OHMRA COLD ZONE UPDATE

LETTER FROM THE CHAIR

Hello everyone, and welcome to the new OHMRA newsletter.

Firstly, I would also like to thank Vice Chair Steve Clark and the numerous people who have written articles and assisted in assembling the newsletter. It's a job well-done.

In our third year as an association, OHMRA has continued to expand our membership. We first extended our association from "Red Lights and Sirens" to Spill Contractors, Industry Response Teams, and Training Professionals. Most recently we have also welcomed, the Ontario Association of Designated Officers, who have joined us as the Designated Officer Branch. These additions continue to meet our mission statement, allowing us to share knowledge with all persons who are somehow involved in hazardous materials emergency response.

"Perhaps the current pandemic best reflects the common roots of our members"

Perhaps the current pandemic best reflects our members' common roots. As this crisis announced itself, Paramedics, Firefighters and Police, as well as many others across the hazardous materials industry, began the first of many discussions on how to best respond. Understandably, while being on the front lines amidst an unknown virus, we all struggled to determine the appropriate personal protective equipment and adequate decontamination

steps. At the same time, many Designated Officers were drawn into very similar discussions regarding their employees and operations. Then, as the virus continued to develop and spread, many spill contractors were being hired for “deep cleaning” of affected facilities. In all of this, the members of OHMRA received many phone discussions, “Whats App” conversations and emails. These connections allowed for the sharing of “best practices”, as known at the time and continue to evolve.

As the new “normals” for COVID-19 were established, OHMRA was forced to postpone its quarterly meetings and training sessions as well as its annual Hazmat Central conference. It was disappointing to have to make that choice, but safety is paramount. While we don’t know the future of the virus, I’m hopeful we may be able to restore some of our sessions under approved and safe conditions. In the interim, Vice Chair Steve Clark has completed OHMRA’s first virtual training session. The topic of Natural Gas Emergency Response took place Sept 28 and was well received by many of our members. OHMRA will continue to investigate the opportunity to deliver more virtual training sessions and would welcome recommendations and suggestions.

While the specific timing is uncertain, I am optimistic that we, working together, help this pandemic resolve. OHMRA will continue to be there for you and doing whatever we can to help you all feel safer at work. .

Until we talk again, stay safe.
Rick Brown
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Understanding the DIY Chlorine Bomb

The goal of this article is to provide an overview of the damage chlorine gas can cause, the ease with which it can be manufactured and a brief summary of medical management. The information on medical management is aimed at both first responder and physicians who may not have access to critical care services within their facility.

In Colorado on April 6th 2019, four teenagers placed a pile of street signs wrapped in saran wrap in the middle of an intersection. A concerned citizen reported the hazard to police. An officer arrived on scene and with the help of the citizen began to remove the hazard. While doing so, the group of teens returned, began yelling and threw a plastic bottle towards the officer. The bottle then exploded releasing a noxious substance. The officer turned to pursue but the noxious substance caused him to lose consciousness after taking just a few steps. The officer remained unconscious for a while, only regaining consciousness once other officers arrived on scene.[1,2]

A detective responding to the incident found a receipt in an adjacent field. This receipt was less than an hour old and showed pool shock and brake fluid had been purchased. This receipt was used to track down the individuals responsible for the attack. When interviewed, the teens stated that they had seen how to make chlorine bombs on-line and did not think they would cause serious injury. Unfortunately, the officer sustained permanent injuries to his lungs as a result of the attack.[1,2]

Chlorine is not a new agent in terms of its use as a weapon. First used in World War I, it has also been used in Iraq as recently as the 2000s.[3] Now the Internet is providing easy access to recipes to make chlorine bombs. Unfortunately, chlorine gas is an effective chemical agent that can be made with a single trip to any hardware store. Commonly, break cleaner, ethyl alcohol or any number of other chemicals can be combined with chlorine intended for use in

pools. This reaction causes the release of gaseous chlorine in its various forms and often has as strong exothermic component.

Chlorine (Cl_2) is a gas at room temperature with a distinct bleach smell and a yellow-green colour. It is approximately twice as dense as air and is mildly miscible. Humans can perceive its odour at just 0.1-0.3 ppm. Mild mucous membrane irritation occurs at 1-3 ppm with moderate irritation occurring at 5-15 ppm. Substernal chest pain, acute shortness of breath and coughing occurs at ~30 ppm and acute lung injury in the 40-60 ppm range. Fatalities occur at ~400 ppm after only 30 minutes of exposure. The range that causes immediate fatality is >1000 ppm.[4]

Chlorine exposure often presents as irritated mucus membranes and wheezing. In 2007, a railroad tanker released 90 tons of chlorine gas in Graniteville, South Carolina. Of the 63 patients that presented to one medical centre, 67% had wheezing on arrival. Seventeen percent went on to develop wheezing after several hours into their hospital stay. Fifty percent of patients developed acute respiratory distress syndrome/acute lung injury (ARDS/ALI) within the first day but only 11% had this finding at initial presentation.[3]

"This reaction causes the release of gaseous chlorine in its various forms and often has as strong exothermic component"

The mechanism of injury is not well understood but it is believed that, due to its partially miscible nature, the Cl_2 reacts with the water in the airway creating hypochlorous and hydrochloric acid. Additional injury is attributed to inflammatory and oxidative processes. The injury often continues to worsen for 3-15 days and it's common for patients to never make a full recovery. Sub-epithelial fibrosis, mucous hyperplasia, and airway hyper-responsiveness are common sequalae.[3]

Treatment both in the field and in hospital is mainly supportive. Humidified oxygen is strongly recommended with β-adrenergic agents also proving to be effective in patients with wheeze. In patients with ARDS/ALI a high positive end expiratory pressure ventilation strategy is recommended. There are anecdotal reports of nebulized bicarbonate being beneficial however there have been no well controlled studies conducted to investigate this. There is some evidence to support both systemic and inhaled glucocorticoids. Decontamination varies based on the state and the concentration of the chlorine.[4]

Hopefully this article has made it clear just how devastating chlorine injuries can be. These injures can result from accident release or intentional harm and despite the best medical care, often result in lasting damage.

