

## FORENSIC ENGINEERING NEWS AND VIEWS

Fall 2016



### Presidents Box

*Rene Caskanette*

Our hot and dry summer has ended in Southern Ontario with no significant tornados (except for our friends in Windsor). Unpredictable weather patterns with winds and rain in excess continue to be a main driver of insurance claims, along with catastrophic events such as wild fires in Alberta. Who knows what the winter season will bring us, heavy wet snow collapsing roofs, frequent melt cycles leading to ice dams on roofs, or bitter cold with deep frost heaving and cracking structures? Whatever comes along our team of experts are ready to assist with determining the cause of the damage and the scope of repairs to make it right again.

I am having one of those milestone birthdays this year, turning 60. A little older and a little wiser. A grandfather. These events all get me thinking about slowing down and letting the younger members of our firm take on more responsibility and move into ownership positions. An inevitable step for all of us one day, plan the path to retirement and the golden years.

To start the process, I intend to slow down to part time work next year, with a focus on training and mentoring younger experts, along with handling my management duties. Baby steps. I don't think I could retire cold turkey, it needs to be a transition. This process will ensure a continuity of our excellent quality of work, so clients will not see any drop off in services.

The year 2017 will be our 19th year in business. It seems remarkable how quickly time passes when you are having fun. I never consider my job to be work, I just enjoy the challenges that come along each day. Every assignment is slightly different and creates a learning opportunity. No matter how long you do this forensic investigation work, you always encounter something new and challenging, and continue to learn. Experience really is the greatest teacher. I plan on making my experiences a valuable resource for others in the firm, so they don't need to relearn the lessons I have completed.

I look forward to this transition process, and the opportunity to pass along what I have learned for the continued benefit of our clients. Maybe one day I can say I have retired, but really, I will just be a senior consultant for years to come. Less day to day responsibility but still involved in the larger and more interesting cases where experience really matters. And of course, attending trials 10 years from now when the matter finally proceeds through the legal system. What little hair I have remaining should be fully grey by then, greatly impressing the judge with my wisdom that comes with age.



### Expanding to the Niagara Region

*Jeff Udall*

Caskanette Udall is comprised of a series of home offices around south western Ontario with our central office in Kitchener. We have engineers in London, Kitchener, Cambridge, and Burlington. With the ease of connected technology, we are able to provide seamless service to our clients as if we were in a larger central office, but with the advantages of a dispersed outreach to the larger region. This reduces costs for our clients in terms of travel costs and allows for faster turn around time when reporting.

In the near future, the Cambridge office will be relocating to the Niagara Falls region. The Niagara peninsula is underserved for engineers and companies are required to travel from the GTA, Hamilton, or Kitchener-Waterloo. With a local presence in the Niagara region, we will be able to provide more timely and cost effective service for insurance and legal claims. Claims in Niagara Falls, Fort Erie, Welland, St. Catharines, Thorold, and Grimsby are easily accessible. Now with offices in Kitchener, London and Burlington, our local outreach is expanding to provide faster and more cost effective service to our clients.

Stay tuned for more on this and give us a call if you have any questions or have any claims involving people in barrels deciding to float down the Niagara River.

Jeff Udall has a new phone number: **519-342-4569**

#### PRODUCT RECALL

#### **Kidde Nighthawk KN-COSM-IBCA and KN-COSM-ICA Combo Smoke and Carbon Monoxide ("CO") Alarm**

##### **Product description**

Kidde NightHawk talking combo smoke/CO Alarm KN-COSM-IBCA and KN-COSM-ICA models with manufacture dates between June 1, 2004 and March 2011. The alarms are hard-wired into a home's electric power.

##### **Hazard identified**

The alarm can fail to continue to chirp when it reaches its seven year end of life if the batteries are replaced or, for the model without a battery backup, if power is removed and then restored to the alarm. This could lead consumers to believe it is still working, which poses a risk to consumers not being alerted to a fire or carbon monoxide incident in their home.



# Radon Gas

*Bob Caskanette*

Radon is a naturally occurring radioactive soil gas, which is produced by the breakdown of Uranium in soil, rock, and water. Radon is the second leading cause of lung cancer deaths in the USA and Canada after smoking and it accounts for

approximately 3200 deaths per year in Canada alone. Radon is the largest single source of radiation in the world, accounting for approximately 42% globally. By comparison, the nuclear industry accounts for approximately 1%.

