

FORENSIC ENGINEERING NEWS AND VIEWS

Fall 2017

Presidents Box



By Rene Caskanette

This has been another year of growth for our firm, so we have hired additional manpower to maintain our quick turnaround time on files. We are pleased to announce our newest employee Alex Caskanette. No he isn't my son, both my kids Micheka and Bob are already working for the company. Alex is my nephew.

Alex graduated from the University of Western Ontario with a Mechanical/Material Engineering degree and is registered as an engineer in training (EIT) with the Professional Engineers of Ontario (PEO). Four years from now he will have the necessary experience to become a registered Professional Engineer (P. Eng.)

You may have met Alex during his two work terms at Caskanette Udall Consulting Engineers while he was in school, or on the job during the past six months as an employee.

His areas of expertise include failure analysis, personal injury, accident reconstruction and mechanical failures including vehicle fire investigation. Working with mentors Peter Johnston in failure analysis and Jeff Udall for accident reconstruction, he is quickly learning on the job, with academic training to help fill in any knowledge gaps. You will see an article from Alex regarding a recent training session he attended in Nevada on accident reconstruction.

It is important for consulting firms to maintain a team of experienced professionals to respond to clients needs, but equally important to keep a young group of keen well educated experts training and helping out on projects, so they can fill in when needed down the road, and in the meantime keep costs down on projects by handling some of the routine file work at their lower billing rates.

Alex will be working from London, along with Micheka Kostyniuk our civil/structural expert in that area, and our draftsman Glenn Tatsu.

We are spreading out geographically as well with Jeff Udall, senior partner now located in Niagara Region. I recently relocated to Huron County near Goderich. We continue to operate from our Kitchener head office, with experts Bob Caskanette, and Sadie Breg located near head office.

Engineering experts are very mobile since we can carry our equipment easily in a car or an airplane when necessary. Being spread around SW Ontario in home offices, our travel to sites is reduced so costs to clients also reduce. This business model has served us and our clients well over the last 19 years.

Looking forward to July 2018 when we will achieve our 20 year milestone. Thanks to all our clients for their support over that time.

Now Serving the Niagara Region



Jeff Udall

Our team of experts have always served the south-western region of Ontario with local offices in London, Kitchener-Waterloo, and Cambridge. We will also travel to other regions of the province, whether its east to our nation's capital, or north to the home of the big nickel. However, we recognize that a local presence in a particular area is always beneficial. Being closer allows for less costly travel time and faster response on critical files.

To extend our presence in the south-western and GTA region, Jeff Udall has now set up an office in Niagara Falls. The Falls is the 7th wonder of the world and a beautiful place to live. We are surrounded by vineyards, the start of the Niagara Escarpment, and a rich history that defined the origins of Canada. The Niagara office now has easy access to the Niagara peninsula, including St. Catharines, Welland, Grimsby, and Hamilton on the north side, and Fort Erie, Port Colborne, Cayuga, and Port Dover on the south.

We have realized that there isn't a lot of local representation in the Niagara region from the Forensic Engineering community. By setting up the Niagara office, we will be able to provide our clients with an expanded local service area to improve the timeliness of reporting and reduce travel fees.

Give Jeff a call if you have a claim in the peninsula. Same great service, now in Niagara Falls.

PRODUCT RECALL

Kidde and Garrison Branded Fire Extinguishers with Plastic Handles

This recall involves two styles of Kidde-branded and Garrison-branded fire extinguishers: Plastic Handle Fire Extinguishers and Push-Button Pindicator Fire Extinguishers. The fire extinguisher can become clogged or require excessive force to discharge and can fail to activate during a fire emergency. In addition, the nozzle may detach with enough force to pose an impact hazard.

See <http://www.healthycanadians.gc.ca/recall-alert-rappel-avis/hc-sc/2017/65014r-eng.php> for details

Motor Vehicle Accidents Involving Pedestrians



By Alex Caskanette

Alex Caskanette is the newest addition to the Caskanette Udall team. He recently attended the ARC-CSI Crash conference in Las Vegas, Nevada.

The emphasis of this year's conference was accidents involving pedestrians. The conference began with live crash demonstrations followed by presentations by many leading experts in the field of accident reconstruction.

Many of us operate vehicles daily. Driving a vehicle is a complex action that requires the continuous monitoring and processing of stimuli to safely navigate from point A to point B. For most experienced drivers exercising physical control over the speed and direction of a motor vehicle becomes second nature.

How many people have driven to work or another familiar destination and zoned out. The next thing you realise is that you are at your destination and you do not recall the details of the commute?

The reason for this phenomenon is the longer it takes for our brains to process information the longer the period of time feels. When driving a familiar path our brain performs more subconscious processing and requires less active processing from the individual.

Many organisations have dedicated considerable resources in determining and characterising the average person's driving behaviour. Crash Safety Research Center (CRSC) is one of these organisations. CRSC has conducted multiple studies including one on Gap Acceptance. Gap acceptance is "how far away must an approaching vehicle be before a driver will pull out." Most of us rely on our driving experience to consciously or subconsciously determine if we have time to cross an approaching vehicles path to complete a turn. When driving we frequently encounter this situation and perform the action without significant conscious thought.

