sections. In all cases, the referenced section must be reviewed carefully since this section is intended to be subordinate to the main requirements found elsewhere in the code.

914.2 Covered and open mall buildings. Covered and open mall buildings shall comply with Sections 914.2.1 through 914.2.4.

◆Various fire protection-related code sections from Section 402 of the IBC are included in the code so that the fire code official has convenient access to the necessary tools to address conditions and monitor new construction requirements related to fire protection systems in covered and open mall buildings. Not all covered and open mall provisions are included here. Specific information regarding kiosk placement, types of signage and other concerns are located in the IBC and can be consulted when the fire code official reviews the covered mall building. Although those provisions are not included here, they address issues that can have an adverse effect on the safety of occupants in the covered or open mall building.

914.2.1 Automatic sprinkler system. Covered

and open mall buildings and buildings connected shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1, which shall comply with the all of the following:

1. The automatic sprinkler system shall be complete and operative throughout occupied space in the mall building prior to occupancy of any of the tenant spaces. Unoccupied tenant spaces shall be similarly protected unless provided with approved alternative protection.

2. Sprinkler protection for the mall of a covered mall building shall be independent from that provided for tenant spaces or anchor buildings.

3. Sprinkler protection for the tenant spaces of an open mall building shall be independent from that provided for anchor buildings.

4. Sprinkler protection shall be provided beneath exterior circulation balconies located adjacent to an open mall.

5. Where tenant spaces are supplied by the same system, they shall be independently controlled.

Exception: An automatic sprinkler system shall not be required in spaces or areas of open parking garages separated from the covered or open mall in accordance with Section 402.4.2.3 of the International Building Code and constructed in accordance with Section 406.5 of the International Building Code.

◆The requirement for an automatic sprinkler system is found in Section 402.5 of the IBC. This reference pro vides the fire code official with the information and tools in order to work jointly with the building official in applying the sprinkler requirement for a covered and open mall building. The covered or open mall building and connected buildings, such as anchor buildings, must be protected with an automatic sprinkler system to protect life and property effectively. As has been discussed throughout the section, numerous allowances (such as reduced tenant separations and elimination of area limitations) are based on the effectiveness of the automatic sprinkler system.

The sprinkler system is to be designed, installed,

tested and maintained in accordance with Chapter 9 and NFPA 13. Additionally, the system must be installed such that any portion serving tenant spaces in a covered mall building may be shut down independently without affecting the operation of the systems protecting the mall area. This special feature is in recognition of the frequent need to shut down the system so that changes can be made to it as a result of tenant improvements and modifications.

In an open mall building, the sprinkler systems for the tenant spaces are to be separate from those provided for the anchor buildings. It is necessary that sprinkler protection for open mall buildings be extended to the underneath side of pedestrian walkways and exterior balconies used for circulation and egress purposes. Although the open mall itself requires no sprinkler protection, it is important that those areas below overhead walkways be provided with sprinklers.

Section 909.12.3 requires operation of the sprinkler system to activate automatically the mechanical smoke control system (where an automatic control system is utilized). It is imperative that the zoning of the sprinkler system match the zoning of the smoke control system. This is necessary so that the area where water flow has occurred will also be the area from which smoke is removed.

The exception clarifies that sprinkler protection need not be extended to complying open parking garages that are adequately separated from the covered mall building, open mall building or anchor store. The allowance is consistent with the automatic sprinkler provisions of Section 903.2 where no sprinkler protection is required in open parking garages based on a Group S-2 occupancy classification.

914.2.2 Standpipe system. The covered and open mall building shall be equipped throughout with a standpipe system as required by Section 905.3.3.

◆ The standpipe requirements for covered and open mall buildings exist in the code, as well

as in Section 402.7.1 of the IBC, which refers to Section 905 for the requirements. For additional information regarding the requirements, see the commentary for Section 905.3.3.