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Dr Sarah Byce is completing her second year of family medicine training and will be starting a residency in emergency medicine in 2021

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DRONES IN EMERGENCY RESPONSE

The use of Remotely Piloted Aircraft Systems (RPAS) by first responders has increased dramatically in recent years. As the technology becomes more capable and reliable, and the cost of entering the operational RPAS space becomes more affordable, first responders have steadily explored various methods of utilizing this equipment.

In the early stages of the technology reaching the prosumer and consumer level, these machines were first used to simply increase the situational awareness of a first responder or a command team. This most basic addition to the real time intelligence gained by first responders demonstrated the possibility of deploying equipment that afforded more capabilities and expanded the operational envelope. RPAS technology quickly found its way into all three main levels of first responders - police, fire and paramedics. Each agency while taking advantage of this new tool is acutely aware of the privacy of individuals or groups that may not be involved in their active occurrence.

"The use of Remotely Piloted Aircraft Systems (RPAS) by first responders has increased dramatically in recent years"

RPAS are being deployed in many aspects of law enforcement in Canada and throughout the world. In many cases the technology is still being used as elevated observation points during events that pose an increased level of risk to officers and/or the public. Additionally, the RPAS imagery has been used to successfully locate numerous missing people in Ontario, as the units can be deployed quickly and cover more area with an array of different sensors. The imagery from a variety of airborne cameras can also be used to aid with the reconstruction of serious and fatal collisions. With the correct training, the imagery can be used to reconstruct a collision as accurately and perhaps more efficiently that traditional methods. This allows for a far more effective presentation of evidence during investigations, inquests and civil litigation.

Fire Departments in Ontario deploy RPAS to fire scenes on a regular basis. The ability to see the seat of the fire during the initial attack by using and RPAS equipped with a thermal imager can allow commanders to adjust their tactics when fighting fires of all sizes. An RPAS placed overhead also allows the command team to realize the direction in which a fire might travel and any structures that may need to be considered for evacuation should it be required.

New-edge detection algorithms also enable firefighters and other first responders to use the RPAS to read HAZMAT placards in low light and smoky environments. This task would previously need to be completed by a firefighter placing themselves in an unnecessarily hazardous situation in order to get close enough to be able to read the information.

For the last few years, RPAS have been deployed to investigations conducted by the Office of the Fire Marshal. As with police investigations the pictures and video obtained by the RPAS had previously been unattainable. This imagery can be invaluable when examining and presenting evidence as often things are seen that may not have been from a solely ground based perspective.

"Agencies that have been entering this paying field have been doing their best to leverage the knowledge of more experienced operators"

Paramedicine is also exploring the ability to deploy RPAS to drop or place objects such as defibrillators or Epi-pens to areas that might be isolated or difficult to reach. The paramedic agency would launch the RPAS with the required medical equipment ahead of ambulance personal. Successful deployments and "drops" of life saving equipment have been recorded throughout the world, and there is a pilot project currently underway in the Region of Peel.

The challenge that has faced first responders from the outset has been the development of the Canadian Aviation Regulations. Transport Canada and NavCanada have worked directly with first responder representatives to ensure that the regulations, that were designed for all RPAS operators, do not hinder this life-saving work performed.. Both Transport Canada and NavCanada have been directly involved in experimental trails and extensive training with various agencies so that they can better understand the capabilities and limitations of the equipment. This unprecedented level of participation has enabled first responders to expand the operational envelope safely with a mutual understanding of the needs of the first responders and regulating bodies.

Agencies that have been entering this paying field have been doing their best to leverage the knowledge of more experienced operators. Although this has been effective, we continue to see silos of development and operation across Canada. Each agency certainly operates with regulations and safety in mind, however the lack of consistency in program design and training challenges the regulator with regards to the best way to handle the variety of special requests. To meet this challenge, the Canadian Emergency Responders Robotics Association (CERRA) was formed in 2020. This new association is working closely with Transport Canada and NavCanada to develop standardized templates and training models that can be used as a basis for RPAS programs in any stage of development or level of experience. CERRA is working diligently to ensure the information that is made available to interested members is in line with the regulations that are still in development. With growing interest in flights that occur beyond visual line of sight (BVLOS), CERRA intends to be positioned to assist first responders that can display a track record of safe operations with navigating the regulatory requirements prior to BVLOS deployments.