There are many variables involved in this type of study but the CSRC has determined the length of acceptance time the average person requires from the approaching vehicle to initiate different traffic maneuvers. Some of the average gap acceptance times they determined are: most people require a 4.5 second gap when turning left across traffic, an 8 second gap to turn right from a rest position, and about 10-12 second gap when crossing a 2-4 lane intersection from rest.

Many factors can impact these times. Older adults are more cautious and require more time, while younger adults accelerate faster and require less of a gap. Also, the presence of a passenger universally makes the driver more cautious and require a larger gap.

Transport Canada reported that in 2015 there were 283 pedestrian casualties from motor vehicle accidents involving pedestrians. The U.S. Federal highway administration reported that in 2015 pedestrians accounted for nearly 15 percent of traffic fatalities. 5,376 pedestrians were killed and 69,000 pedestrians were injured in traffic crashes. On average, a pedestrian is killed every 1.6 hours and injured every 7.5 minutes.

The Crash Safety Research Center has conducted research on the influence of driver's expectation

in nighttime recognition. They determined that pedestrians consistently overestimate how visible they are at night and account for expectancy in an objective way. Pedestrians falsely believe that since they can recognise the approaching vehicle, then the vehicle can likely recognise them. This may explain why there is such a large number of MVAs involving pedestrians and emphasises the need for caution when crossing roadways at night.

The CSRC performed an experiment where human subjects operating driving simulation software reacted when they first recognised a pedestrian or animal on the roadway. Some of their general findings for an unlit roadway, with the driver looking ahead are: The average person recognises a pedestrian, wearing light clothing, on the near side of the street 99m away, a pedestrian (light clothing) on the opposite side of the street 61m away, a pedestrian (dark clothing) on the near side of the street 39m away, a pedestrian (dark clothing) on the opposite side of the street 26m away, and a pedestrian (dark clothing) laying on the ground 0m away.

To summarize their findings: when there is less probability (i.e. a pedestrian laying on the road at night), the response times have been observed to be longer. Likewise, when there is less information (i.e. dark clothing, on the left side, or no pattern on the clothing) response times of the driver are generally longer.

Our company utilizes available studies on human factors, the facts of each unique case, and modeling simulation software to reconstruct crashes involving vehicle and/or pedestrians to recreate accidents and determine all the details surrounding the incident.

Do not hesitate to contact us if you would like to learn more or if you require our accident reconstruction services.

The Elusive Vapour



By Sadie Breg

Water comes in three states: solid, liquid and vapour. The building envelope (walls, windows, roofs etc.) separates the interior from the exterior. Generally, we want

to keep solid and liquid water outside, and find this intuitive. What about vapour? Whenever

we exhale, vapour is released into the air. Other activities like cooking or showering can increase humidity levels inside. Some humidity inside is comfortable, and harmless. Problems begin to crop up when vapour inside the building or within the building envelope can transform into water or ice.

Vapour becomes liquid when it contacts a cold surface and condenses. If the surface is very cold, it may freeze. To avoid accumulation of water and ice, we can do three things:

1. Control the temperature;
2. Control the humidity; and
3. Make provisions for drying.

Condensation occurs when air becomes saturated with vapour. This is called the dew point, and it changes depending on the temperature of the air. As air decreases in temperature, its capacity to store water vapour decreases – this is why we see dew and frost at night when the temperature drops and the humid air from the day is no longer able to hold as much moisture. We also tend to see condensation and ice build-up on other cold surfaces where relatively warm, moist air has passed by. For example, condensation may occur on the outside of cold water pipes, or the underside of attic sheathing where warm, moist air from the interior is getting into the attic.

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Vibration Damage



By Micheka Kostyniuk

Every year there are construction projects large and small. Recent examples of larger projects include the new Herb Grey Parkway (aka Windsor-

Essex Parkway) and Kitchener-Waterloo LRT. Smaller examples are typical roadway or building construction projects – a new highrise building in the downtown, new road services, etc.

Whether large or small in nature, all of these types of projects produce vibrations in the soil. The magnitude of these vibrations depends on what type of project and what equipment is being used. The larger the equipment, the more vibrations. For example – blasting will produce a much higher vibration than a vibratory pile driver, which will produce a much higher vibration than a jack hammer.

How that construction vibration affects people and buildings has been the subject of many studies. We hear almost universally from homeowners that their building was shaking, the noise was deafening, things in their house were rattling (e.g. pictures, windows), they could see trim moving. They start looking around their houses and finding cracks at various locations and think the worst: “Oh no! All this construction has damaged my house!” or the even worse conclusion that their house is no longer safe.