914.2.3 Emergency voice/alarm communication system. Where the total floor area exceeds 50,000 square feet (4645 m2) within either a covered mall building or within the perimeter line of an open mall building, an emergency voice/alarm communication system shall be provided. Emergency voice/alarm communication systems serving a mall, required or otherwise, shall be accessible to the fire department. The system shall be provided in accordance with Section 907.5.2.2.

◆This section is identical to Section 402.7.4 of the IBC. In covered and open mall buildings, there is a need to be able to control the large number of people that may be present. This can best be done when specific instructions are conveyed. Covered and open malls that are less than 50,000 square feet (4645 m2 in area are not required to be provided with an emergency voice alarm system. If a public address system is provided in a smaller mall, it can serve the same purpose. See the commentary to Section 907.5.2.2 for additional information.

914.2.4 Fire department access to equipment. Rooms or areas containing controls for air-conditioning systems, automatic fire-extinguishing systems, automatic sprinkler systems or other detection, suppression or control elements shall be identified for use by the fire department.

◆ Section 402.7.5 of the IBC also states this requirement. The intent is that the fire department be able to access those systems that are critical to fire protection as well as those parts of the mechanical system that can aid in control of the ventilation system to use as conditions warrant. The text is included here so that the fire code official has a means for applying the requirement and approving the means by which identification of the rooms or areas will be provided.

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914.3 High-rise buildings. High-rise buildings shall comply with Sections 914.3.1 through 914.3.5.

◆High-rise buildings have unique challenges that set them apart from other buildings. Section 403 of the IBC establishes multiple fire protection requirements for such buildings.

914.3.1 Automatic sprinkler system. Buildings and structures shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1 and a secondary water supply where required by Section 903.3.5.2.

Exception: An automatic sprinkler system shall not be required in spaces or areas of:

1. Open parking garages in accordance with Section 406.5 of the International Building Code.

2. Telecommunications equipment buildings used exclusively for telecommunications equipment, associated electrical power distribution equipment, batteries and standby engines, provided that those spaces or areas are equipped throughout with an automatic fire detection system in accordance with Section 907.2 and are separated from the remainder of the building by not less than 1-hour fire barriers constructed in accordance with Section 707 of the International Building Code or not less than 2-hour horizontal assemblies constructed in accordance with Section 711 of the International Building Code, or both.

◆ In order to provide protection for occupants and fire fighters, high-rise buildings are required to be equipped with an automatic sprinkler system. There are two exceptions that allow sprinkler protection to be omitted.

Exception 1 is for an open parking garage that is a part of the high-rise building. This exception recognizes the relatively low life safety threat posed by fires in open parking garages. Additional information on open parking garages can be obtained in the commentary for Section 406 of the IBC.

Exception 2 acknowledges the water sensitivity of telecommunications systems. See commentary to the same exception in

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Section 903.2.

914.3.1.1 Number of sprinkler risers and system design. Each sprinkler system zone in buildings that are more than 420 feet (128 m) in height shall be supplied by a minimum of two risers. Each riser shall supply sprinklers on alternate floors. If more than two risers are provided for a zone, sprinklers on adjacent floors shall not be supplied from the same riser.

◆The intent of this section is to increase the reliability of automatic sprinkler systems in very tall buildings, i.e., those that exceed 420 feet in height, by requiring a minimum of two risers for each sprinkler system zone. The difficulty of fighting fires in very tall buildings ranges from difficult to virtually impossible with the sprinkler system impaired. Accordingly, the reliable functioning of sprinkler systems is critical. Various events could cause a sprinkler riser to be impaired, thereby leaving the structure vulnerable to fire. The NIST World Trade Center (WTC) Report documented that the proximate cause of the buildings collapse was a building contents fire that raged out of control, in part at least, because the building's automatic sprinkler systems were nonfunctional due to the initial aircraft attack. Events far less dramatic could knock out or make a sprinkler riser inoperative, thereby leaving the structure highly vulnerable to fire.