Radon is present in all areas of the world at varying concentrations. Radon potential maps cannot be relied upon to determine what buildings may be affected by Radon. Radon is colourless and odourless and cannot be detected in a building without testing.

The 2010 National Building Code (NBC) includes requirements for addressing Radon in new construction. All provinces already have or soon will be adopting it in their code, including Ontario. Parts 5 and 6 require engineers and designers consider Radon protection in their designs. Part 9 includes consolidating air barrier requirements (sealed plastic membrane under foundation slab), granular fill requirements under the slab and rough-ins for future radon reduction system. In addition, some cities have mitigation programs which require new buildings undergo mandatory or voluntary testing.

Radon is a noble gas, which means it is not chemically reactive. It passes through most filters but will adsorb to charcoal. It is carcinogenic and will cause lung cancer. Radon is heavier than air and therefore tends to sink, so the highest concentrations within a building are generally in the lowest level of the building.

When Radon is breathed into the lungs, it tends to stay trapped inside, bouncing around and striking the lung cells and sticking to the lung tissue. This can cause physical or chemical damage to the DNA, which can then lead to lung cancer.

Radon can enter homes in many ways such as cracks in floor slabs and foundations, sump pits, floor drains, basement windows, building penetrations, potable wells, showers, plumbing fixtures and more. Buildings which are negatively pressurized compared to the soils below and surrounding the foundation cause more radon infiltration. This pressure differential will naturally draw more Radon gas into a building through the various entry routes outlined above. This is the primary reason why Radon concentrations vary so much from building to building. How a building is constructed, pressurized and potential entry points vary greatly from building to building, even those which are neighbouring one another. There is no way to predict what the concentrations will be within a building without testing.

Radon concentrations will vary within a building hour to hour, day to day and month to month. It is dependent on many factors such as wind direction, weather (snow cover or ongoing rain will bias results), season, time of day and much more. Concentrations are generally the highest in the winter months when a building is sealed tighter (doors/windows closed), the HVAC system operates more to continually heat a building, stack effect is more of a factor (warm air rises in a building and therefore draws more soil gas in from around foundation), and snow cover prevents Radon from coming up through the ground as it normally does and instead directs it towards a basement floor or foundation.

In Canada, Radon is measured in the unit Becquerels (Bq) and concentrations are expressed as Bq/m<sup>3</sup> (1 m<sup>3</sup> = 1000 L of air). The maximum allowable concentration within a building is 200 Bq/m<sup>3</sup>. For general reference, the average indoor Radon concentration in Canada is around 45 Bq/m<sup>3</sup> and the average outdoor concentration is around 10 Bq/m<sup>3</sup>.

An indoor test should be taken over a term of at least 3 months (91 days) and up to one year. This ensures more accurate results as concentrations can vary greatly in the shorter term and results are therefore less reliable. Shorter term tests are sometimes done (schools, real estate transactions, etc.) but should be followed up with long term testing. Only long term testing results can determine if Radon mitigation within a building is required. Testing should ideally be done in the winter months if possible when concentrations are generally highest. The test should be done in the lowest area of a building that is occupied for at least 4 hours a day by building occupants. For example, if a basement is only used for storage and very rarely entered, it is more meaningful to collect a sample on the mainfloor.

Many types of devices are available to test Radon in a building. Some are better for longer term tests such as the Electret Ion Chamber (EIC) or E-PERM and the alpha track detectors (can be used for shorter term tests also). Activated charcoal devices such as open face, diffusion barrier or bags/vials are an option for shorter term tests but are less reliable. Continuous Radon monitors use computers and are an ongoing direct read instrument. These are typically used more often for shorter term tests but can be used for longer term as well. Digital detectors that can be plugged into a wall similar to a CO detectors are available on the market but cannot be used as a professional measurement device as they are not accurate enough. Continuous working level monitors are also available, but are more typically used in research studies and the mining/nuclear industry.

Radon needs to be mitigated when concentrations in a building exceed 200 Bq/m<sup>3</sup>. This must be measured by a long term test of at least 3 months. If the concentration is between 200 – 600 Bq/m<sup>3</sup>, you have within 2 years to mitigate the building. This range of elevated concentration within a building is found in approximately 6.7% of Canadian homes (around 1 in 15). If the concentration is found to be greater than 600 Bq/m<sup>3</sup>, you have 1 year to mitigate the building. This range of elevated concentration within a building is found in only approximately 0.7% of Canadian homes.

