CANADIAN FIRE SAFETY ASSOCIATION

CFSA NEWS

Fire Safety is Everybody's Business

SPRING 2021

Remote Inspections and Digital Reporting

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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

Spring has sprung and with the new season, many of us are still finding ourselves living a somewhat parallel life on repeat, as did Bill Murray in the classic movie "Groundhog day". While our day-to-day experiences are frequently blending into one and other. There is hope on the horizon for us all and hopefully, as spring turns to summer we will be one season closer to returning to how things were in 2019.

The terms resilient and flexible come to mind as I think of the work that so many of our members are doing now on a day-to-day basis, from home, from site and most often from behind a video screen.

Flexible work environments and flexible learning environments are arguably the best two things that have come from our time while working during the pandemic. For the CFSA, we have been trying to help keep our members advised of current and future trends also, that would allow you all to stay flexible while continuing to meet or exceed the various demands of our Fire and Life Safety Industry. By continuing to provide monthly online training workshops it is our continued goal to provide meaningful training topics for individuals and or the entire office to participate within. Recently these workshops have included topics like *Enclosure Integrity Testing, Updates to ULC standards, Updates to the National Building Code*, and most recently a great session on *Fire Stopping (The good, the bad, and the ugly).* It continues to be our goal to provide sessions on a wide variety of fire-related areas and if you or your company has an area that you would like to see more of please feel free to contact our Education Committee.

Another important spring 2021 milestone is that the CFSA will be celebrating its 50th Anniversary. On May 6, 1971, the Canadian Government through the Department of Consumer and Corporate Affairs granted a Canadian Charter (Letter Patent) to the Canadian Fire Safety Association. While it is hard to really celebrate this achievement in a similar way to how the first meeting was held in May of 2021, we will however be trying our best to highlight this as we move forward with our Annual Education Forum in the fall.

Be sure to follow or connect with us using Twitter @CFSA_NextGen along with @CFSA_Canada. Please feel free to contact me at any time President@CanadianFireSafety.com

Stay safe,

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 CANADIAN FIRE SAFETY ASSOCIATION NEWS

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.

Click on a cover below to view that issue online ...

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Remote Inspections and Digital Reporting

By: Bassem Khalil, CFPS

Despite the pandemic, the building industry is full speed ahead; for example, mega-developments such as Neom in Saudi Arabia, the Crossrail Project in London and even the Eglinton LRT here in Canada. Around the globe, highly challenging and unique architectural designs are being adopted, the tallest buildings in the world are being constructed and shopping malls, hospitals, hotels, theme parks, museums and many other buildings are constantly being built, renovated or reimagined. Current methods of traditional fire inspection testing, commissioning and training isn't cutting it anymore, and has created many challenges for the construction industry, fire and building officials and other authorities as they tackle these new realities.

Some of these challenges being faced include:

- Lack of international fire and life safety knowledge transfer
- Delayed project schedules to accommodate fire inspections, leading to business disruption claims
- Difficulty tracking thousands of fire safety components during installation – one gap can cause a whole system replacement at critical project stages

To address these challenges, the construction industry is utilizing remote inspection technologies, first developed in the Middle East – a region where mega-projects require this innovative approach to fire and building safety to meet monumental building goals.

Remote Fire Inspections: The Construction Industry Disrupter

A decade ago, remote fire inspections were not in use. Around that time, in collaboration with a great team of experts, we developed the remote method while working in the United Arab Emirates, where it is now widely used and has been adopted by NFPA.

Someone who is already on-site can film their facility and send it back to a Fire Protection Engineer (FPE), who can then conduct their evaluation remotely.

In 2012, UAE witnessed a major boom in construction. In 2015, the first remote inspection draft guidelines were introduced under the umbrella of the UAE fire code. And In 2018, NFPA Standards Council approved a proposal by UAE Civil Defense to form the new NFPA 915 for remote inspections. An initial set of objectives were initiated back in 2013 where the first trial of remote inspections:

- Enhance inspection's quality
- Achieve highest levels of safety
- Provide quality services to end users
- Develop new training tools and materials
- Ensure knowledge transfer
- Reduce inspection costs and save time
- Regulate the unregulated parts of the inspection
- Provide a resilient reporting system tool for insurance companies, government officials and building owners

Today, remote inspection is a self-assessment inspection communication reporting method intended to enhance inspection and testing capabilities remotely. It ensures that processes, installations, policies and regulations are being performed, followed and implemented with higher or equivalent quality than current inspection and reporting methods.

In other words, remote fire inspections are a method of commissioning active and passive fire safety systems using audio-visual filming. Someone who is already on-site can film their facility and send it back to a Fire Protection Engineer (FPE), who can then conduct their evaluation remotely.

Just like an in-person fire inspection, remote fire inspections cover:

- Passive and active fire protection
- Egress systems
- Fire detection and alarm
- Smoke management
- Fire pump performance and functional tests
- Sprinklers, automatic wet stand-

pipes/hose reels, and private external hydrants
- Emergency and standby power supplies
- Integrated cause-and-effect testing

Throughout all of these steps, it remains important to engage a qualified FPE who can evaluate the film and conduct the inspection.

Getting the Most out of Remote Inspections

The most commonly used methods in performing remote inspections are:

Live Virtual Inspections, used for periodic and simple re-inspections, is best delivered utilizing mobile phones and proper Internet 3g or WIFI Coverage. Note the need to ensure that whoever is present on site has the proper equipment, and a strong internet connection. Having an inspection plan has proven to save a lot of time during the live virtual inspection process. Many resources and guidelines are now available as the use of live virtual inspections have increased in response to the COVID-19 pandemic.

Remote Pre-Recorded Video Inspections, used for complex inspections as well as building final testing and commissioning, wherein inspection videos are audited by a third-party inspection or Authorities Having Jurisdiction (AHJs) directly. This method is best delivered utilizing proper filming gear or even mobile phones. Pre-Recorded Remote Video Inspections do require in-depth pre-planning and coordination with authorities and all other involved parties to ensure success of the method.

It is also important that the responsible authority advises the project team and client if the remote process is accepted as a substitute for in-person inspections or as an extra assurance measure to confirm compliance.

All of the fundamental passive and active fire safety systems should be filmed as individual films with the possibility for 3D animations or 3D scanning. For example, passive fire protection including but not limited to use of non-combustible or limited combustible materials throughout different parts of construction, flame spread and smoke development indices of wall/ceiling linings, fire rating of assemblies such as fire doors, fire stopping, and facade to slab edge joint details, ducts/dampers, and fire rated glazing. Egress routes including architectural details, doors, locks, exit stairs, passageways, discharge, exit signs and emergency lighting should be filmed.