> “ RPAS technology is developing at an exponential rate”

RPAS technology is developing at an exponential rate. Increased capabilities in the range, weather resistance and payload capacity will continue to allow first responders to take advantage of the technology in a multitude of ways. Working closely with the regulator will ensure that our community is well placed to remain effective as the regulations and best practices develop that enable us to utilize the latest technology to its fullest extent. In many ways, remotely piloted aircraft systems have changed the way that we do business. Their use has increased the operational reach into remote areas that were previously difficult to attain. The measure by which this technology increases our effectiveness while at the same time increasing the safety of our members has made it an invaluable tool that will continue to be embedded into each facet of our professional lives.

Colin Giles

Chairperson

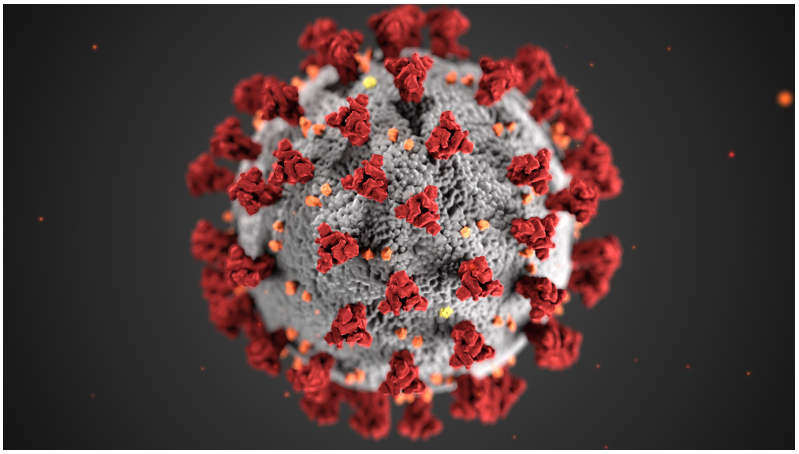
Canadian Emergency Responders Robotics Association

https://cerracanada.ca/

Colin is a 22 year member of the Ontario Provincial Police. He has been operating RPAS since 2013 and began coordinating the RPAS program for the OPP in 2016. Colin has been working closely with Transport Canada and NavCanada in order to ensure the needs of First Responders in the RPAS environment are taken into consideration when regulations and/or exemptions are considered. The CERRA executive consists of RPAS operators that collectively strive to ensure that the needs of first responders are considered and understood. All members of the executive and experienced RPAS operators and have been involved with RPAS deployments in this space collectively for decades. We will strive to develop strategies, templates and guidelines that keep Canadian operators at the pinnacle of operational capabilities.

INFECTION CONTROL FOR INDUSTRY PROFESSIONALS

There is no one on this planet that has not been touched by the pandemic. The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), called COVID-19, was detected in China in late November/early December of 2019. The spread globally was rapid, appearing in Europe then the rest of the world in a matter of weeks. This virus is genetically similar to the SARS virus that appeared in 2003 and killed over 800 people world-wide. COVID-19 is mainly a lower respiratory tract infection that has infected at least 29 million people, and killed over two million worldwide as of mid-January 2021.



Many things have happened with this pandemic: some expected, others not. The run on toilet paper early in 2019 offered comfort to some, as they could then feel like they were controlling a little of what was going on in their world. An asymptomatic carrier state was recognized, where people could have—and shed--the virus without being ill. Also, people could shed the virus for up to 48 hours before showing symptoms. Mask use for everyone was proposed to limit spread from asymptomatic and mildly-symptomatic people who might be out in public. Also, disinfectant wipes, alcohol-based hand rub (ABHR) and other antibacterial products disappeared from store shelves. Every area of healthcare faced a lack of disinfectants as demand tripled overnight. All manufactures of these products were running full out, and we still haven't gotten ahead of the demand. This has led to issues with components of all aspects of disinfectants: reagents, wipe substrate, containers, lids and pumps. One manufacturer was able to 'think outside the box' and provide bulk liquid disinfectant in 20 L pails,

220 L drums and even 1250 L totes to fill the void of no disinfectants.

"There is no one on this planet that has not been touched by the pandemic caused by a new coronavirus"

As the world has got a better handle on this virus, the importance of frequent disinfection of high touch surfaces is at the forefront of reopening our society. Mask use and physical distancing has slowed the spread of the virus, but the public (and all healthcare workers) expect a visible commitment to a safe environment.

What is concerning is the total focus on this one virus, however there are other non-vaccine preventable viruses for which we must be on guard.

Coronaviruses, Influenza, Parainfluenza, Respiratory Syncytial Virus (RSV), and human Metapneumovirus are all viruses that cause ‘colds’ and institutional outbreaks: both mild and severe. All have symptoms consistent with COVID-19 in terms of any combination of cough, fever, congestion, runny nose and just not feeling well. All of these viruses are referred to as enveloped viruses: they have a lipid (fatty) outer layer that we can attack with many reagents such as soap and all disinfectants, even those store-bought ones that you can get at a pharmacy or grocery store. None of these viruses survive that well outside their hosts.

Some of the other ‘cold’ viruses though, such as Rhinovirus, Enterovirus and Coxsackievirus, are non-enveloped viruses: they do not have that protective layer and are actually much more able to survive outside the host in the environment. Norovirus, which causes vomiting and/or diarrhea, is also a non-enveloped virus. None of these viruses would be killed by most store-bought brands of disinfectants. All of these viruses can live for days on surfaces, with some studies indicating that Norovirus could live up to 14 days on surfaces.

