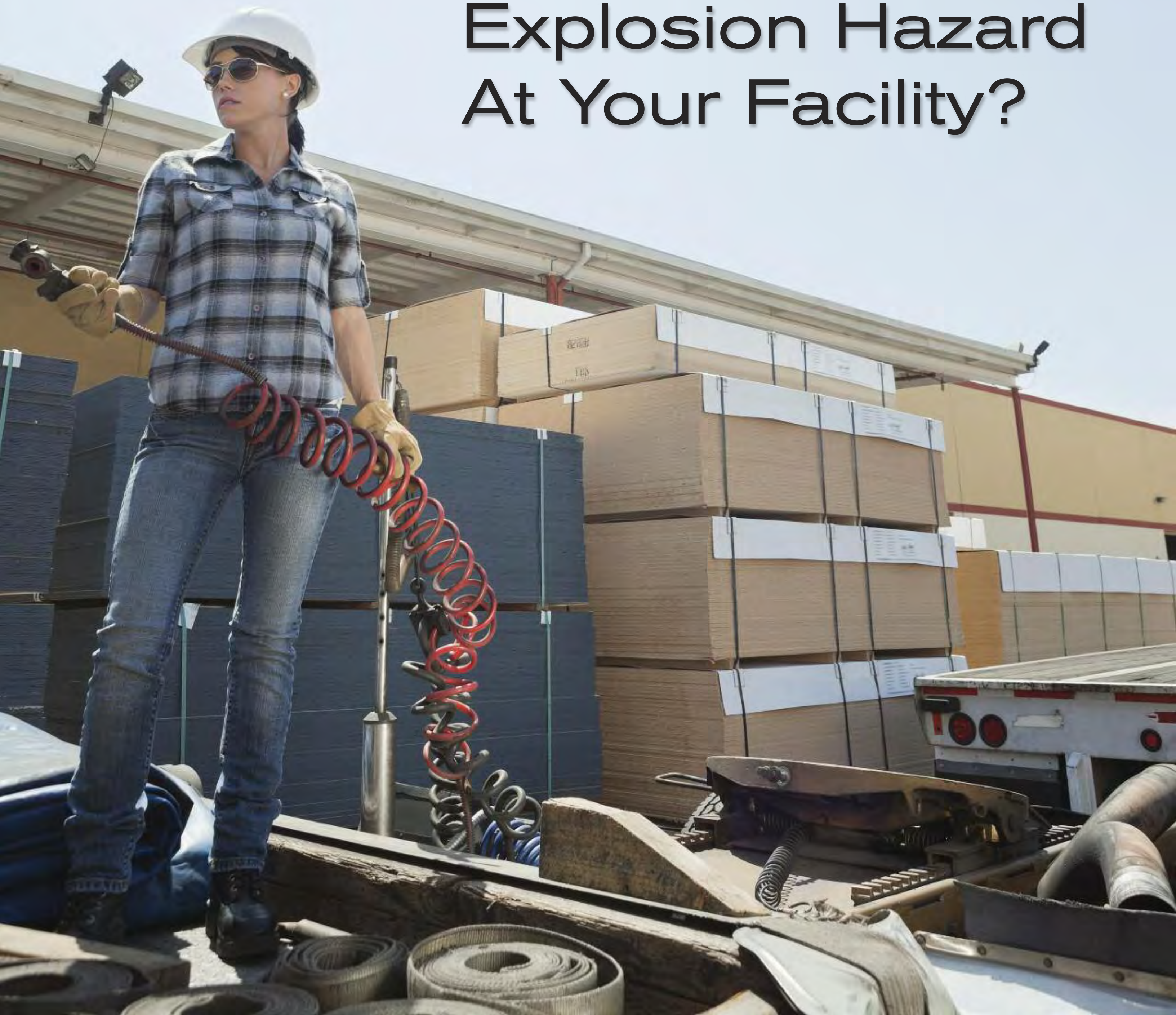
CANADIAN FIRE SAFETY ASSOCIATION

# CFSA NEWS

*Fire Safety is Everybody's Business*

SPRING/SUMMER 2018

## Is There A Dust Explosion Hazard At Your Facility?



CFSA NEWS
CANADIAN FIRE SAFETY ASSOCIATION
*Fire Safety is Everybody's Business*
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# Inside This Issue



**Editor:** Lesley-Anne Coleman
The CFSA News Magazine is published 4 times per year: Winter, Spring, Summer and Fall.

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# President's Message

In my first Presidents message I wanted to ensure to thank David Morris, our now Past-President for his work during the 2016-2018 term as President, as well as within our previous Vice-President, and Board of Director roles. Additionally, I would like to thank all the past elected officers and members of the Board of Directors for their contributions during their various terms and levels of involvement while in these very important volunteer positions.

I would also like to provide a personal and special thank you to another Past-President, Nickolas (Nick) Webb. Nick passed away on April 10th, 2018. He served his country, and community in a variety of Fire and Life Safety positions during his lifetime. Within the Canadian Fire Safety Association (CFSA), he served as a Board member, Vice-President(s) and President. His support and dedication has helped so many people and for that we will be eternally grateful.

As we begin the 2018 - 2019 new term for the CFSA Directors, I am very happy to stand alongside such a passionate group of like-minded individuals. I have been consistently drawn to the CFSA because of its wide span and reach within the Fire Safety community. This has never been more evident as we have just concluded our Annual Education Forum. Within this day long forum format we have members attending that represent all areas of the Fire Service, as well as fire protection, prevention, risk management, Building and Fire Code Consultants. The CFSA does not represent one singular group, trade or sector of the Fire Industry. With such a wide span, we can help to support some many different areas all across Canada.

Within future messages I look forward to providing you with a greater review of our history, our current work, and most importantly; what we are working on for the future. With new initiatives to begin shortly you can expect to see the CFSA continue to support its members with more education seminars, enhanced member interaction, a NextGen group and more student level involvements.

In the meantime be sure to follow the activity of the CFSA on Twitter @CFSA_Canada. Additionally, please feel free to contact me at any time Scott.Pugsley@SenecaCollege.ca

Kindly,

Scott Pugsley
CFSA President

CANADIAN FIRE SAFETY ASSOCIATION
ASSOCIATION CANADIENNE DE SÉCURITÉ INCENDIE

## *What is The CFSA?*

The Canadian Fire Safety Association is a non-proit organization established in 1971, to promote fire safety through the use of seminars, safety training courses, information newsletters, scholarships, and regular meetings.

## *Our Mission Statement*

"To disseminate fire and life safety information and promote a fire safe environment in Canada."

**www.canadianfiresafety.com**

# CFSA NEWS
CANADIAN FIRE SAFETY ASSOCIATION

The Canadian Fire Safety Association (CFSA) produces a quarterly News magazine which is distributed electronically to all members and is available for download from the CFSA website.

The CFSA News provides articles on industry related information, updates on codes & standards and overviews of various CFSA educational seminars provided throughout the year. In addition, Corporate Members and their selected representatives are recognized.

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# Canadian Fire Safety Association Annual Education Forum 2018

By: Alana Detcheverry

On April 5th, 2018 the Canadian Fire Safety Association hosted its Annual Education Forum “Application, Compliance and Enforcement”. The program again boasted a variety of knowledgeable and experienced members of the fire protection and engineering community. The speakers presented topics that were code-focused and featured technology and processes as means of improving efficiency and spending.

Fire Chief Larry Bentley (Vaughan Fire and Rescue Services) welcomed all those in attendance.

The day started with a Keynote address delivered by Fire Chief Tim Beckett of Mississauga Fire and Emergency Services who discussed increasing efficiency through risk assessment and shifting focus to education and enforcement.

Other topics throughout the morning included the application and installation of fire-protected membrane ceilings, presented by Megan Nicoletti, Code Next and Proposed Changes to the CAN/ULC Fire Alarm and Commissioning Standards presented by Simon Crosby, Jensen Hughes.

Updates to the Ontario Fire Code was presented by Gord Yoshida from the Ontario Fire Marshal Office with his usual flair and enthusiasm.

Each year, students enrolled in a Fire Technician, Technology or University Degree program have the opportunity to earn scholarship awards. This year, a total of $8500.00 in scholarship awards was presented to the top 11 students from Seneca, Fanshawe and Durham colleges. Congratulations to all the recipients for the recognition of your hard work.

The afternoon presented information in the latest technology and certifications of Flexible sprinkler piping presented by John Noel of Flexhead Industries and the newest information relating to the Sprinkler and Fire Protection Installers Compulsory Trade Classification which was presented by Diego Savone of Ontario College of Trades.

Jack Keays of Vortex Fire took the audience through a Fire Modeling and Egress Case Study where Jack discussed challenges in designing smoke control systems in unique architecture. Using 2 libraries with interconnected spaces Jack discussed the solutions for these case studies addressing tenability and exiting from a high fire load assembly area with interconnected space. Next, he discussed egress modeling for assisted evacuation using Pathfinder.

The day ended with updates to the Ontario Building Code specific to Retirement Homes presented by Matteo Gilfillan of Matteo Gilfillan & Associates Inc.

The event was successful, and the topics presented were well received by all. Attendees had the opportunity to receive information and network with others in the industry throughout the day. Thank you to all those who attended and all the Companies that provided sponsorship contributing to the success of the event.

The Canadian Fire Safety Association has already begun planning the 2019 Annual Education and looks forward to your attendance next year. ◆

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# Is There A Dust Explosion Hazard At Your Facility?