Active smoke management systems such as atrium smoke control or staircase pressurisation would be filmed. All aspects of the fire protection systems would also be filmed such as fire pump performance and functional tests alongside sprinklers, automatic wet standpipes/hose reels and private external hydrants. Special suppression systems, such as foam or clean agents, would also be reviewed using this approach.

Additionally, emergency and standby power supplies including performance and functional tests (black out tests) would be filmed. Integrated cause-and-effect testing would be the subject of the final film for the project and would include all fire safety systems together including actions of other buildings systems in the fire zone that are initiated by the fire alarm, such as door closers, elevator recall, HVAC interface, etc. Lastly, the acceptance testing and commission of the fire alarm system, including fire detection, alarm notification appliances,

Figure 1: R.I Smoke alarm testing, fire alarm film

and fire telephone system would also be filmed.

Timing and the extent of filming also constitutes an important factor for the success of this process. Filming should only commence when the engineer, contractor and fire safety consultant have agreed that the testing and commissioning is complete.

A sample of the testing and commissioning process of all fire safety systems should be filmed/animated to document the process and for comparison with the completed testing and commissioning records, including the completed approved Authority Having Jurisdiction handover checklists. For some systems, the films will include 100% of the tests conducted. For others, 10% of each system should be filmed and should include typical and non-typical areas of the building. The contractor (or the consultant or a qualified fire consultant, will be required to certify that the testing that has not been

Figure 2: R.I Sound DB testing, sound evacuation film

filmed has been performed in accordance with approved standards and regulations.

If a full building inspection hand over is the target, a minimum of **eight films** will be required indicating the percentage of each fire safety system to be filmed (Note all percentages are for guidance only). Such films include: passive fire protection (10%), egress routes (100%), fire detection and alarm (10%), smoke management (100%), fire pump performance and functional tests (100%), Sprinklers, automatic wet standpipes/hose reels and private external hydrants (10%); emergency and standby power supplies (10%); and integrated cause-and-effect testing of all fire safety systems.

Figure 3: R.I. Fire door testing, Egress routes

Additional Best Practices for Remote Inspections:

Team Members:

The project team should be comprised of the client, the main contractor, specialist fire safety system sub-contractors, the engineer/consultant, the fire engineer, and the production company. It is always recommended that a qualified fire engineer with proper experience is overlooking the whole process.

Filming, Production Specification and Tools:

Any available filming technologies or tools, software, applications, and 3D scanning should be sufficient, so long as the outcome delivers the agreed remote inspection filming objectives, and the minimum filming sufficient quality so that the materials of construction, location of devices, referenced documents and test sequence can be clearly seen by the A.H.J when auditing the pre-recorded films. As an example, if a detector label is being inspected for comparison with a drawing and fire alarm panel output, then these numbers should be legible in the film sequence.

Films Style and Treatment:

The scope of work dictates that the filming will be used for specific applications such as education, website, documentaries, classroom training, on-location training, and high-level government presentations.

This means that the R.I project manager must have proven experience in each of the abovementioned disciplines of film production directly related to fire safety.

Subtitles and Voiceovers:

Subtitles should be embedded in the film in English as well as in the local language, for example, in order to explain the test process alongside the visual scenes of the film. Subtitles should be short, typically 5-10 words per scene. Voiceovers explaining the process, findings and results of the test should be provided if subtitles are insufficient.

Film Verification Methods:

In order to verify that the films are of the stated project and location, each film scene should include relevant samples of the project documentation (drawings, material submittals, testing records). In addition, the location will be verified by geo-tagging via GPS or a similar application. All raw film files with film dates/times and lens used etc. should be retained for comparison with the final edits as needed.

2D / 3D Fire Safety Systems Demonstrations (e.g. 360):

Where filming of a test or sequence of operation is difficult due to multiple actions taking place at different points in the building, the sequence of operation can be documented using a combination of filming, still camera shots and visualisation or animation techniques.

Architectural visualization, industrial visualization, lighting simulation, 3D modelling, computer animation and architectural photography can be used as required to demonstrate and explain the full details of the overall fire protection system or integrated systems. 3D, real-time and immersive technologies may be considered when merging virtual and real worlds to make it possible to display digital models in real environments with navigation in 360 degree views.

2D visual communication should be used to convey large amounts of facts, figures, details, layouts and complete statistics. 2D animation should also be used for demonstrating a complete and fully integrated fire safety system or a part of a mechanical or pumping process. Where possible, 2D animation should accurately show scale, volume, shadows, light, etc.

Concluding Thoughts

As the world acknowledges that there is, indeed, a "new normal" of precaution due to the COVID-19 pandemic, many construction and fire safety industries have begun to embrace the remote inspection method as a new standard of performing site testing and inspection.

Even as countries begin to slowly loosen restrictions and re-open the economy, social distancing measures are likely to stay in place for the foreseeable future. Because of this, remote inspection practices have gained popularity. However, it's important to know the inherent challenges of this new method and how to be well prepared before jumping into implementation.

The NFPA is still in the early developmental stages for NFPA 915, the Standard for Remote Inspections, so, if the industry wants to begin employing remote inspections, it is important for the relevant A.H.J and building owners to have a keen understanding of what is involved. Listed below are the main challenges related to remote inspections, and some advice on how to address each:

Remote Inspection Methods and Applications

Understanding the amount of time, capital investment, and technology and communication tools required is crucial. It's a common misconception that there needs to be a heavy emphasis on high-tech tools or lead time. For example, using one-on-one live remote inspections, wherein the building official is communicating with a representative on-site to conduct periodic and straightforward inspections, can be a simplified way to conduct a remote inspection. Pre-recorded video on-site during construction works well for complex and new inspections. Direct systems monitoring is an additional method which requires more infrastructure, proper monitoring techniques between building officials and A.H.Js, but can work well with periodic inspections.

Oversight and Accuracy of Remote Inspections

Remote inspection best practices indicate the need for the involvement of Fire Protection Engineers and a registered third party to oversee the remote inspection process. Involving A.H.Js alleviates their concerns with oversight of critical inspection and testing items. Especially for complex and life safety-related remote inspections, having a third party to oversee the process is a must to ensure proper flow and accuracy while saving A.H.Js time on managing the process. A.H.Js should be trained with a strong and clear understanding of the remote inspection scope.

Documentation and Insurance

Having a robust in-house quality management system, proper record keeping, clearly published policies and remote inspection legal disclaimers should be a priority. Having proper documentation helps to avoid any future legal disputes and liabilities. It is important that remote inspections are insured or covered under third-party scope.

Planning

Proper planning is the key to a successful remote inspection. Using check lists, creating short training videos for those conducting the inspection and understanding the building design are all critical aspects of the planning process. Engaging a Fire Protection Engineer trained in remote inspections in the planning stage will help to ensure its success and efficient execution day-of.