“Reading the label on your disinfectant is a bit of an art. A store-bought brand that claims to kill 99.9% of cold and flu viruses is usually effective against easy to kill enveloped viruses, not the harder to kill non-enveloped viruses”

These non-enveloped viruses cause morbidity (illness) every winter season, with larger outbreaks occurring in closed populations like schools, nursing homes and military barracks. Spread is through close contact with infected secretions from the nose and mouth or from contaminated food or water, such as the fecal-oral route, such as Norovirus, , or by indirect contact, where viruses on surfaces are picked up by the hands and are then moved to the unprotected mucous membranes of eye, nose or mouth. These hardier viruses rapidly contaminate the environment around ill or symptomatic people, and in many cases need to be inactivated by a disinfectant with a broader spectrum of kill.

Reading the label on your disinfectant is a bit of an art. A store-bought brand that claims to kill 99.9% of cold and flu viruses is usually effective against the easy-to-kill enveloped

viruses such a COVID, but not the harder-to-kill non-enveloped viruses, such as Norovirus. It can be easy therefore, to develop a false sense of security if an institution is using a product on surfaces that may have been contaminated by ill people, and the disinfectant product doesn't have the ability to kill all types of viruses. In Canada, for a product to receive a Drug Identification number (DIN), and to be labelled 'Virucidal' (able to kill viruses) it just needs to be able to kill any type of virus, no matter how hard or easy to kill. For a product to earn the label of 'broad-spectrum virucide', the manufacturer would have to show the product has efficacy against at least one hard--to--kill non-enveloped virus. The way they show their product is a broad-spectrum virucide is by listing that they kill certain test viruses, such as: Poliovirus, Rhinovirus or surrogate viruses for Norovirus like Murine or Feline Calicivirus. If their label doesn't show it can kill at least one of those viruses, it's probably not a broad-spectrum virucide.

With the emergence of SARS-CoV-2, Health Canada established a site to list disinfectants effective against this virus (https://www.canada.ca/en/health-canada/services/drugs-health-products/disinfectants/covid-19/list.html#tbl1). Their disclaimer reads:

> "All disinfectants that have a drug identification number (DIN) have been approved for sale in Canada. While most disinfectants will work against coronavirus, the following list of hard-surface disinfectants are supported by evidence following drug review, demonstrating that they are likely to be effective and may be used against SARS-CoV-2, the coronavirus that causes COVID-19.
> Inclusion on this list does not constitute an endorsement by Health Canada. This is not a comprehensive list of all disinfectants and cleaning products that may be appropriate for use in public, institutional and household spaces."

They have also released disinfectant guidance for healthcare, including Acute Care, Long-term Care, Outpatient and Ambulatory Care (https://www.canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/health-professionals/infection-prevention-control-covid-19-second-interim-guidance.html#a12) and state:

> "Environmental disinfectants should be classed as a hospital disinfectant and registered in Canada with a Drug Identification Number (DIN) and labelled as effective for both enveloped and non-enveloped viruses."

If a disinfectant product doesn't have a DIN, and doesn't state that it can kill non-enveloped viruses, it's probably safe to assume that it shouldn't be used in health-care, or any other congregate settings.

It is important to remember in these times when COVID-19 is the only disease we talk about, that there are other harder-to-kill viruses that can make everyone ill, and they are still circulating in our environment. All settings need to review what their disinfectant product can actually kill, and/or contact their manufacturer/distributor for more information.

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IS YOUR FIRE GROUND ATMOSPHERE SAFE TO BREATHE?

Firefighters are consistently exposed to a myriad of combustion gases and particulate while responding to fire calls. Such constant exposure is detrimental to their long-term health, and results in increased cancer rates amongst firefighters compared to the public (Daniels, Bertke, Dahm 2015). To combat this cumulative toxic effect, the profession adopted the use of SCBA to protect against inhalation hazards. Unfortunately, this has not proven to be enough as fire services continue to see higher rates of cancers.

In order to help mitigate some of the inherent risks of firefighting, fire services must better apply applicable Health & Safety guidelines to assist with determining when firefighters would be safe without respiratory protection in structural firefighting conditions.

Fire is a basic chemical reaction between oxygen in the air and combustibles. A more technical definition from the *NFPA 921 Guide for Fire and Explosive Investigators* defines fire as: “A rapid oxidation process, which is a chemical reaction resulting in the evolution of light and heat in varying intensities.” The oxidation reaction in the real world is not perfect and is more accurately represented by incomplete combustion which is defined as inefficient burning due to lack of oxygen. Smoke and fire gases are the by-products of this real-world reaction. These two by-products consist of varying sizes of soot particulate and thousands of heated gases including: Carbon Monoxide (CO), Acrolein, Hydrogen Cyanide (HCN), Benzene, Polycyclic Aromatic Hydrocarbons (PAH), and Volatile Organic Compounds (VOCs).

For the last decade, Fire services have focused on the synergistic effects of Hydrogen Cyanide and Carbon Monoxide (*Fire Smoke Coalition, Ontario Association Fire Chiefs Section 21 Guidance Note #6-36*), where the effect of the combined chemicals occur is greater than the individual effects of each chemical (Kelloway, 2017, p.137). CO prevents oxygen reaching vital organs by attaching to hemoglobin, and HCN attacks both the central nervous system and cardiovascular system, causing the victim to become disoriented and confused. Their exposure effects though, are primarily due to an inhalation hazard (NIOSH, 2007). While these inhalation effects can be negated with proper SCBA use from fire attack to investigation, it often doesn’t occur. Reasons for this lack include: an uncontrolled work environment, lack of defined guidelines, work culture, and poor understanding of gas detection.