Taylor Kotwa, EIT
Jensen Hughes Consulting Canada Ltd., Richmond, BC

## Intro

The hazards of combustible dusts have been brought to the forefront of the fire protection industry's attention due to a series of recent explosions and fire events including two sawmill explosions in British Columbia in 2012, which resulted in significant property damage and personnel casualties. Other notable incidents in Canadian history include the Westray mine explosion in Nova Scotia in 1992 involving a secondary coal dust explosion. The hazard of dust explosion extends to materials that are not combustible in bulk solid form, but that may become combustible in dust form. For example, three workers were killed in a 2010 titanium dust explosion in West Virginia and 13 workers were killed in the 2008 Imperial Sugar refinery explosion in Georgia.

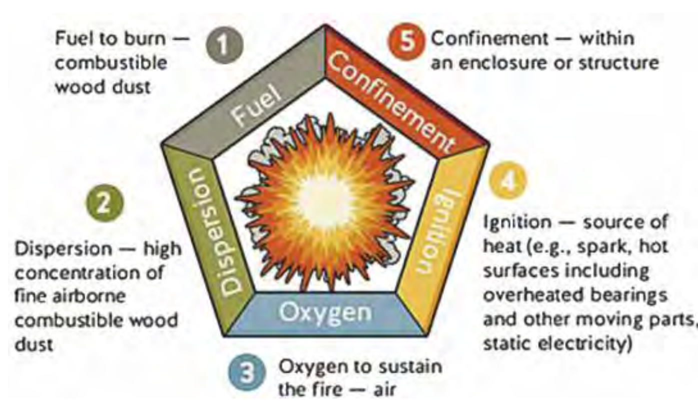
Anytime a process produces dust or dust accumulates on surfaces within a process facility, a hazard may be present and it is imperative for Fire Prevention Officers to be aware of the hazards. There are numerous references to dust within building and fire codes, occupational health and safety guidelines, as well as industry standards. National Fire Protection Association (NFPA) Standard 652 – Standard on the Fundamentals of Combustible Dust, 2016 Edition, defines a combustible dust as follows:

> "A finely divided combustible particulate solid that presents a flash-fire hazard or explosion hazard when suspended in air or the process-specific oxidizing medium over a range of concentrations".

Since dust explosion hazards exist based on a variety of factors, it is the responsibility of the owner/operator to determine the combustibility and explosibility hazards of materials and processes within their facilities. Owners are responsible for identifying, assessing, managing and communicating to the affected personnel any fire, flash fire, and explosion hazards within the facility. Both prescriptive design (code based) and performance-based (good engineering practice) approaches exist to address life safety and mitigation of fire spread and explosions in facilities containing combustible dusts.

## Explosion Overview

The scientific principle behind dust particle combustion is that particle volatiles ignite, rather than the organic solid. As the solids decrease in size, while keeping the overall mass of the material constant, more surface area is available for volatile ignition. Rapid combustion reactions of thermally thin particles are the result of increasing the surface area available for ignition, which is why combustible dusts pose such a severe threat in the process industry. For a dust explosion hazard to exist, the criteria of the explosion pentagon must be present, which includes fuel, ignition source, oxidant, dust suspension and confinement. The explosion pentagon using combustible wood dust as the example fuel is shown below[1].




A broad range of materials can be explosible, including but not limited to; metals and alloys (aluminum, magnesium alloy, titanium etc.), food and grain products (wheat grain dust, coffee, sugar, etc.), wood processing refuse (cellulose, wood etc.), coal products (brown coal, bituminous coal etc.), plastics, resins and rubbers (rubber powder, polyacrylonitrile etc.), and

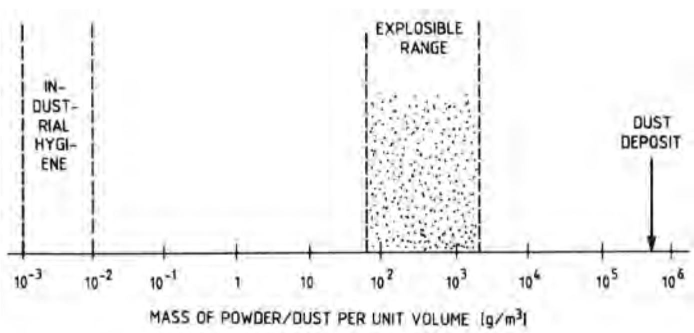
*continued…*

*1 WorkSafeBC, https://www.worksafebc.com/en/health-safety/hazards-exposures/combustible-dust* pharmaceuticals (herbicide, methionine etc.). There exists several material parameters that affect the explosibility of a certain commodity, such as moisture content, chemical composition and particle diameter, which has the foremost influence.

Standardized test protocols exist to characterize explosibility parameters of many commodities, which has industry applicability for the design of suppression and mitigation systems. These parameters include Minimum Explosible Concentration (MEC), Minimum Ignition Energy (MIE), Maximum Pressure (Pmax) and Normalized Maximum Rate of Pressure Rise (Kst). However, since these characteristics vary between facilities, they are best determined through material testing.

The dust concentration local to an ignition source must be within a certain 'explosible range' for ignition to occur. Eckhoff2 provides an example of the dust concentration range that is required for a typical natural organic dust for ignition to occur, as well as the range of acceptable industrial hygiene, shown on the left and the concentration of a dust deposit on the right of the scale.

Dust deposits, although outside of the explosible range, still pose an immediate threat to explosion. To reach the industrial hygiene level, the concentration of material in the dust deposit must pass through the explosible range. Additionally, dust disruption from housekeeping can act as a mechanism for material suspension leading to the concentration of dust lying within the explosible range. Caution should be taken during housekeeping procedures to limit dust suspension if the facility equipment is still operational.




Dust explosion hazards are present both in process equipment (dust handling) and settled ambient dust (fugitive). A facility without the presence of airborne dust is still at a hazard for dust explosion if there exists fugitive dust. A pressure wave induced by an explosion or flash fire, a seismic event, or a mechanical impact can suspend nearby dust particulate in the air, which can subsequently explode. This is referred to as a secondary explosion and is the leading cause of casualties in dust explosion events. One method to mitigate secondary explosions is to keep dust layer accumulations below the housekeeping thresholds, which are typically established through guidelines provided in code literature, such as NFPA 654 or 664.

The easiest ways to mitigate the hazard of a potential dust explosion are to reduce the available fuel (combustible dust) and control the ignition sources. Housekeeping is one way to minimize fuel from the explosion pentagon and reduce the dust explosion hazard in a facility. The use of scoops, brooms, and brushes for sweeping and shoveling are all permitted without specific requirements to the equipment used. To reduce the potential of an ignition event while cleaning, vacuum cleaners are required to conform with NFPA 654 regulations when used in an area of the facility where classified electrical equipment is required. The use of compressed air for cleaning is hazardous and is discouraged by engineering guidelines, however, it can be used for cleaning if strict guidelines are followed regarding pressure requirements set by WorkSafeBC and isolation of all electrical equipment/ignition sources.

The most common ignition sources are open flames (welding, cutting, matches, etc.), hot surfaces (hot bearing, dryers, heaters, etc.), heat from mechanical impact (sparks), and electrical discharges and arcs (electrical failures, static electricity, etc.). Any of these ignition sources may be present in a facility and should be identified when completing a dust hazard analysis of the building(s) and processes contained within. It is assumed the identified ignition sources will always be present, therefore, safe levels of dust accumulation are required to be maintained to facilitate the safety of personnel working around explosible dusts.

### Code Analysis

Standards exist to enforce guidelines on processes that create combustible dust and mitigation strategies for dust explosions. The following standards may require consultation when reviewing facilities where combustible dusts are present:

- National Fire Code (NFC), Section 5.3, and related provincial fire codes (OFC, BCFC, AFC, etc.)
- WorkSafeBC, Section 5.81 of the Occupational Health and Safety Regulation and related guidelines and policies
- CSA-C22.1-15 Canadian Electrical Code (CEC), Rule 18 for classification of electrical equipment

*continued…*

[2] *Eckhoff, R. K., "Dust Explosions in the Process Industries," Butterworth-Heinemann, Second Edition, Linacre, Jordan Hill, Oxford, 1997. pp. 8.*

## Is There A Dust Explosion Hazard At Your Facility? Cont'd

The standards and codes listed above are written to address general conditions. Direct application and performance based designs require specialized knowledge and good engineering practice. The National Fire Protection Association (NFPA) has several standards for industry specific design with regards to combustible dusts. The fire codes and electrical codes shown above reference some of the following NFPA standards:

- NFPA 61 – Standard for Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 68 – Standard on Explosion Protection by Deflagration Venting
- NFPA 69 – Standard on Explosion Prevention Systems
- NFPA 484 – Standard for Combustible Metals
- NFPA 652 – Standard on the Fundamentals of Combustible Dust
- NFPA 654 – Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 655 – Standard for Prevention of Sulfur Fires and Explosions
- NFPA 664 – Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities

### General Outline of Dust Hazard Analysis and Testing

A Dust Hazard Analysis (DHA) includes assessment of the process or facility areas where the five components of the explosion pentagon could exist. These areas are identified, evaluated, and safe operating ranges and safeguards are established to mitigate explosion hazards. In areas where all five components of the explosion pentagon are present, additional design features (isolation, venting, and/or suppression) are incorporated. All facilities with potentially combustible dust should complete a DHA. The analysis includes materials, followed by processes, then buildings.

Material analysis encompasses screening for combustibility or explosibility through historical facility data and material testing. Initially, a "Go/No-go" screening test is conducted for the presence of explosive characteristics. If this test is a "Go" (i.e. a representative sample is found to be combustible), additional tests can be conducted to determine explosibility parameters. Process design such as deflagration venting and suppression requires explosion severity testing for parameters Kst and Pmax. Additional information on industry application of material testing is listed later in this article.