Quality Assurance

Remote inspections methods should always achieve the same level of quality and safety – if not higher – than in-person inspection methods. Conducting a gap analysis and identifying the objectives before the inspection takes place ensures the inspection stays focused, safe and stands up to scrutiny.

Uses and Limitations of Remote Inspections

Remote inspections, in their most basic form, can only confirm proper function and operation of systems. In order to confirm proper compliance with design drawings, other methods should be utilized. Using 360 degree video, virtual reality, 3d scanning, BIM models or digital twin technologies are all good options to further the sophistication of your remote inspections.

Remote inspections are an efficient and powerful tool to help conduct fire and building inspections during COVID-19 and beyond, but there are inherent challenges. In order to ensure the integrity of remote inspection, a close partnership between the building owner (or representative), fire protection engineers and A.H.Js are critical. Understanding the challenges equips building owners and A.H.Js with the tools and skills required to ensure overall safety as the economy ramps up again.

References:

1- Fire Protection Engineering https://www.sfpe.org/page/Magazine FPE 04 2016 ISSUE 72 (Distant Inspection Program)
2- Jensen Hughes Blogpost 2020 HOW TO IMPLEMENT REMOTE FIRE INSPECTIONS DURING COVID-19 https://www.jensenhughes.com/insights/how-to-implement-remote-fire-inspections-during-covid-19
3- Jensen Hughes Blogpost 2020 HOW TO ADDRESS SIX COMMON CHALLENGES OF REMOTE INSPECTIONS OF-REMOTE-INSPECTIONS https://www.jensenhughes.com/insights/how-to-address-six-common-challenges-
4- NFPA - https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=915andtab=research
5- ISO - https://committee.iso.org/files/live/sites/tc176/files/documents/ISO%209001%20Auditing%20Practices%20Group%20docs/Auditing%20General/APG-Remote_Audits.pdf
6- ICC
7- http://media.iccsafe.org/2020_MarComm/Remote_Video_Insp_FINAL_w_Covers.pdf

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Amendments, Errata and Revisions:

Important Updates for Fire Protection and Life Safety Professionals

By: Jim Burns, Fire Inspector/Investigator, Regina Fire & Protective Services

Have you ever applied the wrong edition of a standard? Or referenced an incorrect requirement because you missed an amendment? Or done work in a jurisdiction and didn't account for a local amendment?

It's easy to do and even some of the most experienced people in our profession have likely done it. Did you know that the 2015 Edition of the Canadian National Model Codes (Model Codes) were revised in 2018? Not only were there technical revisions, but the referenced documents were updated. These revisions affect not only the typical code users such as building/fire code officials, architects, engineers, interior designers, but also the fire protection and life safety system installers and inspection, testing and maintenance (ITM) contractors. If your line of business interacts with the codes and standards you need to keep up to date with not only the Model Code revisions, but also provincial amendments and municipal bylaws.

If your line of business interacts with the codes and standards you need to keep up to date with not only the Model Code revisions, but also provincial amendments and municipal bylaws.

Canadian National Model Codes

The National Building Code and Fire Code of Canada (NBC & NFC) are produced through the National Research Council of Canada. Each province has some enabling legislation in which the Model Codes are adopted. When the provinces adopt the Model Codes, they amend them to suit their needs. **Keep in mind that each province may adopt the Model Codes at different times as well.**

Amendments, errata, revisions … what does it all mean? I'm sure there are a bunch of legal definitions for each of the terms. But, in my opinion the legalese doesn't matter. What is important is that these terms indicate something was changed in the Code.

In 2018 a "Revisions and Errata Package" was released for both the NBC and NFC. Both packages contained *"revisions, errata and editorial modifications that apply to the National Building/Fire Code of Canada 2015:*

- *Revisions are changes deemed urgent that were posted for public review from November 6, 2017 to January 2, 2018 and have been approved by the Canadian Commission on Building and Fire Codes.*
- *Errata are corrections to existing text.*
- *Editorial updates are provided for information purposes only.*
- *Editorial changes are modifications that improve clarity."*

Each package contained a Change Summary table, as well as the specific changes that were made to each Code. The Change Summary table is handy. It provides the Division, Code Reference and Description of Change. After the Change Summary Table are printable pages to replace pages in your printed edition. Note if you are in the digital world you can download the 2nd printing from NRC Store here.

Which Printing do I Have?

If you're not sure if you have the First Printing or Second Printing (ie, with all of the revisions, errata and editorial updates/changes), look on the back side of the first page (of the printed edition) or on the second page of the digital version. On the lower half of the page you will see the "First Printing" or "Second Printing" under "Printed in Canada".

It is important to note that not only were there changes to some of the technical provisions, which I think many of us pay attention to, there were also changes to Table 1.3.1.2 Documents Referenced of Division B.

Following are a some of examples of referenced document revisions that are

continued…

Amendments, Errata and Revisions Cont'd

applicable to those of us in the fire protection and life safety industry. **This is by no means an exhaustive list.**

Document #	Title of Document	First Printing (2015)	Second Printing (2018)
CSA 282	Emergency Electrical Power Supply for Buildings	2009	2015
NFPA 12	Carbon Dioxide Extinguishing Systems	2011	2015
NFPA 13D	Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes	2013	2016
NFPA 20	Standard for the Installation of Stationary Pumps for Fire Protection	2013	2016
NFPA 25	Inspection, Testing and Maintenance of Water-Based Fire Protection Systems	2014	2017
NFPA 33	Spray Application Using Flammable or Combustible Liquids	2011	2016
NFPA 34	Dipping, Coating, and Printing Processes Using Flammable or Combustible Liquids	2011	2016
CSA C22.1	Canadian Electrical Code, Part 1	2012	2012*

* See Saskatchewan Amendments below

If you need the latest Revisions and Errata package from NRC, it is found here. The revision package states, *"Code users should contact their local authority having jurisdiction to find out if these revisions and errata apply in their province or territory."* It is important that you are applying the correct edition of the code, as there may be important changes that are applicable to your business, your projects, and your clients.

Provincial Amendments

It is also important to note that while some provinces print their own edition of the Building and Fire Codes, others do not. However, that doesn't mean that these provinces don't have provincial amendments. You need to check the specific province for their revisions. For example, Alberta's Codes are available from the NRC Store in a consolidated single document (print or digital), while Ontario's Codes are available for order in hardcopy or free online in a consolidated single document, and Saskatchewan's amendments are available online as a separate standalone document.

As noted, Saskatchewan does not produce a separate consolidated single document of the Model Codes complete with Saskatchewan amendments. As such, if the Code user is not aware of the provincial amendments, they may be applying the wrong requirements.