In Ontario, Section 21 Committees are established to assist with industry good practice. In the Ontario Occupational Health & Safety Act, under section 21, “the Minister may appoint

committees…to assist or advise the Minister on any matter arising under this Act." To provide that advisement the Ontario Association of Fire Chiefs created a Section 21 committee to provide Guidance Notes on best practice for all the province's fire departments to follow. In Guidance Note 6-36 Limiting Exposure to Fire Gas, it states, "*air monitoring to detect fire gas levels*" and then discusses Hydrogen Cyanide's properties. While the guidance note does not specifically state its position towards a focus on Carbon Monoxide and Hydrogen Cyanide monitoring, they are the only two gasses mentioned in the guidance note, many other articles in the fire service world do. Merely typing in "Toxic Twins, CO and HCN" into a web search engine will display many articles on their toxicology and risks to firefighters. An example of this understanding is from Fire Rescue Magazine – Evil Twins that states *"Why is HCN so dangerous? The answer begins with the fact it is very likely to be in and around every fire today"*. However, none of the articles will provide a defined standard as to what is deemed to be safe. This position exists because; of the fear of liability, not enough research, and the understanding that there are many thousands of other gasses that occur in a fire.

So how does a Chief, and more importantly a firefighter, know when the post fire atmosphere is safe to doff their respiratory protection? Which gas should the fire service be detecting? There is no one single answer, but a multilayer approach to address the issue that includes: using more appropriate gas detection equipment, using existing established chemical exposure limits from other industries, and developing better awareness programs for firefighters on fire exposures.

The fire service must be more proficient in gas monitoring. While HCN and Four Gas Detectors are a solid foundation, the use of other detection systems such as Photo Ionization Detectors and specific colorimetric tubes for Benzene and Ethylene oxide are highly recommended. If Carbon Monoxide and Hydrogen Cyanide are not found, it does not mean any of the other thousands of hazardous gases aren't present after a fire. More emphasis should be placed on Benzene as it has a lower Immediate Danger to Life & Health level (IDLH) and Time Weight Average Limit (TWA, defined as what a worker can be exposed to for 8 hour/day, 40 hour work/week). Benzene is also regulated under Ontario's OH&S-Regulation 833 Control of Exposure to Biological or Chemical Agents, while Carbon Monoxide and Hydrogen Cyanide are not. Under the regulation Benzene is listed having a TWA of 0.5ppm. Comparatively, CO has a TWA of 50ppm and HCN has a TWA of 10ppm (NIOSH, Pocket Guide to Chemical Hazards). These higher TWAs of the Toxic Twins demonstrate the need to adopt the more conservative standard of Benzene to reduce exposure in firefighters.

"So how does a Chief, and more importantly a firefighter, know when the post fire atmosphere is safe to doff their respiratory protection? Which gas should the fire service be detecting?"

Another added benefit to using Benzene is that it can also be viewed with a relatively low-cost Photo Ionization Detector (PID) with a 10.6eV bulb strength. The advantage of using a PID is that the detection system detects most volatile organic compounds, which are common in combustion, at very low levels. This broadens the range of gasses that a firefighter is attempting to detect, while using the more conservative standard of Benzene's TWA - 0.5ppm. This technique provides a safer work environment compared to using a CO

or HCN detector that solely detects those gasses. Using the PID in addition to the recommended HCN and CO detectors would be the most ideal practice by fire departments. Should a fire department have to decide between PID and CO\HCN detection for post-fire conditions, the PID option would be the better, safer choice for fire-ground air monitoring.

Unfortunately, due to the nature of fire and smoke, fire gasses cannot be the only standard that needs to be followed. An additional standard for respiratory protection for smoke particulate needs to be adopted by the fire service to increase firefighter's safety. Particulate size from a combustion sources are recognized as fine particles or PM2.5. These particulates are roughly 1/30th the size of a human hair and can be inhaled deep into the human respiratory system (US EPA, 2018). They also can remain suspended in the atmosphere for days or even weeks. To combat the threat of smoke particulate exposure, the fire service should adopt the existing standard from Ontario's Regulation 833 that states Particles Not Otherwise Specified (PNOS), which has a TWA Limit of 3mg/m^3. Very few, if any, fire department will have the ability to detect and monitor these microscopic smoke particulates, but the understanding would be that even post fire suppression operations such as overhaul and arson investigation require respiratory protection to address the PM2.5 exposure. Fire departments could have private industry, such as an industrial hygienist, to assist with monitoring smoke particulate while conducting any fire investigation operations to determine a safe atmosphere.

Today's firefighters have a better understanding of occupational hazards and are embracing any change that will help reduce exposures from firefighting operations. We need to adopt already regulated and defined safe exposure limits such as Ontario's Regulation 833, and apply them to fire gasses and particulates, like Benzene's TWA 0.5ppm, that are more lethal at much lower exposure levels. We need to educate and advocate for the use of the Photo Ionization Detection, which provides more accurate and broader spectrum gas detection than currently commonly deployed systems, in order to best protect our workers. Over all, we need to stop using the detection of gasses that have a higher exposure limit as our baseline for safety. These changes, while simplistic, will further assist in the reduction of known exposures and the development of long-term illnesses in our people. Let's keep them safer.