Recommendation 12 of the NIST WTC report calls for the redundancy of active fire suppression systems to be increased to accommodate the greater risks associated with increased building height and population. This section seeks to do that by requiring two risers service, the other will be able to supply sprinklers on the floors above and below. This will impede any fire spread and allow the fire department time to respond and extinguish the fire. At the Meridian Plaza fire in Philadelphia, the further spread of an out of control fire occurring on floors not protected by sprinklers was prevented by the operation of ten sprinklers when the fire reached a floor which had been retrofitted with sprinklers.

914.3.1.1.1 Riser location. Sprinkler risers shall be placed in interior exit

stairways and ramps that are remotely located in accordance with Section 1015.2.

◆This section requires the sprinkler risers to be located in protected interior exit stairways and ramps and specifies a separation distance to reduce the possibility that one incident could incapacitate both risers which is consistent with the approach used in the code for interior exit stairway separation. See commentary to Section 1015.2.

914.3.1.2 Water supply to required fire pumps. Required fire pumps shall be supplied by connections to a minimum of two water mains located in different streets. Separate supply piping shall be provided between each connection to the water main and the pumps. Each connection and the supply piping between the connection and the pumps shall be sized to supply the flow and pressure required for the pumps to operate.

Exception: Two connections to the same main shall be permitted provided the main is valved such that an interruption can be isolated so that the water supply will continue without interruption through at least one of the connections.

◆This section requires fire pumps to be fed from two water mains in separate streets. This will greatly reduce the possibility of the loss of water due to a main break, given the valving which is a feature of public water systems with the goal of providing redundancy. The exception provides performance language which is not unique to a specific configuration (looped or gridded system).

It is interesting to note that existing standards for water mains in residential subdivisions call for looping and valving to ensure that no more than 20 homes could be cut off by a water main break. Such a break would create a fire suppression risk for 4 people (the average occupancy of one home) or no more than 80 people (assuming all 20 homes catch fire). In contrast, the code previously did not require looping and valving to isolate failure in buildings that might contain 10,000 occupants. This new section corrects

that disparity.

914.3.2 Fire alarm system. A fire alarm system shall be provided in accordance with Section 907.2.13.

◆See the commentary to Section 907.2.13.

914.3.3 Automatic smoke detection. Smoke detection shall be provided in accordance with Section 907.2.13.1.

◆Section 907.2.13 indicates specific locations where smoke detection is required for a high-rise building. These requirements are due to the fact that the building is a high rise and not necessarily dependent upon the occupancy within. There may be additional requirements in other sections of the code that require specific detection due to the occupancy.

914.3.4 Emergency voice/alarm communication system. An emergency voice/alarm communication system shall be provided in accordance with Section 907.6.2.2.

◆Due to the size of high-rise buildings, an emergency voice/alarm communication is required so that specific commands can be given as necessary. See the commentary to Sections 907.2.13 and 907.5.2.2 for additional information.

914.3.5 Emergency responder radio coverage. Emergency responder radio coverage shall be provided in accordance with Section 510.

◆The provisions of Section 510 are concerned with the reliability of portable radios used by emergency responders inside of buildings. This is in keeping with the philosophy inherent in the I-Codes that, when a facility grows too large or complex for effective fire response, fire protection features must be provided within the building. See the commentary to Section 510 (and its companion Appendix J) for complete information on this topic.

914.3.6 Fire command. A fire command center complying with Section 508 shall be provided in a location approved by the

fire department.

◆Section 508 of the code contains the same information as Section 911 of the IBC on this subject. The fire command center must be always accessible to the fire service. See the commentary to Section 508 for additional information.

914.4 Atriums. Atriums shall comply with Sections 914.4.1 and 914.4.2.

◆Atriums are addressed in Section 404 of the IBC, which identifies several fire protection systems that must be included in atriums. It is important to remember that these are requirements that are unique to the specific condition noted and the fire protection systems are a result of those conditions. These requirements are only partially related to the occupancies that may be present.

914.4.1 Automatic sprinkler system. An approved automatic sprinkler system shall be installed throughout the entire building.

Exceptions:

1. That area of a building adjacent to or above the atrium need not be sprinklered, provided that portion of the building is separated from the atrium portion by not less than a 2-hour fire barrier 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.