Many methods of Radon mitigation are available. The most common and most effective overall is active sub-slab depressurization. This involves having a pipe installed through the basement floor slab into the granular fill below. A series of pipes is connected to exhaust to the exterior. A fan is connected to draw air from below the floor slab and around the foundation and exhaust it out the piping so it doesn't enter the building. Sump hole and drainage system depressurization are also options and are different variations of sub-slab depressurization, only the point where the suction is placed is different. For buildings with soil crawlspaces, active sub-membrane depressurization is very effective. This involves covering the exposed soils with a thick plastic (polyethylene) membrane and building an air tight seal to the foundation walls. The pipe and fan system is then installed to collect Radon gas and exhaust it outdoors.

When mitigating, it is critical to evaluate the pressure differentials within a building, which is a main contributor to Radon entering into buildings. It is also important to seal and repair major entry routes such as sump pits, floor drains, cracks in poured foundation walls and floor slabs, floor/wall joints at base of wall, voids in concrete block walls etc. Increasing mechanical ventilation in homes can balance pressures and help to reduce indoor Radon concentrations. This can be achieved with HRVs and ERVs.

Radon testing and mitigation will be on the rise in the years to come. Health Canada has guidelines for testing within a home or in a public building. All consultants and contractors assessing or mitigating a building with Radon need to be Canadian National Radon Proficiency Program (C-NRPP) trained and certified. Our firm has trained professionals to assess buildings and give you the reliable answers you need. We would be happy to assist you on your next project or answer any questions you may have.



# Debunking the Myths Surrounding Arson Investigation

*Sadie Breg*

Fire investigators must be extremely careful when dealing with a possible case of arson. Unfortunately, myths have sometimes prevailed over the scientific method, with awful consequences.

The origin of several common myths may be traced back to 1977, when a booklet titled *Arson and Arson Investigation: Survey and Assessment* identified seven indicators that were widely used to determine whether a fire was an arson. The booklet cautioned that the indicators had not been scientifically proven, and recommended that experimental testing be conducted. It also recommended that, "a handbook based on the results of the testing program should be prepared for field use by arson investigators."

In 1980, the National Bureau of Standards (now NIST) published the *Fire Investigation Handbook* in response to the call for a handbook to be created. However, they did not conduct any scientific testing to verify the arson indicators; they simply republished the indicators previously identified. Many textbooks and training courses have since been developed which relied upon the NBS publication, propagating arson myths throughout the fire investigation industry. Some of these myths are discussed and debunked below:

**Myth #1: "Liquid pour" patterns or holes in the floor indicate that an accelerant was used.**

Fact: Burn patterns on the floor can have sharp lines of demarcation between burnt and unburnt areas. These patterns can be misinterpreted as the location of a puddle or trailer of accelerant. However, sharp lines of demarcation can be present for a number of reasons, such as when part of the floor is covered by an object during the fire. The area adjacent to the object can be severely burnt, while the area which was protected by the object is relatively untouched. Burn patterns and holes in the floor can also be caused by burning objects such as a cardboard box or laundry basket, or flaming debris falling onto the floor from above. Ventilation effects can also create holes or lines of demarcation.

**Myth #2: Crazed glass (short, random, concentrated cracking in glass) is caused by rapid heating, which indicates that an accelerant was used.**

Fact: This myth was disproven by scientific testing which tried to replicate crazed glass by rapid heating and was unsuccessful. Crazed glass can be re-created instead by rapidly cooling glass which is already heated, for example by spraying water on the glass. Crazed glass in a fire scene generally indicates that the fire department sprayed water on the window.

**Myth #3: Black, sooty smoke during a fire indicates that petroleum products were being burned.**

Fact: Black, sooty smoke can result from burning a variety of materials including wood and plastic. A fire that is starved for air will tend to produce darker smoke as the oxygen to fuel ratio decreases: the byproducts of incomplete combustion.

A falsely determined arson can ruin a life. In addition to the trauma of losing a home and loved ones, an innocent person may be accused of murder, denied their insurance, imprisoned and even executed, as in the tragic case of Cameron Todd Willingham in 2004. It is imperative that a fire investigator know and apply sound engineering principles when assessing a fire scene.