Stu Cond C.E.T., is an Acting Captain for the Barrie Fire & Emergency Services (BFES) with 12 years of service. He currently serves as a Hazmat Specialist/Program Lead and Health & Safety Certified Member. He was formerly a Canadian Army Medical Technician with 31CFHS and a Hazmat Instructor at Georgian College.

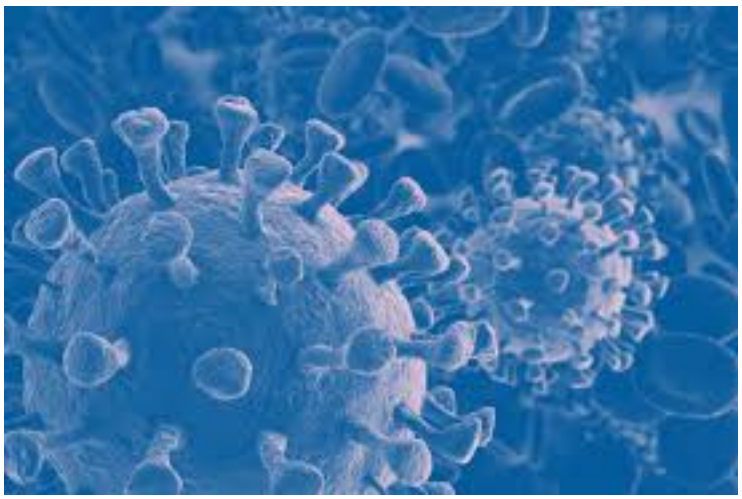
What is the Personal Protective Equipment of Choice for a First Responder for COVID-19?

Well, we have certainly learned a lot over the last few months in regard to dealing with viruses, bacteria and the use of personal protective equipment during the COVID-19 health crisis. This includes those of us who work closely in the area of the fire services hazardous materials response teams. In this article, we will discuss the information communicated to the front-line workers and first responders, as well as the general public, when it came to choosing the appropriate personal protective equipment and wearing of masks for dealing with this deadly virus.

Based on our most current and revised recommendations from public health to prevent COVID-19 transmission for First Responders, fire and emergency services responders should use precautions to protect themselves from droplets and potential contact with droplets, which may remain on solid surfaces. These precautions include eye protection, N95 Respiratory protection , gloves and gowns, and also involve performing meticulous and frequent hand hygiene and sanitization.

Surgical/procedural masks are not the same as N95s and cannot be used interchangeably. N95 masks offer a higher level of protection than a surgical/procedural mask. N95s or higher, are most appropriate when the firefighter or first responder is involved with any kind of medical intervention, or an assessment that involves an aerosol-generating medical procedure (intubation, suctioning, airway management etc.). Surgical/procedural masks may only be appropriate in situations where patients are stable, and the overall risk of COVID-19 transmission is minimal, as these surgical masks do not form a tight seal around the face.

We are still waiting to see how the relatively new COVID-19 variant strains starting to circulate in Canada will play into additional recommendations from our public health experts.



With everything we have been hearing about this nasty, contagious virus through our various media channels and outlets, it's natural to ask some questions. How did we get here and what is the state of our current recommendation? It took us a bit of time to get to this point, as much of

the initial information provided to first responders and the general public reflected the fact that we were still learning about this virus. Despite—or maybe because of—the lack of clarity early on, we saw consistent misinformation and sensationalization from not only the media, but also from supposed experts. We have seen fire services use this information to recommend wearing various personal protective equipment including SCBA air packs (self-contained breathing apparatus), PAPR (powered air purifying respirators), and APR (air purifying respirators)-style respiratory protection.

Within my professional inner circle in the world of hazardous materials and CBRNE training, I have had the opportunity to participate in various webinars and training events across North America to learn more about this pandemic. We always consider risk-based response initiatives when dealing with this on the job as a front-line firefighter, and there was one common factor: No matter who you listened to, every expert had a different opinion or point of view on which personal protective equipment to wear while responding as a front-line worker.

I worked very closely with some of the best hazmat operations technicians in the country, many of whom are well-versed in the areas of chemical response, viruses, bacteria and bio-terrorism events. Diving into discussion and asking these questions caused some of my closest mentors heads to spin. As a relatively younger haz - tech compared to my counterparts, where many are 20 years my senior both in age and experience, I found the lack of answers left me frustrated.

"Based on what we have now learned, we haven't seen too many fire service personnel continuing to respond in an SCBA air pack, not many paramedics arriving in a fully encapsulated hazmat suit,"

How was this virus so different? Does it travel farther, does it have a far greater range of contact than other viruses, does it stay on surfaces or travel in ways that are much different from other viruses we know about? These are all great questions we need to ask, as we develop a plan to respond. We do now understand that the size of the viral particles heavily influences how far the coronavirus can go on normal air currents. However, the smaller the particle, the less likely it is to infect someone, which is why we have focused on a two-metre range for proper social distancing.

At first, though, it seemed that the massive amount of information provided to professional first responders only caused more confusion and frustration among those of us in the hazardous materials and fire service community. It seemed as though every fire department I communicated with was initially wearing many different levels of personal protective equipment when responding to medical calls and other emergencies where the risk of COVID-19 was present. At times, the information provided to emergency services regarding time duration for the wearing of a surgical mask, disposal precautions, possible PPE shortages, virus contact tracing, and surface survivability rates has caused

even some of the most diligent fire services and health professionals to second-guess their choice of PPE when dealing with patients.