Process analysis includes the assessment of each part of the process system where combustible dust is present. The evaluation is required to address the potential intended and unintended presence of dust within the process system, and the potential for deflagration propagation between parts of the process. Each process that poses a fire or deflagration threat is documented during the DHA and guidelines are offered to mitigate the hazards through safeguards and an effective housekeeping plan. An example of a process analysis is a grain hopper in a grain handling facility. All areas where an accumulation of dust is apparent outside of the hopper should be identified, and the housekeeping procedures for the area around the grain hopper are compared against threshold limits set out in the housekeeping strategy. Potential ignition sources in and around the grain hopper should be identified and removed, where possible. Any imperative electrical equipment that could provide a potential ignition source should be intrinsically rated per the classification of the area established through electrical codes.

Building analysis is like process analysis in that it focuses on evaluating the presence, accumulation and movement of dust within the facility and any deflagration hazards within and between buildings. The evaluation of a dust deflagration hazard in a building or building compartment is required to include a comparison of actual or intended dust accumulation to the threshold housekeeping dust accumulation that would present a potential for flash-fire exposure to personnel or compartment failure due to explosive overpressure. Remedial measures for each hazard should be identified and relevant industry or commodity-specific NFPA standard will typically provide options for future hazard mitigation. An example of a building analysis is the possibility of dust spread from one building to another in a facility containing combustible dust.

The primary focus of the dust hazard analysis on a whole is the identification and control of hazardous fugitive dust accumulations. This is achieved by a top down approach which includes dust emission reduction from process equipment, dust collection systems and then housekeeping methods conducted by facility personnel. Once the process equipment and dust collections are implemented in a facility, the onus is on the housekeeping program to actively minimize residual fugitive dust accumulations throughout the facility. Housekeeping plans are required to be scheduled, documented and adhered to in order to maintain life safety.

### JH Capabilities

JENSEN HUGHES has established the only commercial dust explosibility test laboratory in Canada, located in Halifax, NS. This state-of-the-art facility is utilized to test whether a dust is explosible, and then to further characterize the material hazards in terms of explosion and ignition sensitivity. If the

*continued…*

## Is There A Dust Explosion Hazard At Your Facility? Cont'd

dust is explosible from the "Go/No-go" screening, tests for key explosibility parameters with carryover to industrial application can be performed, which include:

- Minimum Ignition Energy (MIE) for control of ignition sources,
- Minimum Explosible Concentration (MEC) for control of dust concentrations,
- Explosion Severity for venting, suppression, containment, isolation and partial inerting,
- Minimum Auto-Ignition Temperature (MIT) for control of process and surface temperatures for dust clouds, and
- Layer (Hot Surface) Ignition Temperature (LIT) for control of process and surface temperatures for dust layers

In addition to material testing, JENSEN HUGHES has engineers, scientists and forensic explosion experts that specializein Dust Hazard Analyses, code consulting and research/testing of combustible dusts.

### Suggested References

Additional literature regarding combustible dusts is provided below:


Eckhoff, Rolf. K., "Dust Explosions in the Process Industries," Butterworth-Heinemann, Second Edition, Linacre, Jordan Hill, Oxford, 1997.

Grossel, Stanley. S., and Robert G. Zalosh, "Guidelines for Safe Handling of Powders and Bulk Solids." Center for Chemical Process Safety of the American Institute of Chemical Engineers, New York, 2005.

Amyotte, Paul., "An Introduction to Dust Explosions: Understanding the Myths and Realities of Dust Explosions for a Safer Workplace." Butterworth-Heinemann, 2013.

Frank, Walter. L., Samuel A. Rodgers, and Guy R. Colonna. "NFPA Guide to Combustible Dusts." National Fire Protection Association, Quincy, 2012. ◆

# The Leap Frog Effect - Protecting Tall Buildings from Exterior Spread

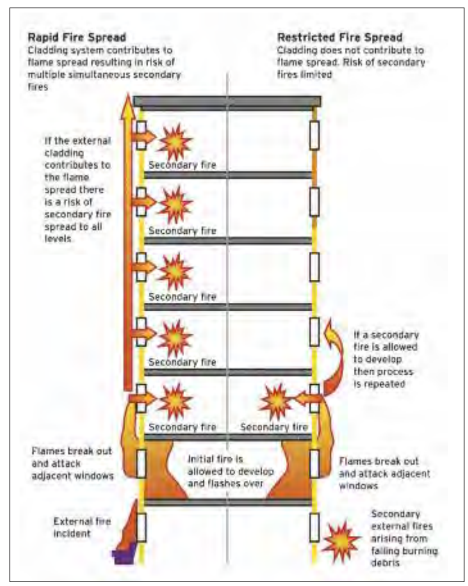
Toni Crimi

Fires can spread up buildings even without the involvement of the exterior materials of the cladding system. There are numerous examples of fire spread from the room of origin to the room above, via vertically adjacent windows but until recently, most have caused only property damage. Most deaths or injuries on floors other than the fire floor are as a result of smoke. However, more innovative ways to insulate buildings to improve their sustainability and energy efficiency are changing the external surfaces of buildings with an increase in the volume of potentially combustible materials being applied, and different construction techniques which favor energy performance. As multiple recent high-rise fires around the world have demonstrated, it is critical that we remain vigilant against potential fire hazards, particularly as we transition to tighter and more energy efficient buildings, and adapt our traditional perceptions to these new methods of construction.

The intersection of the exterior wall and the floor assembly provides a number of different paths for vertical fire spread in buildings. Each of these paths is addressed by different test Standards. The US Building Codes establish different requirements for each of these potential paths to prevent the spread of fire based on each of the separate paths. The intent is to confine a fire to the room of origin and prevent propagation to adjacent areas above the room of fire origin.

Real fire experience has taught us that ineffective curtain wall design, perimeter void fire protection, or inadequate spandrel protection can allow fire to spread through the space between floors and walls, the window head transom, and the cavity of the curtain wall. This can occur either by ignition of the exterior building cladding materials, through window glass breakage, or around melted aluminum spandrel panels. Conceptually, the easiest way to look at the three paths for the fire to spread to adjacent floor levels at the exterior wall are:

1. Through Voids: Spreading within the building through the void space created between the edge of the floor and an exterior curtain wall. These are protected by perimeter fire barrier systems. This includes ASTM E2307, for system design specification, and ASTM E2393 for proper installation.
2. Through Cavity: Spreading through a void or cavity within the exterior curtain wall. In this situation, fire would spread by a path within the concealed space of the exterior wall, or along the outer surface of the exterior wall. These are protected by NFPA 285 compliant assemblies, which evaluate flame propagation due to combustible materials used in exterior wall assemblies.
3. Leap-frog: Spreading to the exterior and then impinging on an opening in an upper level. This is a window-to-window "leap-frogging" mechanism where combustible materials behind an upper window are ignited as a result of the intense heat from flames projected out of a lower window. This mechanism is currently addressed prescriptively, using spandrel panels or sprinkler protection. A new ASTM test method is still under development.




Flame extension and heat fluxes to the window areas above an opening can be expected to be greater where combustible claddings are used in lieu of traditional US code prescribed spandrel panels, due to the contribution of any combustible cladding or insulation materials immediately above an opening. The construction of the spandrel panel, along with the perimeter fire barrier joint system, are important factors in determining the ability of the exterior wall to protect against vertical fire spread. Typical aluminum framed curtain walls using spandrel glass require that any glass in-

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stalled in the spandrel area immediately above openings be appropriately protected. Additionally, the aluminum mullions require insulation protection; otherwise the aluminum frame will melt and no longer support the wall system. These measures will help keep the glass spandrel panel, and any associated fire barrier system, intact.

## Evolution of Curtain Wall Façade Construction

Curtain wall design became common in commercial construction over the past 40 years. Cladding is often used because it is attractive and can be easy to clean. For example, it was installed on the Grenfell Tower, a 24-story mid-1970s structure in the UK, a more modern look. Curtain wall systems, which are non-structural external covering spanning multiple floors, are typically supported by mounting methods connecting the framing system at the edge of each floor. This normally results in a gap between the edge of each floor and the curtain wall. With many combustible materials used today in commercial wall assemblies to improve energy performance, reduce water and air infiltration, and allow for aesthetic design flexibility, the combustibility of the assembly components has been known to directly impact the fire hazard to the building. These systems include Exterior Insulation Finish Systems (EIFS), metal composite claddings, high-pressure laminates, and weather-resistive barriers (WRB).

Cladding has played a contributing role in numerous fires worldwide. The aptly named "Torch Tower" high-rise building in Dubai has seen two major cladding fires in the past 3 years. The Torch Tower first went up in flames back in February 2015. More than 1,000 people were evacuated from the 1,105-foot tall, 87 storey building. The building was repaired, but experienced a second cladding fire on August 4th, 2017. According to local officials with the Dubai Civil Defense Department, the two main causes of the fires at the Torch Dubai were an electric circuits in the 2015 fire, and a cigarette carelessly tossed from a balcony and landing on a plant in a lower balcony in 2017. While there were no reported deaths, Dubai Civil Defense reported 38 apartments were damaged in the fire, and 64 floors were affected by the blaze.

Experts also cited cladding as a factor in similar fires in which flames raced along the sides of buildings, including a high-rise fire in a building under renovation in Shanghai in 2010 that killed at least 58 people when it re-entered the building on multiple floors, a 2015 apartment fire in Azerbaijan that left 16 people dead and a 2009 fire at Beijing's TV Cultural Center that killed a firefighter. Similarly in Australia, more than 400 people were evacuated from the Lacrosse Tower on November 25, 2014, when a discarded cigarette on a balcony started a fire that very quickly spread up the face of the building. While there were no fatalities, owners of the Lacrosse tower are claiming more than $12 million in damages, and lawyers for the owners are claiming almost $1 million in lost rent, money spent on emergency accommodation during the fire emergency and compensation for an increase in insurance premiums since the blaze.