2. Where the ceiling of the atrium is more than 55 feet (16 764 mm) above the floor, sprinkler protection at the ceiling of the atrium is not required.

◆Due to the possibility that smoke and fire could spread through an unprotected vertical opening, an automatic sprinkler system is required when an atrium is present in a building and must be installed throughout the building as a preventive measure. If, however, the atrium is treated as a shaft and provided with a 2-hour enclosure, only the atrium itself must be sprinklered.

The assumption in Exception 1 is that the passive protection systems that isolate the atrium would be sufficient to

compensate for the limited sprinkler coverage and be an acceptable alternative to sprinklers throughout the building.

Exception 2 allows for the omission of sprinklers in tall spaces for two reasons. First, due to the entrainment of cooler ambient air in the flame plume, the likelihood that sprinklers will activate diminishes greatly with increased atrium ceiling height. Secondly, the effectiveness of the sprinkler water discharging from such heights is also substantially diminished.

914.4.2 Fire alarm system. A fire alarm system shall be provided where required by Section 907.2.14.

◆See the commentary for Section 907.2.14.

914.5 Underground buildings. Underground buildings shall comply with Sections 914.5.1 through 914.5.5.

◆Section 405 of the IBC contains requirements for underground buildings. The fire protection features necessary for this type of building are also found elsewhere in this chapter but are reiterated in the following sections. Underground buildings present unique hazards in that the path of egress is upward, in the same direction as vertical fire movement. Fires in such buildings are also more challenging for fire fighters since there is no opportunity for an exterior fire attack. See the commentary for Section 405 of the IBC for additional information.

914.5.1 Automatic sprinkler system. The highest level of exit discharge serving the underground portions of the building and all levels below shall be equipped with an automatic sprinkler system installed in accordance with Section

903.3.1.1. Water-flow switches and control valves shall be supervised in accordance with Section 903.4.

◆Underground buildings have occupiable levels that are more than 30 feet (9144 mm) below the lowest level of exit discharge. This requirement from the IBC indicates that sprinklers are required for the portions of the building

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that are below ground and the story at the highest level of exit discharge. The provision does not require sprinklers for any stories that may be above the highest level of exit discharge. If sprinklers were required for those areas, it would be due to provisions in other sections of the code. In some respects, this is an expansion of the general provisions for windowless stories in Section 903.2.11.1.

914.5.2 Smoke control system. A smoke control system is required to control the migration of products of combustion in accordance with Section 909 and provisions of this section. Smoke control shall restrict movement of smoke to the general area of fire origin and maintain means of egress in a usable condition.

◆One common application for an underground building is to use excavated caverns for storage. In such a condition, there is no roof from which the fire service can attempt to vent the "building." Because occupants must egress in the same direction that smoke will vent itself, and because there are few, if any, openings by which to vent smoke to the exterior, the need for smoke control is greater than for traditional buildings. This section adds a degree of clarity to the design requirements of Section 909 in that the intent is to contain smoke to the general area of origin. Any method identified in Section 909 can be used, given that the intent is to allow for egress and limit smoke spread to areas of the building that are not involved in the fire event. See Section 909 for additional commentary on smoke control.

914.5.3 Compartment smoke control system. Where compartmentation is required by Section 405.4 of the International Building Code, each compartment shall have an independent smoke-control system. The system shall be automatically activated and capable of manual operation in accordance with Section 907.2.18.

◆When buildings contain levels that are more than 60 feet below the lowest level of exit discharge, Section 405.4.1 of the IBC requires that there be at least two fire-resistance-rated compartments per floor and of approximately the same

size. Because compartmentation exists, there is a need for additional safety with the smoke control system. Consequently, each compartment must have a smoke control system that is independent of that in the adjoining compartment. The word "independent" means that there can be no sharing of ductwork, mechanical equipment or power distribution. Connection to the standby system can be shared since that is consistent with the general intent of the smoke control system provisions in Section 909 and the IMC. See the commentary to Section 405.4 of the IBC.