You can count on our team of experienced and certified fire investigators to do the job right and provide you with the answers you need on the cause of fires, answers that can be proven in court by fire science.



*Figure 1: Irregular burn patterns on the floor created in a test fire where no accelerants were used. (Photo: Scientific Protocols for Fire Investigation, John Lentini, pg 487)*



*Figure 2: Puddle-shaped burn pattern created by burning a cardboard box on an oak parquet floor (Photo: Scientific Protocols for Fire Investigation, John Lentini, pg 484)*

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# Smart Protection for Homes

*Micheka Kostyniuk*

It seems like everyone is using Smart Phones these days to help manage their lives. But Smart technology can

do more than help you check email on the go. It can also be used to reduce loss of property and could even save lives.

Smart Smoke and Carbon Monoxide detectors are available for homes. They can be programmed so that each detector has a specific room or name associated. For example, "Kitchen", "Master Bedroom". Imagine, your detector goes off and it's an emergency. What's going on? Where's the fire? But what if you knew, because your smoke detector told you that there is smoke in the laundry room? You would know exactly where the danger is and could plan your escape route more effectively.

Another amazing feature is that these detectors not only alert you verbally in the home, they will send an alert to you on your phone. While you are sitting at your desk at work or out for coffee with a friend, you could learn that you have smoke in your bedroom and could call 911 when the fire is still in its early stages rather than the fire growing undetected until a passerby notices and calls 911. This could drastically improve the outcome of a fire in terms of property loss.

It can be costly to upgrade all the smoke/CO monitors in the house, but there is a cheaper retrofit option available. You can purchase a Smart battery that you install into your existing monitor to turn it "Smart". You don't get all the features of a Smart detector, but you will get alerts to your phone in the event that the smoke detector goes off so that you can catch the fire in its early stages, similar to other Smart Smoke and CO detectors. And really, that is the most important feature of a Smart detector over a standard detector.

Another available product is a Smart Thermostat, which again could help reduce costs and reduce property loss claims. They have "away" settings so you don't need to waste energy, just activate the feature when you leave the house. And the convenience of being able to turn up the temperature of your thermostat as you are driving to the cottage so it is nice and warm by the time you arrive is very appealing! But they also have "safe" settings. If the temperature drops too low, or climbs too high, the "safe" temperature alarm is triggered, and sends an alert to your phone so you know there's a problem. It would be immensely

valuable to learn while you are comfortable at home that your cottage's furnace stopped working and the temperature has dropped to a point where your pipes may freeze.

There is some benefit to buying multiple Smart products from a single manufacturer. For example, you can purchase smoke and carbon monoxide detectors and a thermostat from one manufacturer. If you have smoke or carbon monoxide detected, your detector can communicate with your thermostat and tell it to shut down the furnace. This could be helpful in many ways. Think of a furnace that is malfunctioning and blowing out huge quantities of soot or carbon monoxide into the house. The smoke or CO detector activates, communicates with the thermostat, which shuts down the furnace, eliminating the source of the contaminant. The loss is suddenly mitigated and less costly to repair.

There are many Smart products and many features that each product offers. These new devices can help us to protect our homes and lives, and save insurers substantial money along the way.

There are Smart water leak detectors you can attach to plumbing pipes to alert you if there is a water leak. Shutting off the water quickly while you are away could eliminate a lot of property damage.

They are creating Smart electrical receptacles that you plug into your existing receptacle so that you can control it remotely. Imagine getting a low temperature alert to your phone from your Smart thermostat, and being able to remotely activate an outlet that you have a backup heater attached to, so your cottage warms up and your pipes don't freeze? Or hearing a thunderstorm forecast for your home town while on a trip, and you have the ability to remotely turn off the receptacles to your computer and electronic equipment to protect against lightning damage.

They are starting to create Smart cookware (crockpots) so that you can adjust cooking on the go. Maybe Smart stoves that remind you that your range is turned on could help prevent careless cooking fires in the future. The possibilities are endless.

As technology advances, it is paramount to keep up to date on best practices to safeguard property and lives. Insurers can have a big influence on consumer choices by offering incentives for them to buy and install this new equipment for the benefit of everyone.

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