*Fire raced up Dockland's Lacrosse tower in 2014 in just 15 minutes, as flammable aluminium cladding caught fire.##*

During the One Meridian Plaza fire in 1991, flames broke through several windows around a major portion of the fire floor, exposing the floor above to auto-exposure from flames lapping up the side of the building. Additional alarms were called to bring personnel and equipment to the scene for a large scale fire suppression operation.
As the fire developed on the 22nd floor, smoke, heat, and toxic gases began moving through the building. Vertical fire extension resulted from unprotected openings in floor and shaft assemblies, severe deflection of the floor assemblies and the lapping of flames through windows on the outside of the building).##9USFA FEMA Report

Most recently, the tragic fire in the 24-story Grenfell Tower in West London on June 14, 2017 killed at least 71 people, but police said only 21 of those victims could be formally identified. The fire spread rapidly up the exterior of the building, circumventing the interior fire protection features, re-entering from the exterior and eventually consuming every floor.

What all of these fires have in common is that the fire was able to spread by one or more of the three mechanisms described above; through perimeter voids, wall cavities, and/or leap-frog, either singly, or in combination.

## Protecting against "Leap-Frog"

Initially, US legacy model building codes of the time included only cursory mention of fire protection of exterior curtain walls and floor-to-wall perimeter voids, or spandrel construction. Consequently, architects, designers, contractors and code officials often adopted untested and uncertain solutions. Later, more effective products were developed and tested for curtain wall fire protection in accordance with ASTM E119 and NFPA 285. However, because neither of these test Standards specifically evaluate vertical fire spread via leap-frog, codes only partially addressed the fire risk by requiring minimum vertical separation of openings, or full sprinkler protection of the building. Employing prescriptive minimum vertical spacing requirements between openings limits design flexibility. While sprinkler systems are very effective at controlling interior fires, studies have reported that, globally, the percentage of exterior wall fires occurring in buildings with sprinkler systems installed ranges from 15-39% for the building height groups considered. This may be due to either external

continued…

fire sources, or failure of sprinklers.
# (NFPRF Report June 2014)

**Currently there is a void in the fire testing community, both with respect to Code Requirements and Test standards, when it comes to identifying and protecting against this exterior fire spread phenomenon.** The International Building Code (IBC) - Chapter 7, Fire and Smoke Protection Features requires the fire resistance rating of building elements, components or assemblies be determined in accordance with test procedures set forth in ASTM E119 or UL 263. Chapter 7, Section 715.4 further details the description and procedures for Fire and Smoke protection at perimeter void between the Exterior Curtain Wall and Floor Intersection. This specific section focuses ONLY on the required protection for the perimeter void between the floor slab and the interior face of a curtain wall. ASTM E2307 is the test method that was specifically developed to evaluate the ability of perimeter fire barrier joint systems to prevent the interior spread of fire through the perimeter void into the room above.

**The spread of an interior fire venting through the broken glass and up the exterior face of a building (the Leap Frog Effect) is a unique fire condition.** When ASTM first published its Standard Test Method for Building Perimeter Fire Barrier Systems, ASM E2307, in 2004, it was acknowledged that an additional test method was needed to mitigate the effects of fire exposure on the spandrel and vision glass area from the exterior of the building. This condition represents a significant fire exposure created when the magnitude of flame and hot gasses escaping through a window opening is sufficient to cause the re-entry of the fire, or ignite combustible materials, in the room above the storey of fire origin. This can occur when fire spreads vertically up the exterior of the building, circumventing the interior perimeter fire barrier joint system, any inherent fire re-

*The Parque Central was a 56 story government office building in Caracas, Venezuela. The fire started on the 34th floor and climbed to the 47th floor. Oct 14, 2014.*

*The Grenfell Tower Fire is believed to have started on the 4th storey of a 27 storey high-rise in the UK in June 2017, and ultimately spread to every storey, with tragic consequences.*

sistance of the exterior wall assembly, or a sprinkler system. When this mechanism of fire spread occurs at any floor, it has the potential to repeat via the same mechanism to every floor above it. This phenomenon is referred to as the "Leap frog" effect. This new test method is intended to simulate the fire exposure from a post flashover compartment fire venting through an opening, onto the exterior spandrel area, or portion of the exterior cladding immediately above a window opening. When published, the test can be used to evaluate the effectiveness of exterior spandrel areas above the opening, and any glazing.

**ASTM committee E05 on Fire Standards has been working on the development of a new test method, currently titled "Proposed New Standard Test Method for Determining the Fire-Test Response Characteristics of Building Spandrel containment systems Due to External Spread of Fire."** This draft test is designed to evaluate the fire performance of the portion of an exterior wall assembly directly above an opening, principally the building perimeter spandrel system, with or without glazing, to impede the spread of fire to the interior of the room or the story immediately above it, via fire spread on the exterior of a building. A task group of ASTM E5.11 is charged with further developing a test method that would evaluate the performance of this unique construction detail that is not addressed by any other fire test method. For example, features that form vertical channels on a building facade, such as vertical shades or a recess in the facade, increase the hazard of high fire exposure to the facade. Features that disrupt vertical air movement along the facade, such as balconies, protect the facade above these features from high fire exposure.

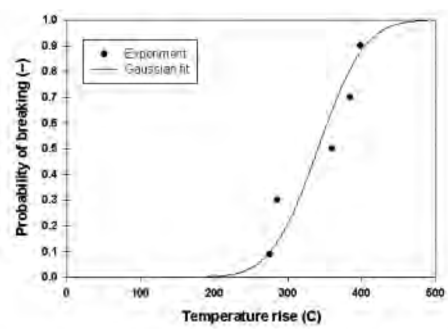


*Figure 1: Probability of Glass Breaking Out vs Temperature (Tanaka, T., Performance-Based Fire Safety Design of a High Rise Office Building - 1998)*

**Literature reviews, and independent research, have been used to help develop the criteria for the current ASTM draft Standard.** Studies have confirmed that, in 6mm (.236) float glass, first cracking occurs when the bulk glass temperature reaches around 110 o C (230 o F). This corresponds to a heat flux of

*continued…*

## The Leap Frog Effect Cont'd

around 3 kw/m². In this same study, glass fell out when exposed surface temperature reached 415 - 486o (779 - 907°F) or heat flux of around 35kw/m².
## (Reference Vyto Paper here)

To verify that the proposed apparatus provides adequate flame exposure to evaluate leap frog, additional research was also conducted by students at Worcester Polytechnic Institute (WPI)[2]. This Report included a literature review and computer modeling conducted using the exposure conditions and configuration of ASTM E2307. The project reviewed varying window dimensions, conducted heat flux calculations at various heights on the exterior wall above a window opening and at the flame propagation on the exterior wall.

The proposed leap-frog test uses the same apparatus as ASTM E2307 and NFPA 285, with the same fixed window opening size, to create the fire exposure on the exterior side of the spandrel panel or curtain wall. The "opening" is 30 inches high and 78 inches wide. The research report concludes that the current size of the fire (Time-Temperature Curve/Burner) is sufficient to provide:

- Incident heat flux of 35 kW/m² at a height of 3 ft. above the head of the window opening
- Incident heat flux of 9 kW/m² at a height of 10 ft. above the head of the window opening

In addition to the WPI research findings, testing of a typical aluminum curtain wall system with a 36 inch spandrel height was conducted at Southwest Research Institute, San Antonio TX and witnessed by Underwriters Laboratory. Instrumentation was installed to provide a temperature profile and incident heat flux measurements both vertically and horizontally during the test. The flame temperatures and heat fluxes were determined to be consistent horizontally across a 24 inch width, when measured at 12, 24, 36 and 48 inches above the opening.

Based on the research findings above, the ASTM task group agreed to utilize the approach of measuring the incident heat flux behind the exterior wall, on the floor above the burn room. The choice of pass/fail criteria was selected based on the level of heat flux required for unpiloted ignition of easy to ignite combustible materials, and glass breakage. Those heat flux limits are consistent with the normal temperature rise limits imposed by ASTM E119 when determining fire resistance ratings of assemblies (i.e. a maximum average temperature rise of 250 °F, together with a maximum individual temperature rise of 325 °F). These represent an incident heat flux of 1.8 to 2.6 kW/m² at the measurement location. (See Figure XXX).