914.5.4 Fire alarm system. A fire alarm system shall be provided where required by Sections 907.2.18 and 907.2.19.

◆The threshold for requiring the fire alarm system is the same as that for compartmentation—an occupied floor level more than 60 feet (18 288 mm) below the level of exit discharge. The fire alarm requirements include the requirements for an emergency voice/alarm communication system. See the commentary to Sections 907.2.18 and 907.2.19 for additional information.

914.5.5 Standpipe system. The underground building shall be provided throughout with a standpipe system in accordance with Section 905.

◆Section 905.3.1 requires a standpipe system when the building's lowest level is more than 30 feet (9144 mm) below the lowest level of fire department access. By definition, an underground building is one in which the lowest level is more than 30 feet (9144 mm) below the lowest level of exit discharge. One condition uses fire department vehicle access as the benchmark while the other uses the level of exit discharge. Care must be taken so that both conditions are addressed when determining standpipe system requirements for buildings that have levels below ground.

914.6 Stages. Stages shall comply with Sections 914.6.1 and 914.6.2.

◆Section 410 of the IBC contains definitions and

requirements for both stages and platforms. A stage, however, is a special condition according to the IBC.

It does not mean, for example, that an elevated platform in the front of the banquet hall is intended to be regulated the same as a stage. The term “stage,” as used here, is traditionally considered a “legitimate stage” –one with scenery drops and a gridiron above.

See the commentary to Section 410 of the IBC for further information.

914.6.1 Automatic sprinkler system. Stages shall be equipped with an automatic sprinkler system in accordance with Section 903.3.1.1. Sprinklers shall be installed under the roof and gridiron and under all catwalks and galleries over the stage. Sprinklers shall be installed in dressing rooms, performer lounges, shops and storerooms accessory to such stages.

Exceptions:

1. Sprinklers are not required under stage areas less than 4 feet (1219 mm) in clear height utilized exclusively for storage of tables and chairs, provided the concealed space is separated from the adjacent spaces by not less than 5 /8 -inch (15.9 mm) Type X gypsum board.

2. Sprinklers are not required for stages 1,000 square feet (93 m2) or less in area and 50 feet (15 240 mm) or less in height where curtains, scenery or other combustible hangings are not retractable vertically. Combustible hangings shall be limited to a single main curtain, borders, legs and a single backdrop.

3. Sprinklers are not required within portable orchestra enclosures on stages.

◆Stages contain significant quantities of combustible materials stored in, around and above the stage that are located in close proximity to large quantities of lighting equipment (i.e., scenery and lighting above the stage). There also is scenery on the sides and rear of the stage; shops located along the back and sides of the stage and storage, props, trap doors and lifts under the stage floor. This combination of fuel load and ignition sources increases the

potential for a fire. As such, stages and accessory areas, such as dressing rooms, workshops and storerooms, are required to be protected with an automatic sprinkler system (see commentary, IBC Section 410.6).

Both of the exceptions are intended to be applied where the building would not otherwise be required to be provided with sprinklers. If the building must be sprinklered throughout then the two exceptions are moot. Sprinkler installations must be in accordance with NFPA 13 and placed as required by that standard.

Exception 1 allows simple storage in the space below the stage, a space traditionally used for table and chair storage. The space must be compartmentalized so that a minimal thermal barrier is provided between the stored material and the areas outside the space. If the height of the space exceeds 4 feet (1219 mm) or the materials stored are other than those associated with table and chair storage, then sprinklers must be provided.

Exception 2 recognizes that small stage settings do not pose the same risk as larger stages. In schools where the stage may only be an elevated portion at the end of the cafeteria, for example, the exception gives a basis for determining whether sprinkler protection is required or not. If scenery is simply manually set in place or moved horizontally, the large fuel loads associated with stages is not present.

914.6.2 Standpipe system. Standpipe systems shall be provided in accordance with Section 905.

◆Due to the historic fires on stages of theaters, the code requires that a standpipe system be provided for all stages greater than 1,000 square feet (93 m2) in area. The design requirements are dependent on the extent of sprinkler protection. See the commentary to Section 905.3.4 for additional information about the standpipe requirements.