Document #	Title of Document	NFC Second Printing (September 28, 2018)	Saskatchewan Amendments
CSA B149.1	'Natural Gas and Propane Installation Code	2010	2015
CSA B149.2	Propane Storage and Handling Code	2010	2015
CSA C22.1	Canadian Electrical Code, Part 1	2012	2018

It is important to check the provincial amendments for technical changes and revisions. Failure to do so may lead to delays in your project, and potentially noncompliant designs. Here is a list of the applicable codes for each province and territory.

Municipal Bylaws

To make things more complicated municipalities may also have specific requirements. These requirements are made through bylaws. Some municipalities have extensive bylaw requirements, such as Vancouver, while others may have very few. It is important as an architect, engineer, ITM contractor or fire protection system installer to check into the municipal bylaws as well.

As a father of two that was fortunate enough to take parental leave with both kids, the one addition to the Regina Building Bylaw that I really appreciate is the inclusion of infant change facilities to men's washrooms. While this is minor in the grand scheme of things, there are local requirements that need to be addressed. **But in relation to fire and life safety, some municipalities in Saskatchewan require specific fire protection and life safety contractors to obtain a license.** These requirements are outlined in their fire bylaw.

The Latest and Greatest

Sometimes a version of a standard may be available but not referenced in the applicable Code. What do we do then? I've seen some people apply the latest edition of a standard regardless of the fact that it is not the referenced edition. If you opt for this approach you need to speak with the AHJ as this may require an alternative solution. By choosing a standard that is not specifically referenced you may encounter incompatibilities or inconsistencies between the requirements of the codes and standard.

The 2020 editions of the Model Codes were slated for release in early 2021. That has changed. As of January 2021, the Codes Canada website indicates that "the 2020 editions of the national model codes are now anticipated to be published in December 2021." The more important point is, when will they be adopted and with what amendments?

This article was originally published on the Kilo Lima website. For further information regarding the Kilo Lima Community, visit https://kilolimacode.com/. ◆

A Proud Look Back & Exciting Look Forward ...

The Canadian Fire Safety Association (CFSA) continues to be positive and excited about promoting fire safety while finding new ways to evolve our methods of delivering fire protection and prevention information to the Canadian Public and industry at large.

We are proud to have hosted a couple of great technical presentations so far this year. Kicking off the New Year covering the common overlooked importance of *Enclosure Integrity Testing* presented by Iain Boyd, President of Fire Integrity Testing Solutions Inc. (FIT Solutions). This presentation highlighted the importance of room integrity in the built environment and demonstrated how the concentration and ultimately effectiveness of a gaseous suppression system heavily relies on the integrity of the room construction and more specifically, how consideration of other services such as HVAC play a role in achieving satisfactory test results.

Next up, the CFSA, joined by one of the industries leading code consultants Tony Crimi, P.Eng., MASc., of A.C. Consulting Solutions provided a preview of the expected changes to the National Building Code of Canada (NBCC) as they relate to fire safety. Due to the COVID-19 global pandemic, the National Research Council (NRC – publisher of the codes) has delayed the traditional five-year review of Canada's model construction codes until December 2021. This presentation covered the coming attractions for how the coming code updates affect fire protection, occupant safety, accessibility, and housing and small buildings.

As the CFSA looks ahead, the lineup of technical presentations, including the Annual General Meeting, Scholarship and Awards presentation, and of course the CFSA 2021 (virtual) Annual Education Forum is encouraging our members to look forward for what is to come for the remainder of this year. Our members and the fire safety community are invited to visit our website (https://canadianfiresafety.com) for more information on all upcoming dates and topics.

On a final note, the CFSA is excited to announce the latest feature offered to our membership. With a couple of great and relevant technical presentations covered this year and the many more to come, we are in the process of building a technical library for our members that will allow access to recordings of past presentations on-line. This will provide easier access to technical content and greater flexibility to our members as we all continue to adjust to our new and unique working environments.

Interested in becoming a member?

To become a member and gain full access to the technical library and more, register online today by visiting us at:

https://canadianfiresafety.com/members/join-cfsa/membership-benefits.

Alex Yarmoluk
Member of the Board of Directors – Technical Training Committee

Special Hazard Systems... What's so Special?

By: Gerry Bourne, P.Eng.

Early in my career in Fire Protection I was working with a National Canadian business in the Fire Alarm, Sprinkler and Life Safety industry. I quickly gravitated towards an area of the business called "Special Hazard Systems". These systems fascinated me because they are designed to protect a space or equipment and to extinguish a fire BEFORE traditional fire protection methods – like wet sprinklers – would normally activate. Working with these systems, we need to consider the protection of building and equipment as the primary design objective rather than the evacuation or safety of occupants (of course in most cases special hazard systems have to be in place in addition to our tradition systems required by Codes and Standards for life safety purposes)

Most of us understand the role of sprinkler and fire alarm systems in our buildings, and the extreme value they bring to the life safety of building occupants. But, sometimes the project environment will require our professionals to bring it to the next level.

We need to ask some important questions:

- *Will the introduction of water cause more damage to equipment than a fire?*
- *Will the evacuation of a control room, triggered by a fire alarm system notification, create a dangerous situation for occupants?*
- *Will there be insufficient water available to provide the fire control and suppression required for the hazards?*
- *Will the introduction of water via traditional sprinklers be incapable of suppressing the types of fires anticipated?*

These are just a few of the questions that, if the answer is yes or maybe, you need to consider the use of a special hazard system.

Keep in mind that this category of protection systems is broad and is on the leading edge of innovation in the fire protection industry, and therefore continuously evolving. In all likelihood, by the time you finish this article, a new system has gained approval or an entirely new product has been created. This characteric of special hazard systems is what makes this category so exciting. Since we can be satisfied that our buildings are safe – because of the Code requirements for traditional sprinkler protection systems – special hazard systems are the "sandbox" where new innovation and product development are free to advance.

For those new to special hazard systems, I'm going to outline some of the popular systems that are available today – they each have a unique application and benefit – consider if these would help a Client or suit a specific design project.

continued...

Pre-Action Sprinkler Systems

The most common instances that rely on pre-action systems are where the accidental release of water could significantly damage equipment or could be deemed to be catastrophic to the building. Consider, for example, a computer server room or a cold storage warehouse. A release of water accidentally from a traditional sprinkler system could be extremely damaging to building and business integrity.