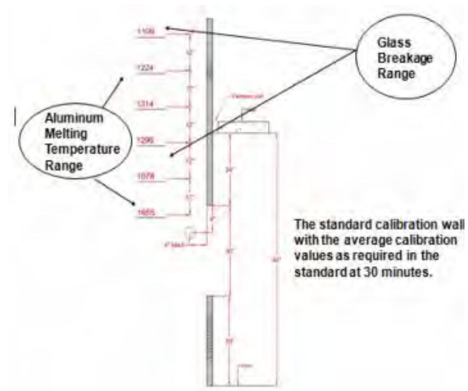


*Figure 3: Standard Calibration Wall.*

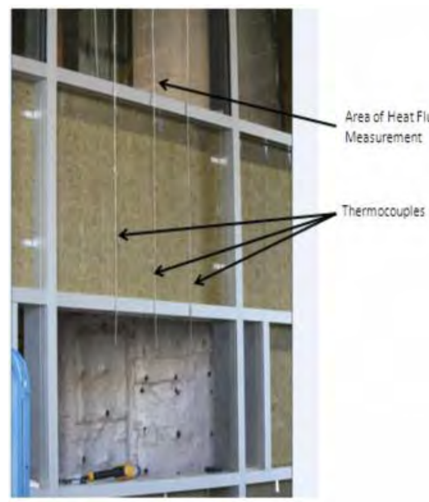


*Figure 4: Thermocouple arrangement measures flame width on a Calibration Wall.*

**When considering floor-to-floor fire spread via openings (e.g. windows), the nature of exterior wall/curtain wall designs is a critical factors that will dictate the relative capability to resist floor-to floor fire spread.** Key factors that impact curtain wall resistance to vertical fire spread, which need to be evaluated by testing, can include:

- Full height or partial height vision glass or spandrel panel design
- Nature of the glass used to construct glazing system
- Nature of the curtain wall components (e.g. framing, spandrel panels, rain screen, air gap)
- Vertical or horizontal projections on exterior that may deflect or enhance flame behavior
- Building geometry at curtain wall –

*continued…*

**Table 1: Window Dimension Result Values**

| Window Size | Flame Height (ft.) | Flame Profile | Height above window with heat flux greater than 9 kW/m² (ft.) | Height above window with heat flux greater than 35 kW/m² (ft.) |
|---|---|---|---|---|
| ASTM Standard (2.5 x 6.5 ft.) | 5.5 | Against wall | 10+ | 3 |
| 3 x 3 ft. Square | 3.8 | Slightly away from wall | 3.5 | 1.25 |
| 2.125 x 4.25 ft. Wide | 4.5 | Against wall | 10+ | 3 |
| 4.25 x 2.125 ft. Tall | 3.4 | Far away from wall | 3 | 0 |
| 3.18 x 6.37 ft. Wide | 6 | Against wall | 10+ | 3 |
| 6.37 x 3.18 ft. Tall | 3.5 | Far away from wall | 2.5 | 0 |

*Figure 2: Window Burner Results from WPI Research Report Number ME-GT-FR09 Dated Apr. 12, 2010*

## The Leap Frog Effect Cont'd

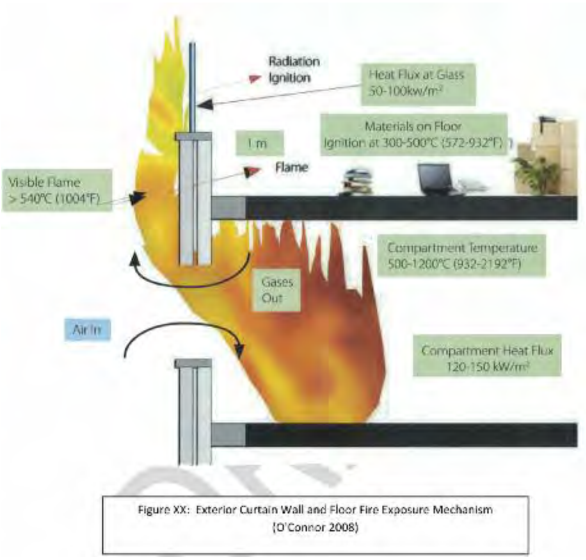


*Figure XX: Exterior Curtain Wall and Floor Fire Exposure Mechanism (O'Connor 2008)*

inclined, staggered, sloped, etc.

- Operable windows/openings – size and orientation
- The vertical alignment of windows/openings

Among its other functions, a Spandrel containment systems impedes the vertical spread of fire via exterior fire spread, from the floor of origin to the floor(s) above.

## Conclusions:

Our understanding of exterior fires and their mechanism of spread in buildings has been researched and reported. However, the risks of fire spread, particularly as related to super high-rise buildings and their facades, still present unacceptable levels of risk to building occupants. Current code practices recognize the successful record of full sprinkler protected high-rise buildings and only require that the void space between the curtain wall and the floor slab be resistive to fire spread using a perimeter fire barrier system. However, the desire to improve energy efficiency becomes increasingly urgent, more innovative ways to insulate buildings to improve their sustainability and energy efficiency are changing the external surfaces of buildings with an increase in the volume of potentially combustible materials being applied. A number of significant fires, such as those discussed previously, have demonstrated the potential risks.

Building geometry and exterior projections of the curtain wall or building structural elements can have a beneficial, or negative, effect on flame length extension and heat flux exposure to curtain wall elements above the fire compartment. This can be particularly important if operable windows, ventilation openings, or inclined exterior wall designs are used. Of course, any such condition can allow the unrestricted passage of flames and hot gases from a fire on a floor below into the floor above. The position of the opening relative to the expected flame extension is important in assessing the risk of a leap frog event.

The current Code requirements focus on the fire testing of specific assemblies that are not necessarily consistent with the goals of the architect, yet the larger concern is the associated risk of the fire leapfrog effect for high-rise buildings. A review of the history of significant high-rise fire losses where the leapfrog effect was evident shows that the hazard is real and can be catastrophic. Key factors that impact a curtain wall's fire resistance are being addressed by the proposed *New Standard Test Method for Determining the Fire-Test Response Characteristics of Building Spandrel containment systems Due to External Spread of Fire*. This Standard can be useful when there is a need to provide enhanced protection or evaluate a curtain wall assembly's potential performance when subject to uncontrolled heat/flame exposure. The most important concept is that the risk for high-rise buildings requires the consideration of several factors that include the engineering design of the sprinkler systems, fire department response capabilities, the occupancies and associated fire loads, the building's evacuation approach, compartmentation features, and security threat assessment scenarios. With appropriate consideration and evaluation of these risk factors, it is possible to select a curtain wall design that meets both the esthetic goals and fire safety objectives for any building.

Based on several years of literature review involving actual high rise fires, research reports, fire modeling and actual fire test data developed for the ASTM Task Group, there is sufficient justification and information available to proceed with the development of the ASTM E5.11.20 "Leap frog" standard.

**References:**


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Damage to the Belaire Apartments after Cory Lidle's 2006 crash Date: October 2006. Location: New York, NY Cause: Small plane hit 30th floor. Source for story: Here Scroll to bottom of page for information on fire. Source for picture: Here

The Parque Central was a 56 storey government office building in Caracas, Venezuela. The fire started on the 34th floor and climbed to the 47th floor. That's not similar to the WTC 7 because the fires were on the lower levels. The building didn't have a tube in a tube design like any of the WTC buildings either. Location: Caracas, Venezuela Date: October 14, 2004

Initial Development of Multi-Story Test Apparatus by Arther Parker, Sr. Fire Protection Engineer, Hughes Associates

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NFPRF, Fire Hazards of Exterior Wall Assemblies Containing Combustible Components, Nathan White CSIRO Highett, VIC, Australia Michael Delichatsios FireSERT, University of Ulster Jordanstown, Northern Ireland © June 2014 Fire Protection Research Foundation ◆

# Lounge Furniture Targeted as Multi-Res Fire Risk

## Toronto cracks down on combustible materials located within evacuation routes

Michelle Ervin

Some condo lobbies may be looking spare lately, and it has nothing to do with minimalist design. The lounge furniture that usually occupies these spaces is being targeted as a fire risk.

Toronto Fire Services now instructs its staff to look at the flammability of seats, tables and cabinets that display decorative objects for the purposes of enforcing a provincial regulation that prohibits the accumulation of combustible materials in means of egress. A new guideline, issued last year, establishes criteria for hallway and lobby furnishings located in routes occupants may use to evacuate multi-residential buildings including long-term care, nursing and retirement homes. It also offers a list of compliance options, such as installing overhead sprinklers.

The move responds to a very real life-safety issue – furniture has been implicated in three serious fires – but it has also caught the condo industry off-guard. Although it has been shared with industry stakeholders, the engineering technical bulletin that details the new guideline is an internal document of Toronto Fire Services, so property managers are sometimes seeing a copy for the first time at the same time they're receiving a notice of violation.

For property managers who have received notices of violation in the last several months, the quickest short-term fix has often been to remove furniture from affected hallways and lobbies until the best long-term solution can be determined.

### A fire risk emerges

On Feb. 5, 2016, at 1315 Neilson Rd. in Scarborough, four people died after someone deliberately set fire to combustible chairs located at the intersection of two hallways on the top floor of a five-storey seniors building. A pair of subsequent blazes in high-rise buildings shared the same fuel source: furniture.

"The fires TFS has responded to in hallways and corridors have been intentionally set," said Deputy Chief Jim Jessop, Toronto Fire Services, speaking June 7 at an Institution of Fire Engineers Canada Branch event designed to bring building owners and managers up to speed on the new guideline. "We can't stop individuals from committing a criminal act. What we can do is remove the fuel and reduce the subsequent impact of that criminal act."

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This doesn't mean building owners have to junk all their lounge furniture. What it does mean is that they have to select one of seven compliance options to mitigate the fire risk. Showing that combustible furniture falls within prescribed limits for heat release is one way to do this.

In the Scarborough case, follow-up investigation found that the type of furniture involved resisted ignition when exposed to a lit cigarette, but once on fire, it released heat at a rapid pace.

Recognizing this, the guideline points to two standards that subject furniture to open-flame testing to measure how quickly the furniture would release heat if it was involved in a fire. The guideline permits combustible furniture that building owners can prove passes the Flammability Test Procedure for Seating Furniture for Use in Public Occupancies described in the State of California Department of Consumer Affairs, Bureau of Home Furnishings and Thermal Insulation Technical Bulletin 133-91 (TB 133). Alternatively, the guideline permits combustible furniture that building owners can prove achieves similar results under ASTM E1537-16, the Standard Test Method for Fire Testing of Upholstered Furniture.