We have seen some of the same confusion among the general public when it comes to the mandatory use of masks by ordinary citizen while indoors in a public place. It is absolutely vital to wear masks, even when appropriate social distancing is taking place. Based on what we have learned about the virus since the pandemic began, we understand that the use of mandatory masks indoors is of critical importance to minimize the spread of this deadly virus. We have no recommendation for members of the public to be fit-tested to any mask, not like a first responder would be for a more specialized breathing apparatus and respiratory protection. The most common masks that require fit-testing for firefighters are the SCBA (Self Contained Breathing Apparatus), the N95, and the P100, which are used as respirator devices designed to protect the wearer from inhaling hazardous atmospheres, including fumes, vapours, gases, particulate matter such as dusts, and airborne microorganisms such as COVID-19.

"The respiratory mask must be chosen based on what the emergency first responder is doing, as masks are not always interchangeable."

What about the opportunities for cross-contamination by not donning and doffing the mask properly (putting it on and taking it off)? We know that the use of a surgical mask is recommended not necessarily to only protect the wearer, but to protect those around the wearer. Although the protection rate isn't 100%, it can all have some effectiveness in reducing the infection rate. We will continue to learn from these events, as we move further down the road.

However, one thing appears to be commonplace even after the many months of information, social media posts, and insights from various doctors and experts on this super virus: a vast majority of us in the emergency services and health-care facilities are still taking many of the exact same precautions we did in the first place. These guidelines—prepared prior to the pandemic—were a part of our universal precautions, medical risk-based response initiatives from our original standard operating procedures for dealing with a virus or bacteria. The

universal precautions approach to infection control to treat all human blood and certain human body fluids, bacteria, viruses and additional blood-borne and airborne pathogens as if they were known to be potentially infectious. This PPE selection would include eye protection, respiratory protection, medical gloves, and gowns overtop of our regular station wear or firefighter bunker gear, to reduce contact to the skin and respiratory system. The respiratory mask must be chosen based on what the emergency first responder is doing, as masks are not always interchangeable. The main issue really is that the idea of “universal precautions” was never utilized well in the past and wasn’t communicated with a real understanding of the actual risks of exposure. We can manage this risk better, as we conduct a more thorough risk assessment as a first responder.

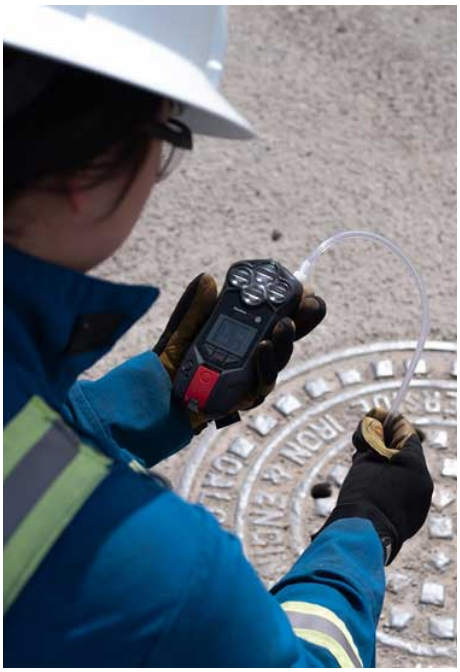
Based on what we have now learned, we haven’t seen too many fire service personnel continuing to respond in an SCBA air pack, not many paramedics arriving in a fully encapsulated hazmat suit, and few police officers wearing a tactical CBRN response mask lately. This suggests that as we continue throughout the pandemic, sometimes simpler really is better.

Adam McFadden is a professional firefighter and hazmat technician for one of the largest fire departments in Canada. He is the owner of Firehouse Training and is responsible for program development of various fire service training and career coaching programs, and is also the co-chairman of CBRNEU University, an online micro-learning training platform, for those currently working within the area of hazardous materials response.Adam is an executive member with OHMRA. He can be reached at info@firehousetraining.ca for more information.

THE IMPORTANCE OF REALISTIC GAS DETECTOR TRAINING

When it comes to Hazardous Materials response, the gas detector is the most important tool in the responder's toolbox. This device is trusted to make life safety decisions every day all over the world. Yet not only are these devices not fully understood, our training on these devices doesn't realistically prepare us for the real world. These portable detectors are becoming increasingly more capable every day. It wasn't that long ago that a fire department would employ only a single gas detector, which soon became a 4-gas detector, and now 6+ gas detectors are becoming the norm. While response technology has continued to improve, the training environment has struggled to keep up. Having taught first responders and private response teams across North America, I have seen firsthand the methods and technique used to train responders on these devices. From expensive (and limited) hardware solutions, to low tech solutions ranging from flags with handwritten "readings", to Post-It notes with the "readings" written on them. These are then stuck to pipes, compressors, drums, etc. While these low-tech solutions "get the job done" the element of surprise is not there and realism is lacking. The student really does not need to think very hard, as the instructor is usually close by to prompt the student "what is your meter saying" or "what do you need to do now?

"IT IS CRITICAL THAT THE TRAINING ENVIRONMENT MATCHES THE RESPONSE ENVIRONMENT"



A CONFINED SPACE TEAM MEMBER PERFORMS ATMOSPHERIC MONITORING PRIOR TO ENTRY

It is critical that the training environment matches the response environment. We need our operators to *understand* our detectors, and not just react to them.