The term "pre-action" refers to an extra step that is required to confirm a fire before releasing water into the pipes of a dry sprinkler system. This is usually done by having electronic detection devices connected to a fire alarm panel – which controls solenoids to introduce water. This means that you will only apply water for suppression when both the electronic detection takes place and a sprinkler head is activated (by temperature). This provides a level of redundancy so as to avoid a false activation and unnecessary release of water. It also provides a time delay to potentially limit the likelihood that water will be unnecessarily released for suppression. Often these systems are available in ready-to install cabinets, which include: detection, suppression, and releasing equipment.

Typical applications include IT/ data rooms, control equipment and cold storage warehouses.

Deluge Sprinkler Systems

When we talk about a traditional automatic sprinkler system, we are referring to sprinkler heads that are normally closed and that automatically open from the heat of a fire. Water is only released from the heads that have reached the specified activation temperature. Deluge type systems have normally open sprinkler heads and the water is only introduced by either electronic or pneumatic type detection devices. When released, the water comes out of all the open sprinkler heads at once. Hollywood has a bad habit of showing traditional sprinkler systems that are able to activate all heads at once, but usually these are shown in installations where automatic ("normally closed") heads would be installed; so, this wouldn't occur.

A typical deluge installation application is an industrial setting where the protected hazard has an extra risk of fire and to protect the equipment and occupants, you need to introduce a high volume of water (or foam) to the entire area instantaneously

Foam Systems

There are certain types of hazards that when a fire occurs just can't be controlled or suppressed in an effective way using water. The only way to manage a fire is to introduce something that will really starve the fire of oxygen; this is where a foam system works best. Foam systems can function to control a fire in many ways: the foam can blanket surface the surface of a burning fuel to smother the fire, the fuel can be cooled by the water content of the foam, and the foam blanket can also suppress the release of flammable vapors produced by a fuel that can mix with the air and burn.

Typical applications are high-hazard situations, such as: airport hangers, fuel storage & processing rooms, and heavy industrial environments.

Inert Gas & Clean Agent Systems

In some situations, the discharge of a water sprinkler system (even with a pre-action system) will cause significant and very costly damage to the equipment or space that it is protecting. What if you are protecting something so valuable that you want to detect and suppress a

continued…

Photo: U.S. Air Force photo/Sachel Seabrook

fire before it has a chance to do damage or activate the other traditional systems protecting the building? Or maybe it is important to minimize downtime from a fire event avoiding business interruption?

Some examples of these types of applications are: data centers, electrical vaults / switchgear rooms, file storage, or art galleries.

These conditions present the best applications for an inert gas or clean agent system. These systems extinguish fire by releasing a non-water suppression agent into the area. The agents are electrically nonconducting and leave no residue upon evaporation.

Water Mist Systems

There are special applications where a hazard may be present, but the site may have limited water supply such as remote locations or historical buildings. Additionally, for certain industrial projects there may have equipment that cannot be fully enclosed to allow for a clean agent or inerting gas system to be suitable, such as **industrial turbines or open-processing systems**. While these two challenges are quite different on the surface, the solution might be a Water Mist System in each case. Water mist systems control, suppress, and can potentially extinguish fires by discharging a fine water mist at high velocity into the protected area or at the special hazard itself. The water mist is created by pushing regular water through specialized nozzles at very high pressure. These systems come in both high and low pressures as well with either automatic or deluge type heads.

In December 2011, the technology achieved a critical milestone when a major brand became the first water mist fire protection product to receive Underwriters Laboratory (UL) listing for Ordinary Hazard Group 1 (OH1) applications. This, together with Factory Mutual (FM) Light Hazard (LH) system approval, has paved the way for water mist to be used in commercial buildings including data centers, high-rise buildings, hospitals, cultural heritage sites and hotels in the absence of traditional wet sprinklers.

continued…

Hybrid Systems

A hybrid fire suppression system utilizes both the oxygen displacement properties of nitrogen, as well as the cooling properties of atomized water. Instead of a traditional sprinkler head, a hybrid fire suppression technology uses an emitter to mix nitrogen with water.

A benefit of the hybrid systems is that the water droplets are also much too small to conduct electricity – so these systems can be used in spaces where electricity is present. Additionally, with such a small quantity of water being discharged, there is no requirement for floor drains or clean-up. Another advantage of hybrid systems is that they do not require room integrity testing as the system will run for a continuous period, unlike the inert gas or clean agent style systems.

Hybrid systems are unique in that they have many of the advantages of the inert gas or clean agent systems while also using water for its cooling effects and ability to carry the displacing gas throughout the space. Because of this, hybrid systems are used in many spaces that may also be suitable for water mist and/or inert gas or clean agent technologies.

Summary – You learned something Special!

It's not an exhaustive list – but hopefully this article introduced you to new technology or new concepts for fire suppression and control that may exceed the minimum requirements of the Codes and may also perfectly suit a unique fire hazard that you've encountered.

Gerry Bourne *has 13 years experience in the Fire Protection Industry with broad experience in specialty detection, special hazard systems, sprinkler, fire alarm, and security. He has managed offices, large installation projects, and teams of technical sales associates. Gerry sat on the national board of directors of the Canadian Fire Alarm Association (CFAA) and was an active member of their education committee. Gerry served as a Member-at-Large for the Society of Fire Protection Engineers (SFPE), Southern Ontario Chapter from May 2015 to May 2019.* ◆

CFSA is Celebrating 50 Years in 2021!

Stay tuned to our website for more information as plans are finalized.

UPCOMING CFSA EVENTS

INTEGRATED SYSTEMS TESTING OF FIRE PROTECTION AND LIFE SAFETY SYSTEMS

May 12, 2021

CFSA Online Learning
9:00 am - 10:00 am

Presenters: **Michele Farley**
FCS Fire Consulting Services Ltd.

Theresa (Tess) Espejo
ULC Standards

MORE INFORMATION AND TO REGISTER

CFSA ANNUAL GENERAL MEETING (AGM)

June 23, 2021

Virtual Meeting
9:00 am - 10:00 am

2021 ANNUAL EDUCATION FORUM

September 21 & 22, 2021

Virtual Meeting

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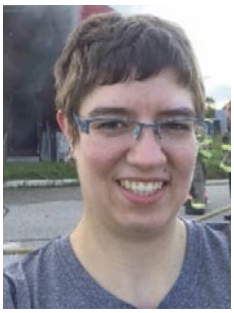

Using Video Recordings to Measure Smoke Evolution: A First Step

By: Jennifer Ellingham, EIT, MASc, MBA

I am incredibly honoured to have been selected as the winner of the 2020 CFSA Founders Award for Leadership and Excellence. It is quite inspiring to have my master's research work, leadership contributions, and personal motivations recognized with this award. The award committee also valued my academic accomplishments and community involvement.