The act of arson in the fatal Scarborough fire remains under ongoing criminal investigation by the Toronto Police Service. Meanwhile, however, Toronto Fire Services charged building owner Toronto Community Housing Corporation (TCHC) for Ontario Fire Code violations it said it observed during its post-fire inspection, including permitting combustible materials to accumulate in a means of egress. TCHC ultimately pleaded guilty to one charge for failing to fully implement the approved fire safety plan for the building – and was fined $100,000 – and resolved the deficiencies noted in the charge to Toronto Fire Services' satisfaction.

### Enforcement quickly follows

Complying with the guideline can be as simple as checking furniture for a label attesting to the fact that it meets TB-133. However, property managers could also find themselves rifling through old files to track down supporting documents from interior designers for custom pieces.

"You rarely see a board of directors go out to the Brick and pick up a $1,299 couch and throw it in their lobby, so the financial and resident comfort impact is significant," said Michele Farley, president and senior code consultant at FCS Fire Consulting Services, speaking after the Institution of Fire Engineers event. "And in a lot of cases, removal of the furniture is not warranted, because the furniture is actually certified."

Farley acknowledged the basis for the guideline, but added that it has been enforced quickly, without much warning, in some cases forcing affected property managers to hire movers and store furniture while they weigh next steps and at least temporarily leaving residents and visitors without places to sit and socialize or wait for transportation. She said that she has also encountered varying opinions as to what's acceptable as notices of violation have come across her desk over the last six months.

"Some of the inspectors are interpreting anything in a lobby as combustible and they want it out," said Farley. "Others are saying, 'You have an eight-foot marble path between the two carpeted areas that have your couches in them, and you have containment, there's smoke detection here, there's 24/7 security, and the furniture is out of the way, so I don't consider this a means of egress, so you can leave your furniture there.'" Provided there is an evacuation route that bypasses the lobby, having fire separation between the lobby and the sections of corridor that serve suites is another compliance option if building owners can't prove combustible furniture falls within prescribed limits for heat release. This compliance option, and several others, are contingent upon meeting a list of conditions, including that the area be equipped with either a smoke alarm or smoke detector, depending on whether it's possible to connect to an existing fire alarm system.

"We've been very aggressive in terms of what we will permit or not permit. I know it's sort of sent shockwaves through the industry," Deputy Chief Jessop acknowledged, adding that Toronto Fire Services has done outreach to apprise stakeholder groups such as the Greater Toronto Apartment Association of its expectations.

### Coming into compliance

The guideline cites Sentence 2.4.1.1.(2) of Division B of the Ontario Fire Code, which prohibits the accumulation of combustible materials in means of egress, among other areas, except when the design of those spaces addresses those materials. Convictions for violations of the Ontario Fire Code carry a maximum fine of $100,000 for corporations and $50,000 for individuals, who also face a maximum term of imprisonment of one year.

However, Deputy Chief Jessop said Toronto Fire Services is trying to work with building owners by explaining notices and orders and giving them time to remove furniture.

"You're allowed to come forward, we've accepted alternatives, we've helped people, which is what we want to do," said Deputy Chief Jessop. "We're not charging people, so let me be very clear: We don't walk in, see a couch and take you to court. We don't do that."

Property managers can also call the fire prevention division of Toronto Fire Services for guidance on compliance.

*continued…*

## Lounge Furniture Targeted Cont'd

Although she has yet to see any violations taken to court, Farley urged property managers to address notices promptly. "They have to evaluate what their options are, swiftly, because there may be a risk and because the fire department will be back in a couple of weeks to see what you've done," said Farley.

Farley said she has one client who plans to fight a violation because the client believes she has the documents to demonstrate that her furniture does in fact comply with the guideline. Others, meanwhile, are looking at how much it will cost to install sprinkler systems in affected areas. Some of the compliance options may be more desirable than others. "What they're allowing in is unpadded wooden furniture and just some of the things they're saying would be reasonable for people to have in their lobbies isn't very comfortable," said Farley. "There is certainly an impact of people within a condominium who are used to that big, cushy leather chair and now they're going to get a wooden bench that's similar to something they could sit on waiting for a TTC bus.

"A lot of thought, planning, design and cost goes into condo lobbies and that should be taken into consideration when working towards evaluating existing materials and complying with the fire code."

### Provincial regulation possible

Condos outside of Toronto could be forced to confront the fire risk posed by combustible furniture in the future. A provincial regulation inspired by the local guideline, which would have had a similar effect, was on the cusp of being adopted when the most recent Ontario government dissolved. Toronto Fire Services last week issued an updated version of its guideline that has been adjusted to better align with the proposed provincial regulation in case it gets revived by the incoming Ontario government.

*The preceding article originally appeared on the REMI Network. https://www.reminetwork.com/remi/home/*

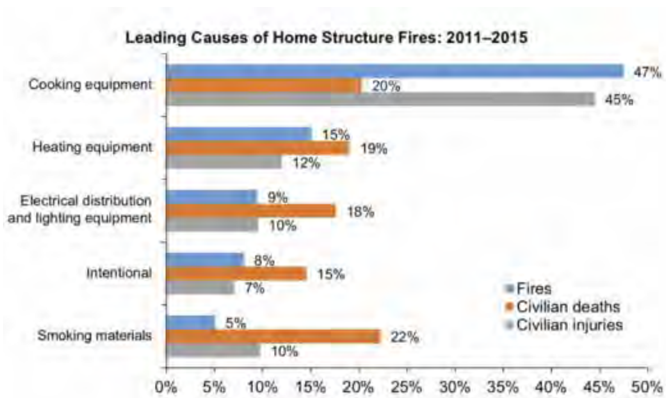
# Fire Safety in Residential Condominiums

Anthony H. Van Odyk, B. E. Sc.

The writer has presented this information to fellow condominium residents in a large two-tower project where he resides.

## Fire Statistics

Any discussion of this topic, needs to start with the common sources of fire occurring in a residential building. Typical statistics (such as the one below - source NFPA) give an interesting guide to fire prevention. However, this information also includes detached and semi-detached homes.




This information gives us insight into how we might prevent fires.

## Suite Fire Equipment

Each condominium unit has mechanisms to assist in the detection and the control of fire. Various devices are included in suite fire protection systems. These devices are:

- A Heat Detector near the suite entrance
- A Speaker near or in the bedrooms
- A 120 Vac Smoke Alarm near or in the bedrooms (owner responsibility)
- A Self-closing Fire Rated Entrance Door (20 min. or more)

Other equipment outside the suite includes: smoke detectors in corridors, manual stations and fire-fighter telephones near the exit stairwells, and fire hose cabinets with fire extinguisher (one or more depending on the corridor length).

## In Case of Fire

So what do you do in the case of fire in your own suite? Following are the steps:

- Leave your unit
- Make sure that the door is CLOSED
- Operate the Fire Manual Station
- Notify Concierge or superintendent where the fire/emergency is
- Leave the building
- If you can't leave the floor, go to a neighbor's unit as far from the fire as possible

## What happens when a fire occurs in a building?

Usually, the speakers give an Alarm tone, a signal is sent to the Fire Department, the Elevators are recalled to the Ground Floor, the Fire panel (often at Concierge) shows the floor that has the alarm and then the Concierge announces the Fire over the speakers. In short order, the fire department arrives and takes control.

It is always a good ideal to have a Fire Exit Plan which includes keeping the entrance door clear, knowing where the exits are (if you are a visitor), have the address near the telephone (for children) if calling 911.

Have an evening safety check including Appliances OFF, Cigarette and Candles OUT. Never leave the washing machine, dishwasher or clothes dryer running overnight.

## Renovations

Many owners have a contractor renovate their units to more accurately reflect their needs and wants. Condominium corporations often have rules that must be followed during a renovation. In addition to those rules, it is often helpful to provide your contractor the following information in addition to your specifications:

- Keep suite door closed (dust can cause the hallway smoke detector to get dirty and go into alarm)
- Make sure that manual stations and exit doors are not blocked

*continued…*

## Fire Safety in Residential Condominiums Cont'd

- Keep the corridor clear
- Protect the smoke alarm speaker and heat detector from painting

After renovations are completed, have the contractor clean your smoke alarm.

### Kitchen Safety

At this point, we must address condominium safety. Contrary to what most would expect, the most dangerous area of the suite is the bathroom due to slips and falls. The most dangerous area from a Fire Safety point of view is the Kitchen, which accounts for approximately 50% of fire incidents.

The reason that the kitchen is so high risk results from the availability of fuel and a source of ignition in the form of heat. It is best to view this from the approach of fire prevention. Since 40 to 50% of fires are started by cooking, we can do a number of things to reduce the number of fires. These include:

- Clean oven and toaster on a regular basis - Fat, crumbs and grease are highly combustible
- NO METAL IN THE MICROWAVE – sparks are generated by this
- Check that kitchen fans and exhaust work correctly
- DON'T OVERLOAD THE ELECTRICAL RECEPTACLES
- Focus on the task at hand - Turn the heat down or off, if you get a call or have to answer the door
- Avoid loose clothing that could drape across the stove - clothing is combustible
- Keep tea towels and electrical cords off the cook surface
- DON'T DRINK & COOK!
- Switch off the burner or oven after cooking
- Avoid having pan handles sticking out from the stove (important with children)
- Keep appliance cords away from water

So what do you do if an appliance or pot catches fire? Remain calm. If it is hot, leave it where it is. If it is safe, turn the heat OFF. If possible put a lid on it. **NEVER** put water on a deep-fat-fryer, it will cause a fire ball. **NEVER** put water on an electrical appliance – you could electrocute yourself. If possible turn off the breaker controlling the electrical appliances and receptacles. **Call 911**.