914.7 Special amusement buildings. Special amusement buildings shall comply with Sections 914.7.1 and 914.7.2.

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◆A special amusement building is one in which the egress is not readily apparent, is intentionally confounded or is not readily available. Due to those characteristics, special fire protection features are required. See the commentary to Section 411 of the IBC for additional information about these types of facilities.

914.7.1 Automatic sprinkler system. Special amusement buildings shall be equipped throughout with an automatic sprinkler system in accordance with Section 903.3.1.1. Where the special amusement building is temporary, the sprinkler water supply shall be of an approved temporary means.

Exception: Automatic sprinklers are not required where the total floor area of a temporary special amusement building is less than 1,000 square feet (93 m2) and the travel distance from any point to an exit is less than 50 feet

(15 240 mm).

◆ Special amusement buildings do not normally have a readily identifiable means of egress. Consequently additional time for safe egress may be necessary. A sprinkler system will minimize the potential hazard to occupants by controlling fire development (see commentary, IBC Section 411).

914.7.2 Automatic smoke detection. Special amusement buildings shall be equipped with an automatic smoke detection system in accordance with Section 907.2.12.

◆ Section 907.2.12 indicates that a smoke detection system is required for special amusement buildings. See the commentary to Section 907.2.12 for additional information.

914.8 Aircraft-related occupancies. Aircraft-related occupancies shall comply with Sections 914.8.1 through 914.8.5.

◆Aircraft related occupancies include air traffic control towers, residential and commercial hangars and heliports and helistops. Hangars can be those for storage and “parking” of the aircraft or for repair and painting. All of these are addressed in Section 412 of the IBC.

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While the following provisions do not identify fire protection requirements for heliports and helistops, Section 412.7 of the IBC requires that these facilities be designed in accordance with NFPA 418. That standard contains various provisions for fire protection including a foam fire-extinguishing system for rooftop landing pads and portable fire extinguishers.

Section 1107 of the code contains fire protection requirements for helistops and heliports. Section 905.3.6 requires a standpipe system for helistops and heliports. Additional requirements for portable fire extinguishers in aviation facilities can be found in Section 1105 of the code.

914.8.1 Automatic smoke detection systems. Airport traffic control towers shall be provided with an automatic smoke detection system installed in accordance with Section 907.2.22.

◆ Airport traffic control towers are required to have an automatic fire detection system. Because the tower is designed so that people are elevated in the air, the vertical supports generally are narrow and contain little room for separated stairways. An early notification of a fire hazard is important in alerting the occupants so that fire safety operations can be begun as quickly as possible. An automatic detection system is therefore required. Suppression is not required by the code and may not be provided. Consequently, the detection system is vital for the safety of the occupants. No requirements are included in Chapter 11 of the code to address airport traffic control towers.

914.8.2 Fire suppression. Aircraft hangars shall be provided with a fire suppression system designed in accordance with NFPA 409, based upon the classification for the hangar given in Table 914.8.2.

Exception: When a fixed base operator has separate repair facilities on site, Group II hangars operated by a fixed base operator used for storage of transient aircraft only shall have a fire suppression system, but the system shall be exempt from foam

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requirements.

◆To minimize the fire hazards associated with aircraft hangars, most hangars are required to be protected with a fire suppression system. Where required, the fire suppression system must be designed and installed in accordance with the referenced standard, NFPA 409 which requires fire suppression based on the type and construction and the activities in a given hanger.

In the standard, the suppression requirements are broken down based on three categories: Group I, Group II and Group III hangars. Table 914.8.2 designates which Group designation applies to various sizes of fire areas within a hangar and the type of construction. For example a hanger which is 28,000 square feet (2601 m2) in Type IIB construction would be a Group II hangar. Groups I and II hangers are required to have fire suppression as specified the NFPA 409. In general Group III hangers are exempt from providing fire suppression unless one (or more) of the hazardous operations listed in Section 914.8.2.1 occurs within the hangar. In these situations fire suppression based on the appropriate portion of the standard for either Group I or Group II is required.