TRAINING "PUMP" SIMULATORS CAN BE PAIRED WITH ANY SMART PHONE FOR CONFINED SPACE TRAINING

A common practice I see during confined space training is a student will be at the top of a tank with a meter in hand, and the instructor will yell “YOUR OXYGEN IS DROPPING - WHAT DO YOU DO NOW?”

The student will then begin to initiate the rescue plan. Again, the student is strictly reacting to instructor input instead of interpreting what the meter is telling them and reacting accordingly.

This lack of realism on the training ground leads to poor understanding of how to interpret the readings on these devices during real events.

A FIREFIGHTER CHECKS THEIR METER PRIOR TO ENTERING THE “HOT ZONE”

IF ONLY OUR DETECTORS TOLD US *EVERYTHING* WE NEED TO KNOW

Simply put, gas detectors are dumb devices requiring smart operators. We owe it to our operators to prepare them as best we can. Gas detectors can only show us what they are *equipped* to show us. A CO detector will tell us nothing about CO2, but maybe our Oxygen sensor would react in that same situation? The misunderstanding and misuse of portable gas detectors as being the only thing we need to be protected, is widespread.

We need to better prepare our operators.

“A GAS DETECTOR IS A FIRST RESPONDERS LIFELINE DURING A HAZARDOUS MATERIALS EMERGENCY”

The portable gas detector is a first responders lifeline during a hazardous materials emergency, and in some case the responders *only* lifeline. Confined space operators rely on this device to tell them when it’s safe to enter a space, when to don respiratory protection or when to evacuate. Firefighters use this equipment to tell a homeowner when it is unsafe to remain in their homes during a Carbon Monoxide emergency. Firefighters and Police use portable gas detectors to determine who to evacuate during Natural Gas emergencies. And private sector responders and workers rely on this equipment every day to determine PPE levels for both work, and for emergencies. We also rely on these tools for protection from (and really our *only* protection from) LEL environments. As the only defence to explosive emergencies is prevention.

Utilizing gas detectors to tell us when we must evacuate, as no PPE (this includes bunker gear) will protect us from the concussive forces of a blast.

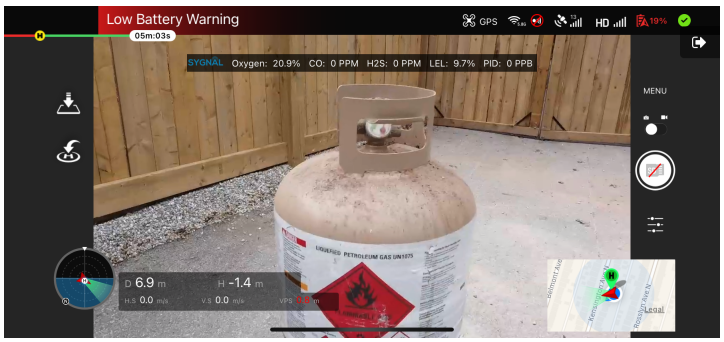
This tool is our lifeline.

DRONES AND GAS DETECTION

Drones are increasingly finding their way into the hands of first responders. They give us an “eye in the sky” as well as additional benefits of thermal and zoom cameras. And now there are several manufacturers who have designed gas detectors to mount to these systems, which can prevent the necessary risk of sending responders “down range” to find out if that tank truck or rail car really is leaking. As with portable gas detectors, as these systems become more and more common, the need to train with them will become more and more important. SYGNAL can not only simulate any portable gas detector combination, on any smart phone, but it can also be used as a fully functional flight controller for most popular drone platforms. SYGNAL also integrates real time gas detection simulation into the heads-up display / flight screen of the drone pilot controller. This further adds realism to your teams training, and better prepares us to respond with these tools. SYGNAL can integrate a drone platform with simulated readings, with your response teams cell phones simulating readings as well. All while being controlled manually by an instructor or responding automatically via GPS.

A DRONE SYSTEM WITH A 6 GAS DETECTOR AND PROBE AS ITS PAYLOAD

“GAS DETECTORS ARE DUMB DEVICES REQUIRING SMART OPERATORS”



AN EXAMPLE OF THE SYGNAL FLIGHT HUD ON AN ANDROID PHONE FOR DJI DRONES - NOTE THE GAS DETECTOR “READINGS” IN THE TOP MENU BAR.

All of these assets can be tracked in real time on a map via GPS, and an instructor or Incident Commander can send direct messages, all while watching the drone screens, gas detector readings remotely on a big screen or command post in the command centre.

SYGNAL’s patented system allows for unlimited range, thanks to the secure “cloud”. This ensures that your team can train remotely or virtually over any distance to overcome COVID restrictions. Training sessions can be password protected and their discoverable range can be set to allow for training privacy and

security. The range settings also allows for large scale, realistic training exercises, which integrate all your teams assets. First Responders, fixed location detection systems, Drone assets, and Command Posts, can all be integrated in the same training session. With GPS functionality. All these detectors allow for GPS tracking and PEAK readings are available to be viewed in real time.

Enhance your teams training today and transform the smartphone from a training distraction, into an asset.

Steve Clark has been involved in Hazardous Materials response since 2006. He began his career as a private spill response contractor, and spent nearly 10 years with his fire departments Hazardous Materials team. He has taught Hazardous Materials response across Canada and the United States. He has published articles internationally, and is currently the Vice Chair of OHMRA and the Director of SYGNAL.

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