**Child-proof your kitchen** by keeping matches and lighters out of reach of children – use a spark ignitor. Fit a safety catch on the oven door and install an anti-tip mechanism on the stove (It comes with all new stoves).

### Bedroom & Safety in Other Areas

Ensure that electrical blankets are in good condition, CSA listed, and less than 10 years old. Avoid tucking them in as this creates a hot spot and a possible source of ignition. Ensure that all electrical cables are in good condition.

In other areas of the suite, ensure that fires or heaters are safe and at least 3 feet from combustibles. Turn off when you leave or go to bed. Ensure that all cables and appliances are in good condition. Unplug Appliances where practical. NO CABLES UNDER CARPETS. Over time the cables will become damaged and fray – acting as a source of ignition. Make sure that electrical receptacles on NOT OVERLOADED.

Medical oxygen users are at greater risk of Fire.

### Fire Risk from Smoking and Candles

Smokers are responsible for 5 % of Fires.

Never leave a cigar, cigarette or pipe unattended as they can tip or fall into combustibles (i.e. carpets & papers). Dispose of them properly. Use ashtrays that won't tip. NEVER PUT THEM OUT IN A WASTEBASKET! Never smoke when lying down, as you may fall asleep and drop it onto a fuel source like carpet. Be careful when drinking.

Vaporizer cigarettes present similar risks and since they are battery operated may be more susceptible to failure.

Use child resistant lighters.

What about Candles? They are responsible for 5 % of Fires.

Use in a proper holder - on a heat resistant surface. Be sure to use them away of from breezes, curtains and flammable decorations. Make sure that you extinguish them before you leave the room and/or go to bed. Use a snuffer or spoon - avoid blowing out

In a power outage, use flashlights rather than candles.

This article may be re-printed with appropriate credit. ◆

# Harmonization of UL and ULC Canadian Certifications

By Brian McBain / Senior Regulatory Affairs Representative

Authorities Having Jurisdiction and other users will now be able to search within one central database thereby simplifying the search for certified products for Canada.

In 2015, Underwriters Laboratories LLC (UL LLC) and Underwriters Laboratories of Canada Inc. (ULC) initiated a process to combine the Canadian Certification Directories into one single Canadian Listing Directory for certified (Listed) products. This process entails harmonizing approximately 300 Canadian Category Control Numbers (CCNs).

A step back into history to understand how the relationship between UL LLC and ULC evolved:

- **William H. Merrill founded UL in 1894 as an independent product safety certification organization.**
- **William H. Merrill submitted an application to establish an affiliate of UL in Canada and a Charter was granted to Merrill on August 15, 1920.**
- **1949 – Underwriters' Laboratories of Canada became a completely Canadian organization**
- **1995 – ULC's affiliation with UL Inc.**
- **2011 – ULC becomes part of UL's Global Family of Companies.**

UL LLC and ULC are both accredited by the Standards Council of Canada (SCC) as Certification Bodies and there are numerous product certifications within the Scope of Accreditation of both companies. These product certifications are found in our Canadian Certification Directories and are organized by Category Control Numbers or CCNs.

When certification is provided by ULC, the product receives the ULC Listed mark and these certified products would be found in a CCN – a five digit alphabetic or alpha numeric code ending with a "C" (For example: BXUVC, XHEZC, etc.). These products then would be found in the ULC Online Certification Directories and bear the following Listing Marks -

ULC LISTED ULC LISTED

Alternatively, when UL LLC provides the certification, the product receives the cUL Listed mark and the products would be found in the UL Online directories under a CCN ending in "7" (For example BXUV7, XHEZ7, etc.) and bear the following Listing Marks -

c UL LISTED c UL US LISTED UL CERTIFIED SAFETY US-CA E123456

The ULC Listed, the cUL Listed and the new UL Enhanced mark are equally accepted in Canada by all Provincial and Territorial Jurisdictions. Having one of these marks on a product, means that either ULC or UL LLC has evaluated the product to the applicable Canadian requirements.

## The "Power of We" and the One UL:

The process of harmonizing the Canadian Certification categories into one single directory is now well on its way. Users can now search in the ULC Online directories for the CCNs that end with a "7" in addition to CCNs ending with the "C". This process of harmonization will take some time to complete, therefore, users are still recommended to use both ULC Online Directories and the UL Online Directories in the interim. Also, UL Product SpecTM has a search feature for cUL and ULC certifications. To access the Canadian version of UL Product SpecTM go to www.ul.com/productspec and click on the Canadian Certifications.

The ULC Code Authorities website provides access to the individual certification bulletins for the product category that has been or currently being harmonized. The web page can be found via the following link "Canadian Category Harmonization".

Upon completion of the Canadian Category Harmonization project, users will be able to find all Canadian product and service certifications in one central location. This will simplify the search method in the Online Directory database for all users.

For more information about the Canadian Category Harmonization process or for questions please contact Brian McBain at Brian.McBain@ul.com or +1.613.751.3404 ◆

# PUBLIC NOTICE

Release No. 18PN-21 and 18PN-22

Michelle Press
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## UL Warns of Counterfeit UL Mark on Fire Sprinklers (Release 18PN-21 and 18PN-22)

**NORTHBROOK, Ill., June 22, 2018 —** The following is a notification from UL that the fire sprinklers, identified below, bear counterfeit UL Certification Marks for the United States and Canada. The fire sprinklers have not been evaluated by UL to the appropriate Standards for Safety and it is not known if the fire sprinklers comply with any safety requirements.

Although the fire sprinklers are marked GL5661 and GL5651, the fire sprinklers were not manufactured by Globe Fire Sprinkler.

**Product Models:** Models GL5661 and GL5651

### Release 18PN-21

**Product Identification**: The products are marked with a counterfeit UL Certification Mark and "GLOBE" on the wrench boss. The counterfeit fire sprinklers employ a thermo bulb marked "JOB F5" and may be provided with an orange guard. The following is marked on the deflector:

GL5661 155°F 68°C SSU-1

GL5651 155°F 68°C

**Product Photos:**

Model GL5661


Model GL5651


Orange guard

**Location:** The fire sprinklers have been found in the United Arab Emirates. UL has not received reports of these counterfeit sprinklers in other locations.

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## Release 18PN-22

**Product Models:** Models GL5661 and GL5651

**Product Identification**: The products are marked with a counterfeit UL Certification Mark and “MAFCO” on the wrench boss. The counterfeit fire sprinklers employ a thermo bulb marked “JOB F5” and may be provided with an orange guard. The following is marked on the deflector:

GL5661 155°F 68°C SSU-1

GL5651 155°F 68°C

**Product Photos:**

Model GL5661

Model GL5651


Orange guard


**Location:** The fire sprinklers have been found in the United Arab Emirates. UL has not received reports of these counterfeit sprinklers in other locations.

**About UL:**

UL fosters safe living and working conditions for people everywhere through the application of science to solve the safety, security and sustainability challenges.  The UL Mark engenders trust enabling the safe adoption of innovative new products and technologies. Everyone at UL shares a passion to make the world a safer place. We test, inspect, audit, certify, validate, verify, advise and train and we support these efforts with software solutions for safety and sustainability. To learn more about us, visit UL.com.

# Membrane Ceilings

Megan Nicoletti, CodeNext Inc.

Are all ceiling membranes created equal? There is a common misconception as to what constitutes a ceiling membrane when speaking in terms of fire protection and life safety. In general terms, a ceiling membrane provides a protective fire and smoke barrier for the structural components within a floor assembly.

The confusion arises when determining how to construct a ceiling membrane.

Floors must be constructed to remain in place; so as to provide sufficient time for occupants to safely exit the building. This is also known as the "fire-resistance rating" (FRR); which, as defined by the Building Code, *"the time in minutes or hours that a material or assembly of materials will withstand the passage of flame and transmission of heat when exposed to fire under specific test conditions and performance criteria…"*.

The fire-resistance ratings of materials, or assemblies of materials, are determined on the basis of results of tests conducted in conformance with CAN/ULC-S101 "Fire endurance Tests of Building Construction and Materials". Testing laboratories that are accredited by the Standards Council of Canada will typically publish directories of various assemblies and their associated fire-resistance ratings. Alternatively, the MMAH Supplementary Standards to the Ontario Building Code (OBC) or Appendix D of the National Building Code of Canada (NBCC) can be applied for determining the appropriate fire-resistance rating. MMAH Supplementary Standard SB-2, "Fire Performance Ratings", allows users to calculate the fire-resistance rating through the use of the component additive method, whereas MMAH Supplementary Standard SB-3, "Fire and Sound Resistance of Building Assemblies", is used for buildings regulated under OBC Part 9 (housing and smaller buildings) by providing graphic descriptions of various fire-rated assemblies and their associated fire-resistance rating.

When the fire-resistance rating of an assembly is determined on the basis of MMAH Supplementary Standard SB-2, there are two separate methods that can be utilized. The fire-resistance rating can be achieved by implementing a ceiling system that forms part of the floor assembly (herein referred to as a ceiling assembly) or by implementing a ceiling membrane (herein referred to as a ceiling membrane) that will act independently as the sole protective fire and smoke barrier.

Specifically, OBC SB-2, 2.3.4.(1) states that the fire-resistance rating of a framed assembly may be calculated by adding the time assigned for the membrane on the fire-exposed side plus the time assigned for the framing members, plus the time assigned for additional protective measures such as the inclusion of insulation or the reinforcement of a membrane. Conversely, OBC SB-2, 2.3.12. permits the fire-resistance rating of a ceiling assembly to be determined on the basis of the membrane only and not on the complete assembly, provided no openings are located within the ceiling membrane.