The exception allows for Group II hangers that the foam requirements for fire suppression do not need to be provided if the hangar is essentially a parking garage for transient aircraft. The exception is only applicable where a larger airport facility has multiple hangars and separate hangars for repair operations.

TABLE 914.8.2. See below.

◆ This table is a correlation of the NFPA 409 construction and area limits with the IBC construction type requirements. It combines several tables in NFPA

409 into a single table that allows determination of the group type for aircraft hangars based on construction type and area before proceeding to the standard for the suppression requirements. Note a indicates that, regardless of size or construction type, any hangar with a door opening greater than 28 feet high (8534 mm) is

required to have a fire suppression system as required for a Group I hangar. Note c provides a Group IV designation for any hangar located in a membrane structure.

914.8.2.1 Hazardous operations. Any Group III aircraft hangar according to Table 914.8.2 that contains hazardous operations including, but not limited to, the following shall be provided with a Group I or II fire suppression system in accordance with NFPA 409 as applicable:

1. Doping.

2. Hot work including, but not limited to, welding, torch cutting and torch soldering.

3. Fuel transfer.

4. Fuel tank repair or maintenance not including defueled tanks in accordance with NFPA 409, inerted tanks or tanks that have never been fueled.

5. Spray finishing operations.

6. Total fuel capacity of all aircraft within the unsprinklered single fire area in excess of 1,600 gallons (6057 L).

7. Total fuel capacity of all aircraft within the maximum single fire area in excess of 7,500 gallons (28 390 L) for a hangar equipped throughout with an automatic sprinkler system installed in accordance with Section

903.3.1.1.

◆ Any of the operations listed in this section where they are happening in a Group III hangar will require some level of fire suppression under NFPA 409. The hazardous operations on the list are straight forward.

Additional information may be found as follows: Item 1 is discussed further in Section 914.8.3; Item 2 is regulated by Chapter 35; Items 3 and 4 are regulated by Chapter 57; Item 5 is regulated by Chapter 24.

914.8.2.2 Separation of maximum single fire areas. Maximum single fire areas established in accordance with hangar classification and construction type in Table 914.8.2 shall be separated by 2-hour fire walls constructed in accordance with Section 706 of the International Building Code. In determining the maximum single fire area as set forth in Table 914.8.2, ancillary uses

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which are separated from aircraft servicing areas by a minimum of a 1-hour fire barrier constructed in accordance with Section 707 of the International

Building Code shall not be included in the area.

to establish fire areas than stay within the limits. This section is more stringent than the definition of "Fire areas" which allows fire barriers to establish a fire area. For hangers, the fire areas must be created by exterior walls of a building or a combination

maintenance shops and storage areas. The fire suppression requirements contained within NFPA 409 are primarily focused on the protection of aircraft within the servicing and storage area. The fire protection requirements in the ancillary areas are not as

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TABLE 914.8.2
HANGAR FIRE SUPPRESSION REQUIREMENTS[a,b,c]

MAXIMUM SINGLE FIRE AREA (square feet)	INTERNATIONAL BUILDING CODE TYPE OF CONSTRUCTION								
	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB
> 40,001	Group I	Group I	Group I	Group I	Group I	Group I	Group I	Group I	Group I
40,000	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II
30,000	Group III	Group II	Group II	Group II	Group II	Group II	Group II	Group II	Group II
20,000	Group III	Group III	Group II	Group II	Group II	Group II	Group II	Group II	Group II
15,000	Group III	Group III	Group III	Group II	Group III	Group II	Group III	Group II	Group II
12,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group II	Group II
8,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group II
5,000	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group III	Group III

For SI: 1 square foot = 0.0929 m^2, 1 foot = 304.8 mm.
a. Aircraft hangars with a door height greater than 28 feet shall be provided with fire suppression for a Group I hangar regardless of maximum fire area.
b. Groups shall be as classified in accordance with NFPA 409.
c. Membrane structures complying with Section 3102 of the *International Building Code* shall be classified as a Group IV hangar.