My personal goals are very similar to the Association's objectives. We are committed to promoting fire science and improving fire protection and prevention methods to obtain and spread information on these subjects. Accordingly, my master's research work involved early development of a new method for measuring continuous, fine-mesh smoke evolution data from video recordings. Early results, detailed in my thesis [1], are quite promising. Once fully refined, the smoke evolution data could be used in aggregate to gain a better understanding of fire and smoke dynamics or for validation of smoke progression estimations in computational fire models. The method might even be used in fire investigations to estimate smoke layer height and smoke density in a manner that introduces minimal subjectivity.

My findings are based on 13 full-scale sofa fire experiments conducted in the two-storey, steel 'burn house' apparatus at the University of Waterloo (visible in the background of my headshot above). The sofas were made from six different material combinations with a variety of fire-retardant properties. Various aspects of the experimental data have been analyzed including heat release rate [2] and the general fire and smoke evolution [3]. Given the nature, size and complexity of these experiments, the whole fire research team is involved (to some extent) in most aspects of the experiments and analysis. So, besides my part in the experiments and subsequent analyses, I spent much of my time installing and maintaining the 16 cameras used in the most recent experiments. I also analyzed the smoke progression captured on the interior video footage (up to 12 cameras per experiment, three in **Figure 1**).

The analysis essentially involves measuring the continuous change in background contrast through progressive video frames to estimate the optical smoke density and smoke layer descent for each analysis area. The general process is depicted in **Figure 2**, and the detailed derivation and associated assumptions are included in my thesis [1]. Analysis showed that consistent results could be obtained for these experiments with square areas as small as 6 pixels × 6 pixels in the image and representing a physical area of 30mm × 30mm. Thus, the smoke progression estimations could be resolved at up to 58 vertical locations for each camera (shown in **Figure 1**).

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Figure 1: Analyses areas from three cameras: a) V1, b) V2 and c) V7 viewing the fire compartment [1]

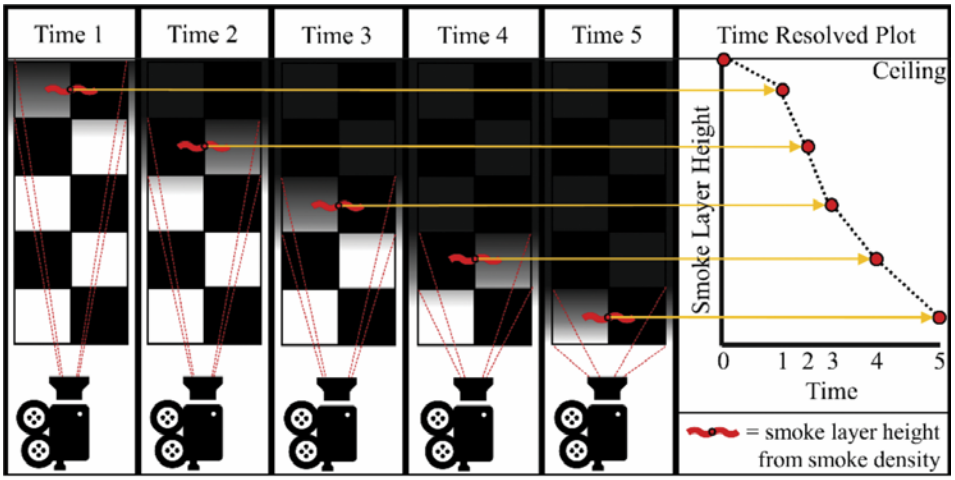

Figure 2: General premise of the analysis [1]

As expected with image-based analysis, the quality of recorded images influenced the results. Influencing factors included camera angle, presence of backlighting (required for maximum smoke density estimation), available background contrast, image resolution, fire proximity, ambient light levels, and availability of a colour calibration curve. However, this method was successfully applied to:

- recordings collected with and without method-specific instrumentation (e.g., camera selection, camera angles, and inclusion of checkerboards)
- colour and non-colour (i.e., infrared, or black and white) recordings
- recordings from various cameras, various recording speeds and differing image resolutions.

Although preliminary, the results collectively show that the method is quite robust in terms of potential applications. Findings to date consistently show a large rise in smoke density at approximately the time when the smoke layer passes through the analysis height. Further investigation will be conducted to determine the ideal smoke density indicator value that signals the smoke layer height in different lighting scenarios. Nonetheless, the fine mesh analysis can be used to create high-resolution contour plots for smoke density with time such as **Figure 3**.

Given that smoke collects at the ceiling before descending through a compartment (visible in **Figure 1**), it is consistent that the estimated smoke layer position descends through the various analysis areas by height as shown in **Figure 4**. These progressions were found to be similar between different camera angles (see **Figure 4**) and for repeat experiments with the same sofa material. Conversely, as expected, different smoke layer progressions with time were noted between different sofa materials. To date, the image-analysis results were within 91 seconds of observer-based estimates of smoke layer height such as those shown **Figure 4** (Obs. Range). For comparison, other common smoke layer height estimation methods were used as well. These yielded results that were up to 155 seconds different from observer-based estimates [1].

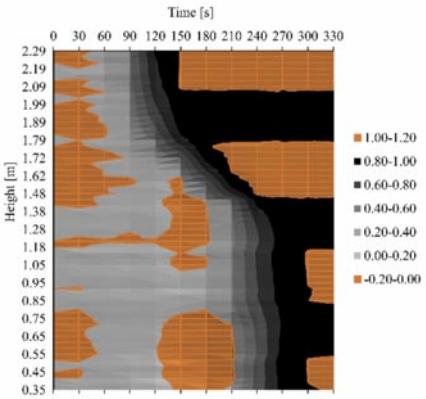

Figure 3: Contour plot of smoke density at all 58 heights on the checkerboard in Figure 1a) and at 30s time intervals from ignition to 330s. [1]

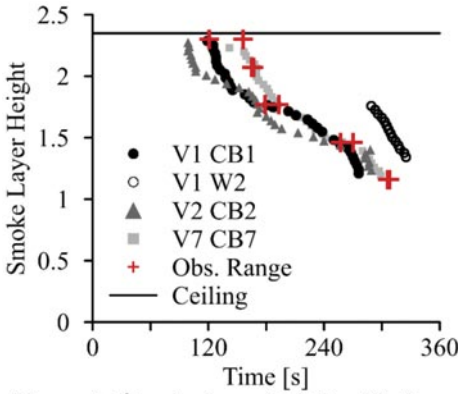

Figure 4: Smoke layer height with time using cameras V1, V2 and V7 at up to 34 determinations from checkerboards (CB#) or across the window (W2). Ceiling height and observer-based smoke layer heights (Obs. Range) are included for reference. [1]

The maximum smoke density results were very promising – estimates, when possible, were within 1% of an average value determined from different tests and analysis areas for each sofa material. This small deviation includes up to 14 data points between analysis areas in the same experiment and between experiments with the same sofa material. The relative ranking of the average maximum smoke density values matched those obtained using the Smoke Density Chamber (where available). Only two of the six material types had both i) Smoke Density Chamber results and ii) image-analysis results for comparison, so further investigation will be done to confirm these results. Although refinement is ongoing, this new method appears to be a good alternative for analyzing smoke evolution from video recordings. The time varying

smoke layer height results are promising for video recordings that have visible light (i.e., close to white) coloured areas. For recordings with backlit areas, the maximum smoke density estimates appear to produce accurate rankings compared to the Smoke Density Chamber. While currently inconclusive, results show potential for estimation of soot deposit [1] which will be investigated using data generated during upcoming full-scale 'burn house' experiments.