When implementing a ceiling membrane system (where the ceiling contributes the entire fire-resistance rating), the maximum permitted fire-resistance rating is 1 hour, when designed in accordance with MMAH Supplementary Standard SB-2. If a greater fire-resistance rating is required, then a listed design, tested by an accredited laboratory must be implemented.

The benefits to installing a ceiling membrane system are such that any exposed structural floor or roof components (i.e. wood joists, open-web steel joists, beams, metal decking, etc.) need not be independently protected. Applications where this system is often used is where a ceiling space contains an abundance of ductwork and piping and it is too difficult or hazardous to install/construct a fire-protection system that would independently protect the structural elements. For example, oftentimes mechanical rooms in older buildings contain steam pipes suspended from the mechanical room ceiling. Due to the close proximity, and high-heat radiating from the adjacent steam pipes, traditional fire-protection methods (i.e. spray fire-resistance material or intumescent coatings) for any exposed steel beams would be difficult to construct/implement. Environmental considerations such as humidity levels may also have an impact on certain fire-protection materials. As such, the construction of a membrane ceiling, below these steam pipes might be a more practical installation.

It is important to note that penetrations through a membrane ceiling system are not permitted. This is due to the fact that the membrane ceiling provides the sole barrier for fire and smoke and any penetrations may compromise the integrity of the membrane. However, in some jurisdictions, the Authorities have been receptive to membrane penetrations for sprinkler heads. The nature of the hazard posed by single membrane penetrations of sprinkler piping is limited due to the size of the opening(s), and the consideration that the sprinkler system will assist to mitigate the propagation of heat and flame; thereby

*continued…*

## Membrane Ceilings Cont'd

providing an additional level of protection for the ceiling membrane. The inclusion of a metal escutcheon plate, protecting the annular space surrounding the penetrating sprinkler piping will also limit the free passage of fire and smoke through any annular space. For projects implementing this approach, local Authorities Having Jurisdiction (AHJ) should be contacted for an agreement in principle, prior to proceeding with a design that includes a membrane ceiling penetrated by sprinkler heads.

Alternatively, if ceiling openings/penetrations are anticipated, then a holistic approach to consider the fire-resistance rating of an assembly on the basis of the component additive method is recommended. The OBC allows for penetrations of a ceiling assembly provided the openings satisfy the corresponding Code requirements. Specifically, the Code allows for ceiling membranes that form part of an assembly to have openings as follows:

- Openings leading to ducts (with specific size, spacing and clearance limitations) need not be protected with a fire stop flap.
- The concealed space above the ceiling assembly can be used as a return-air plenum provided every opening through the membrane is protected by a fire stop flap.
- Sprinkler heads are permitted to penetrate a ceiling assembly as indicated above, without prior acceptance from the AHJ.
- Noncombustible electrical outlet boxes need not be protected by a fire stop system provided the annular space is limited and the outlet boxes are less than 100 $cm^2$ each in area with an aggregate area of 650 $cm^2$ in any 9.3 $m^2$ of surface area.

In summary, when deciding which ceiling system is most suitable for a project, the two methods described above provide different performance criteria. A ceiling membrane that contributes to the fire-resistance rating of the entire assembly is permitted to have openings/penetrations but will require the other components within the assembly (i.e. structural elements, insulation, roof and sub-floor systems) to also contribute to the fire-resistance rating. Whereas, a ceiling membrane, that achieves the entire fire-resistance rating is often the easier solution in retrofit projects where protection of other components of the floor is not feasible. However, this ceiling membrane system would not allow for any openings or penetrations; which might pose complexities with respect to lighting, fire alarm devices, speakers, etc., which would all be required to be surface mounted.

Should you require further information on this topic, please contact Megan Nicoletti at 416-220-5650 or mnicoletti@CodeNext.ca. ◆

# 2019 Scholarship Initiative

To assist in funding the Founders Award for Leadership and Excellence the Canadian Fire Safety Association (CFSA) is looking for new financial donations from both Individual and Corporate members. Any amount donated upwards of $500.00 or $1000.00 dollars could lead to the naming of a new scholarship fund.

Any individual donations will be eligible for a tax receipt. If you, your organization or business is interested in creating a scholarship please contact us for information at, 2019 Scholarship Initiative, Canadian Fire Safety Association, 2800 14th Avenue Suite 210, Markham, ON L3R 0E4

I am confident that together we can support future professionals who will embrace the challenge to make this world a better place to live and work through fire protection and life safety. We invite you to join us in the challenge to make a difference in our community by shaping and developing outstanding leaders in the communities we serve. We are grateful to the organizations noted above that make these scholarships possible.

Jim Stoops
Chair, Scholarship Committee

## CFSA 2018 Scholarship Donations

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# Medical Marijuana in the Workplace: Risks for Employers

Carola Mittag, President of Workplace Safety Group

As the use of medical marijuana increases across Canada, employers will need to make changes to their workplace policies with the passing of new Medical Marijuana Access Regulations. Much like other medical drugs, a prescription for marijuana does not give the employee a green light to use it in the workplace. Both the employee and employer are subject to certain obligations with regards to the use of medical marijuana in the workplace.

Accommodating Medical Marijuana under the Ontario Human Rights Code Medical marijuana engages the same principles of accommodation as any other doctor prescribed drug. Employees may be prescribed medical marijuana to cope with a number of conditions such as arthritis, cancer, chronic pain, or sleeping disorders. An employee's need to consume medical marijuana triggers an employer's statutory obligations.

## Accommodating Medical Marijuana under the Occupational Health & Safety Act

The use of medical marijuana in the workplace is also governed by Ontario's Occupational Health and Safety Act (OHSA). Under section 25 of the OHSA, employers have the duty to "take every precaution reasonable in the circumstances for the protection of a worker." Thus, employees do not have a right to be impaired in the workplace where their impairment may endanger their own safety or the safety of co-workers.

The employer's obligation to accommodate does not end when a meaningful impairment of the employee's ability to perform their current job becomes apparent. It is important for employers to understand that they have a broad obligation to investigate and make efforts to accommodate employees using prescription medications, including medical marijuana.

## Creating Policy for Medical Marijuana in the Workplace

Workplace policies dealing with medical marijuana should fundamentally reflect policies created to address any other use of prescription medication in the workplace. Employers should communicate what, if any, uses of medical marijuana will be considered acceptable in the workplace, and the appropriate procedure for reporting the use of medical marijuana. Employers should consult with employees seeking accommodation when establishing the appropriate adjustments to the employee's work duties, schedule or work arrangements and must also address the disciplinary consequences of breaching the use or reporting protocols.

## Drug Testing

First, the onus lies on the employer to demonstrate reasonable cause to subject the employee to drug testing. The employer must be able to point to evidence enough, to form a reasonable opinion that the employee is impaired. Evidence of a general problem with marijuana or other drug abuse in the workplace may be sufficient to subject employees to random drug testing.

Employers may not necessarily be allowed to draw adverse inferences from an employee's refusal to submit to a drug test. Drawing such inferences could amount to discriminating against the employee. Again, the obligation is the employers to establish reasonable cause to test the employee, then shifts to the employee to disprove that evidence by subjecting themselves to a drug test.

## Conclusion

While medical marijuana engages similar protocols for accommodation as any other prescription drug, employers would be wise to review their workplace policies to ensure they are complying with their obligations. Employers should also strive to effectively communicate the responsibilities of employees seeking to use medical marijuana.
This article provides only an overview. The issue is complex and obtaining legal advice is recommended.

*Carola Mittag is President of Workplace Safety Group, experts in workplace health and safety. Workplace Safety Group has designed training programs specifically for the housing sector, and developed an auditing tool to ensure that housing administrations meet all legal health and safety compliance requirements.*
*Email: carola@workplacesafetygroup.com*

# Canadian Fire Safety Association
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- **$1,000.00 CFSA Founders Award for Leadership & Excellence**
  **Kaitlyn Hunt, Seneca College**
  Presented to the TOP GRADUATE of a 3 year full time Fire Protection Technology or University degree, who has demonstrated leadership qualities including a balance of academic excellence, outstanding leadership, motivation and community service. The applicant should excel in displaying outstanding leadership, display motivation and contribute to the fire safety community, achieve academic and technical skills to impact the fire safety community and outstanding concern for others/volunteerism.

- **$1,000.00 CFSA Fire Safety Award 2015 In Memory of Rich Morris Winner**
  **Fang Zhu, Seneca College**
  Presented to the TOP STUDENT having completed year 2 of a 3 year full-time Fire Protection Technology Course with outstanding leadership, motivational and technical skills and overall academic proficiency ≥ 3.3 GPA.

- **$1,000.00 CFSA LRI Engineering Inc. Award Winner**
  **Andy Williams, Seneca College**
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# CFSA Scholarship Program

# Your Opportunity to Support Our Students

## The CFSA is very proud of its scholarship program and each year we present financial awards to deserving post-secondary students enrolled in a Fire Safety program.

It is important to recognize the achievements of those students who stand out amongst their peers and to assist them with the cost. Completing this 3-year program can be as high as $24,000.

**As a scholarship sponsor, you will:**

- provide the criteria for your award
- present the award at our Annual Education Forum
- be recognized in the CFSA Newsletter and on the CFSA website
- help a deserving student in their quest to become a fire safety professional

**The following corporations have generously signed on to provide annual scholarships:**

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- Jensen Hughes Consulting Canada
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- Underwriters' Laboratories of Canada Award
- City of Markham, Buildings Standards Department
- Siemens Canada Ltd.
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***Please add our company's name to this prestigious list of scholarship sponsors:***

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**Scholarship Committee Chair, Jim Stoops, will contact you to discuss opportunities for your company's participation.**

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❑ VISA ❑ MasterCard ❑ American Express

Account # ____________________

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Signature ____________________

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