Table 914.8.2 places a maximum size limit on hangars based on type of construction. For a hangar structure to exceed these sizes requires the construction of fire walls

of exterior walls and fire walls. Note that there is some allowance for the use of fire barriers to create fire areas when separating ancillary uses such as business offices,

extensive as those required for the aircraft servicing and storage areas and less restrictive separations are considered appropriate. This allowance is

consistent with NFPA 409 requirements.

914.8.3 Finishing. The process of "doping," involving the use of a volatile flammable solvent, or of painting shall be carried on in a separate detached building equipped with automatic fire-extinguishing equipment in accordance with Section 903.

◆Doping is a type of lacquer used to protect, waterproof and make taut cloth surfaces of airplane wings. It is used on lighter-than-air, ultra-light and some light aircraft. It is essentially painting on fabric. Doping is not used on metallic surfaces; however, the use of flammable paints is also addressed in this section. When flammable finishes are applied, the process must occur in a separate building not attached to the hangar. Because the code text refers to Section 903 the intent is for an automatic sprinkler system to be installed, unless otherwise approved (see commentary, IBC Section 412.4.5).

914.8.4 Residential aircraft hangar smoke alarms. Smoke alarms shall be provided within residential aircraft hangars in accordance with Section 907.2.21.

◆A residential aircraft hangar, as defined in Section 412.2 of the IBC, is ". . . an accessory building less than 2,000 square feet (186 m2) and 20 feet (6096 mm) in height, constructed on a one- or two-family residential property where aircraft are stored. . ." The requirements for the residential hangar are very similar to that for a residential garage. The hangar can be either detached or attached. If attached, it must be separated from the dwelling by construction with not less than a 1-hour fire-resistance rating. Section 907.2.21 requires a minimum of one smoke alarm in a residential aircraft hangar. See the commentary to Section 907.2.21 for additional information.

914.8.5 Aircraft paint hangar fire suppression. Aircraft paint hangars shall be provided with fire suppression as required by NFPA 409.

◆To minimize the fire

hazards associated with aircraft paint hangars, all such buildings are required to be protected with a fire suppression system. This requirement is applicable regardless of the size of the hangar in terms of height or area or the types and quantities of aircraft that are being cleaned or painted. The fire suppression system must be designed and installed in accordance with NFPA 409. This section assumes the primary function of the hangar is as a paint hangar. Minor painting may constitute finishing in accordance with Section 914.8.3. While not referenced in the code, NFPA 410 provides additional guidance on aircraft maintenance, including the painting of aircraft.

914.9 Application of flammable finishes. An automatic sprinkler system or fire-extinguishing system shall be provided in all spray, dip and immersing spaces and storage rooms, and shall be installed in accordance with Chapter 9.

◆Chapter 24 provides detailed information about spaces and rooms involved in the application of flammable finishes. This section references Chapter 9 for the appropriate type of fire-extinguishing system.

914.10 Drying rooms. Drying rooms designed for high-hazard materials and processes, including special occupancies as provided for in Chapter 4 of the International Building Code, shall be protected by an approved automatic fire-extinguishing system complying with the provisions of Chapter 9.

◆This section reiterates the requirements from Section 417.4 of the IBC. See the commentary to Section 417.4 of the IBC for additional information.

914.11 Ambulatory care facilities. Occupancies classified as ambulatory care facilities shall comply with Sections 914.11.1 through 914.11.3.

◆This section simply introduces the fire protection requirements for ambulatory care facilities. See also the commentary to Section 422 of the IBC.

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914.11.1 Automatic sprinkler systems. An automatic sprinkler system shall be provided for ambulatory care facilities in accordance with Section 903.2.2.

◆See the commentary to Section 903.2.2.

914.11.2 Manual fire alarm systems. A manual fire alarm system shall be provided for ambulatory care facilities in accordance with Section 907.2.2.

◆See the commentary to Section 907.2.2.

914.11.3 Fire alarm systems. An automatic smoke detection system shall be provided for ambulatory care facilities in accordance with Section 907.2.2.1.

◆See the commentary to Section 907.2.2.1.

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