My intent is to apply the method to various fire scenarios to confirm applicability and minimize subjectivity and uncertainty. The frame-by-frame, fine-mesh analysis that is possible with this method is very promising for applications in fire safety. If you have an idea of where this method might be applied, feel free to reach out via email (jennifer.ellingham@uwaterloo.ca). I would love to collaborate and expand the applicability of this method – the more it is used, the more we can learn.

References

[1] J. Ellingham, "Measuring Smoke Evolution at Full-Scale with Video Recordings," MASc thesis, Mechanical and Mechatronics Engineering, University of Waterloo, Waterloo, ON, 2021. Available: http://hdl.handle.net/10012/16818

[2] B. Forrest, "Heat Release Rate in Ventilation-Limited Furniture Fires," MASc thesis, Mechanical and Mechatronics Engineering, University of Waterloo, Waterloo, ON, 2021. Available: http://hdl.handle.net/10012/16065

[3] B. Forrest, E. Weckman, M. DiDomizio, P. Senez, and N. Ryder, "Smoke development and movement during ventilation–limited fires in a multi–storey house," Fire and Materials, May 2020. [Online]. Available: https://doi.org/10.1002/fam.2860 ◆

Face masks that contain graphene may pose health risks

Starting date: April 2, 2021
Type of communication: Advisory
Subcategory: Medical Device
Source of recall: Health Canada
Issue: Product Safety
Audience: General Public, Healthcare Professionals, Hospitals
Identification number: RA-75309

Report a Concern

Guide to re-opening Ontario's schools

Last updated: 2021-04-02

Summary

- **Product:** Face masks labelled to contain graphene or biomass graphene.
- **Issue:** There is a potential that wearers could inhale graphene particles from some masks, which may pose health risks.
- **What to do:** Do not use these face masks. Report any health product adverse events or complaints to Health Canada.

Issue

Health Canada is advising Canadians not to use face masks that contain graphene because there is a potential that they could inhale graphene particles, which may pose health risks.

Graphene is a novel nanomaterial (materials made of tiny particles) reported to have antiviral and antibacterial properties. Health Canada conducted a preliminary scientific assessment after being made aware that masks containing graphene have been sold with COVID-19 claims and used by adults and children in schools and daycares. Health Canada believes they may also have been distributed for use in health care settings.

Health Canada's preliminary assessment of available research identified that inhaled graphene particles had some potential to cause early lung toxicity in animals. However, the potential for people to inhale graphene particles from face masks and the related health risks are not yet known, and may vary based on mask design. The health risk to people of any age is not clear. Variables, such as the amount and duration of exposure, and the type and characteristics of the graphene material used, all affect the potential to inhale particles and the associated health risks. Health Canada has requested data from mask manufacturers to assess the potential health risks related to their masks that contain graphene.

Until the Department completes a thorough scientific assessment and has established the safety and effectiveness of graphene-containing face masks, it is taking the precautionary approach of removing them from the market while continuing to gather and assess information. Health Canada has directed all known distributors, importers and manufacturers to stop selling and to recall the affected products. Additionally, Health Canada has written to provinces and territories advising them to stop distribution and use of masks containing graphene. The Department will continue to take appropriate action to stop the import and sale of graphene face masks.

Products affected

Face masks labelled as containing graphene or biomass graphene.

What you should do

- Do not use face masks labelled to contain graphene or biomass graphene.
- Consult your health care provider if you have used graphene face masks and have health concerns, such as new or unexplained shortness of breath, discomfort or difficulty breathing.
- Report any health product adverse events or complaints regarding graphene face masks to Health Canada.

continued…

Media enquiries

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hc.media.sc@canada.ca

Public enquiries

(613) 957-2991
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hcinfo.infosc@canada.ca

For more information

- COVID-19 medical masks and respirators
- Canada.ca/coronavirus

Date modified: 2021-04-02

Spring into Safety

Inside the home

- Check and clean your smoke and carbon monoxide alarms. Smoke alarm batteries should be changed once a year.
- There should be at least one smoke alarm on every floor of the house. Test your smoke alarms by pressing the test button to ensure they are operational every month.
- Check for overloaded or damaged extension cords.
- Check and clean filters above stove.
- Prepare for storm related outages. Make sure your flashlights and portable radios have batteries and that other supplies such as bottled water are stocked and available.
- Practice your escape plan with your family so everyone knows what to do in case of an emergency.
- Properly store household chemicals and never mix cleaning agents.
- Pull the refrigerator out and vacuum or dust the coils.
- Check windows to ensure they open and close properly, in case they are needed as an exit.
- Always keep stairs and landings clear for safe evacuation in event of an emergency.

Chimneys

- As cozy as it was in January and February, with the warmer weather approaching chances are you'll be less inclinded to build a fire in the living room fireplace. As easy as it is to just scoop out the ashes and close it up, it's just as easy to forget about it until November. Have the chimney inspected as part of your spring cleaning routing.

  NFPA recommends having a chimney inspected and thoroughly cleaned at least once a year. Getting it done and out of the way also can mean ridding it of buildup that would only cause more damage if it hung around until the fall.

Dryers

- The leading cause of clothes dryer-related fires is a failure to keep dryers clean. Scooping out the lint basket takes all of about 10 seconds, so be sure to clear it out every time you throw a load in. NFPA also recommends cleaning out the vent pipe at least once a year, so no a bad idea to add it to your spring cleaning and safety list.

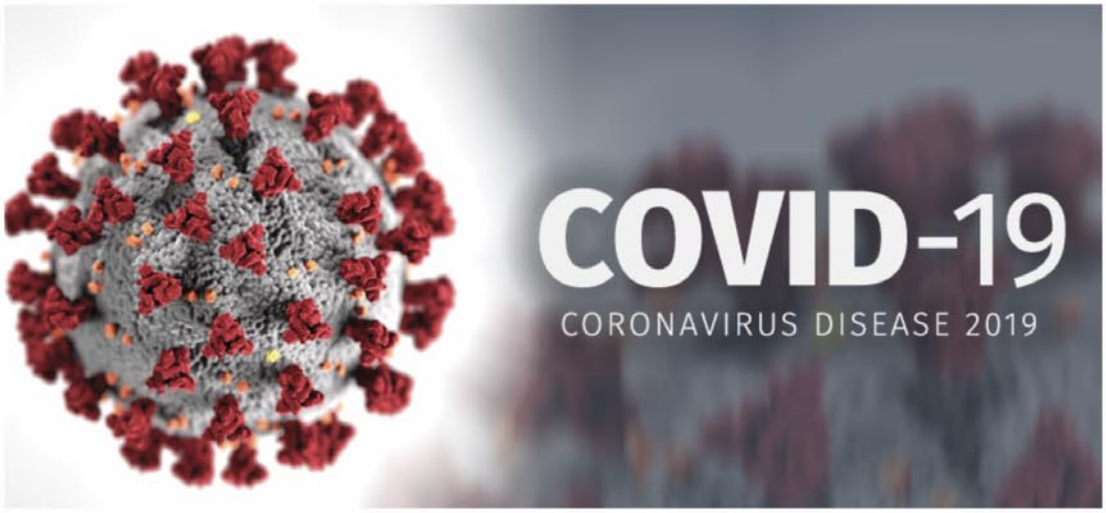
Outside and around the yard

- Make sure your address numbers are up and visible from the street.
- Clean up yard debris. Cut back dead limbs and grasses.
- Maintain a clear 'fire zone' of 10 feet around structures. Clean up leaves and debris and consider using stone or non-combustible mulches.
- Check outdoor electrical outlets and other electrical appliances.
- Get your BBQ grill cleaned and serviced. Check all propane tanks and lines for leaks and damage.
- Keep 100 feet of garden hose with an attached nozzle connected and ready for use.
- You can view barbecue safety videos by visit the Technical Standards and Safety Authority (TSSA) website:
  - Taking your propane tank for a ride
  - Light it right
  - Make a clean start - test it!
  - Your BBQ needs your full attention
  - Never BBQ in an enclosed space

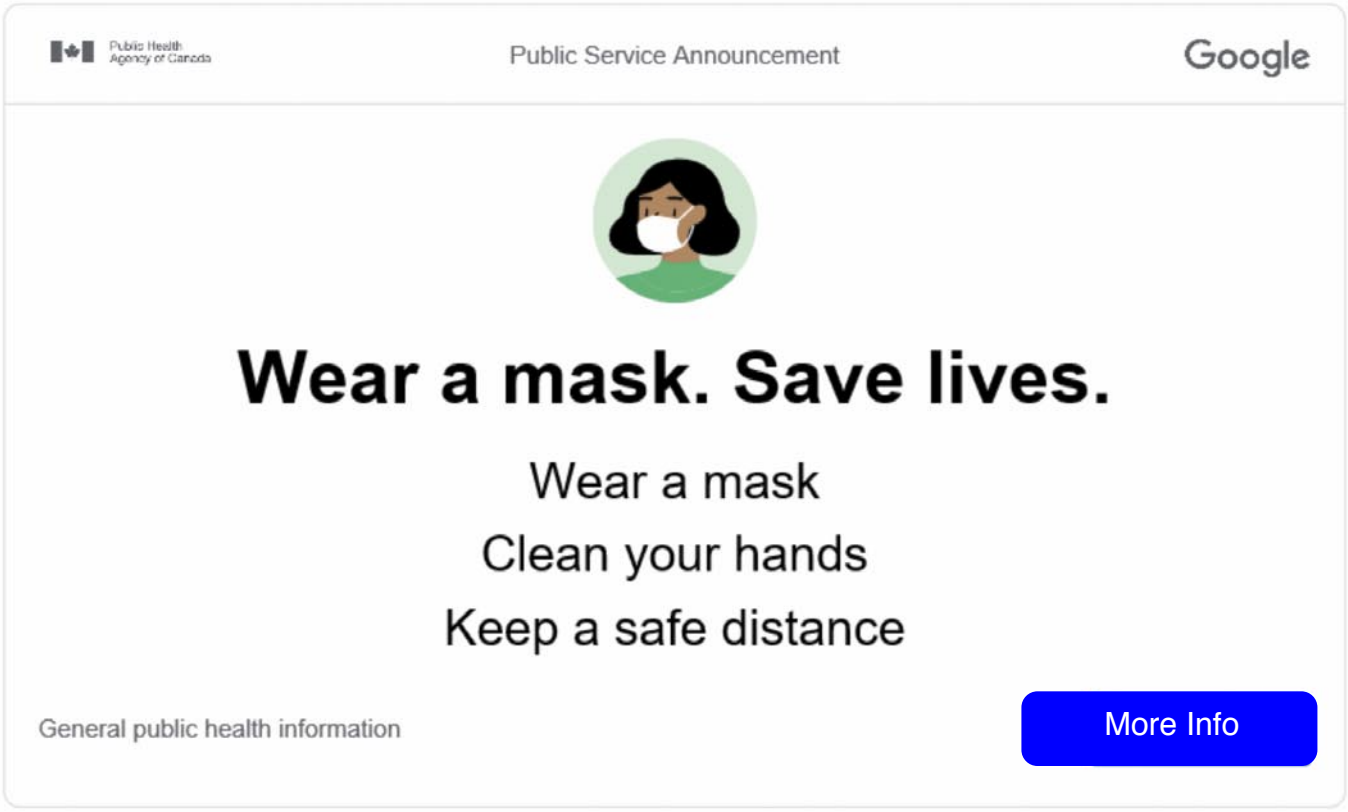
In the garage or shed

- Clean up and properly store paints, pool and yard chemicals
- Check fuel containers for leaks and make sure they are properly stored.
- Have all power equipment cleaned, serviced and ready for use.
- Let power equipment sit for approximately 30 minutes before placing it inside.

COVID-19



A reminder from the Government of Canada regarding COVID-19



For more information visit:

https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks.html

CANADIAN FIRE SAFETY ASSOCIATION
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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 financial burden. The cost of completing a 3-year program can be as high as $24,000.

As a scholarship sponsor, you will:

- provide the criteria for your award
- participate in the virtual award ceremony at the Annual General Meeting
- be recognized in the CFSA Newsletter and on the CFSA website
- help a deserving student in their quest to become a fire safety professional

Thank you to the generous corporations that provided donations to support the 2020 scholarship program:

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Scholarship Committee Chair, Kate Schramm, will contact you to discuss opportunities for your company's participation.

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