The majority of the time we find nothing structurally wrong with these homes. “But how can that be?” people ask. The answer is that soil is able to dampen (reduce) vibrations very well. As the vibrations travel through the soil, they dampen very quickly. And when they do reach the structure, they dampen even further. They require

direct load transfer paths through a structure to damage anything at the interior of the structure.

This seems strange to people, because they say, “But I heard and felt the vibrations in my home. They were awful! And I could barely hear the TV over all the noise”. This is the second point, that vibrations are far more disturbing to people than structures. There has been a lot of research done with respect to this.

Construction Vibrations: State-of-the-Art by John F Wiss (Published in the Journal of the Geotechnical Engineering Division in February 1981) through to the more recent Transportation and Construction Vibration Guidance Manual (published by the California Department of Transportation – aka CalTrans – September 2013) have had similar findings. While vibrations produced from construction activities can be “disturbing” to people, these same vibrations are often insufficient to cause damage to structures, including fragile older historic buildings, let alone newer more resilient buildings.

Does this mean we never see vibration damage to structures as a result of vibrations/construction activities, then? No, it doesn't. We have seen foundation walls collapse inwards as a result of nearby construction activities, as well as other less severe damage. For significant structural damage to occur, the source of the vibrations must typically be very close to the structure in question.

Your next (logical) question will be, “What distance is a safe distance?” That's not something with a straightforward answer. Obviously, you can use a jack hammer much closer to a structure than you can use dynamite without causing damage to a building. It becomes important to know what type of equipment was used and how far away it was used, so that this can be analysed and determined. It is also important to look at the quality of the structure in question – is it an older structure in poor condition or a new commercial building? Obviously, the new building can sustain higher loading from vibrations without sustaining damage as compared to an older structure in

poor condition. These are all factors that come into consideration when we assess a building, as each building and construction situation is unique.

And of course, there is always the question from the homeowner, “But how can you say my building did not sustain any damage when I have found cracking all through my entire house?”. This is often the most difficult part to deal with. The problem is that people start walking through their house with a critical eye, and issues that may have been there for years are now being seen for the first time.

Depending on the type and source of vibrations, maybe there are new cosmetic damages and maybe there aren't. Building finishes such as drywall are more brittle than the wood framing behind. For this reason, cosmetic damages are not necessarily indicative of structural damage. It takes little force to worsen cosmetic damage. For example – that crack above your door that has been there forever just doubled in length.

Assessing the cosmetic damage can often be the most difficult part of these types of claims. But the general rule of thumb is that if there is any cosmetic damage, it will be most significant at the exterior wall that is facing the source of the vibration. If you are seeing a high amount of cosmetic damage at the back wall of the house, but none at the front wall of the house, yet the construction was in front of the house, then it is likely that these cosmetic damages were not related to vibrations.

All situations are unique and there are several factors in each situation that need to be considered and assessed to determine if observed damage was caused by construction vibration. Key variables are magnitude at source, distance to structure, condition of building, and the damage pattern observed. Other variables are soil type, duration of exposure, saturation level of soil, and continuous versus intermittent loading.

We are happy to help you sort through these factors and determine what, if any, damages were sustained as a result of vibrations.

The Elusive Vapour

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Let's imagine a balcony supported by a steel beam which extends into the building where the surrounding air is warm and moist. Over the winter, this steel beam will conduct cold temperatures into the building. This is a design flaw called thermal bridging: not only is it inefficient from an energy perspective, it can damage the building. If the beam is cold enough, condensation can freeze and build up layers of ice over the winter. This is the same phenomenon

that happens inside a freezer that needs a good defrosting. When the weather warms, this ice can melt all at once and give the misleading impression that a leak has occurred.

Vapour often moves with air and can travel any path which air can travel. Water vapour molecules can also diffuse through some materials which are impervious to air. The building envelope should be designed to control the flow of vapour so that water or ice is not able to accumulate, and so that humidity levels are maintained below 60% relative humidity to prevent mold growth and deterioration of moisture-sensitive materials.

We can control the humidity using vapour barriers and the temperature using insulation, so that we don't reach the dewpoint inside our buildings. As a third line of defense, we should also allow the building envelope to dry when it becomes wet (whether from water ingress or condensation). A small amount of condensation can become a big problem over time, when moisture is trapped inside the wall.

Sometimes leaks aren't quite what they appear – condensation and ice buildup may be the culprit.

Smoke and Soot Mapping Analysis and Clearance Sampling within a Building



By Bob Caskanette

Following a fire loss, issues often arise pertaining to smoke odour and soot residue within a building and on contents. How far has

the contamination reached? Have wall or ceiling cavities been compromised? What building materials and contents require removal and replacement? What items can be cleaned and salvaged? Should sealing and encapsulation of some areas be considered? Undertaking smoke and soot contamination mapping within a building will help answer these questions and establish a restoration protocol for the contractor to complete.

A detailed assessment of the building and building construction is essential. We offer a combination of air sampling and surface swab or tape lift sampling services that give an overall analysis of the building and/or contents in question. We can assess if incomplete products of combustion (smoke/soot) are present on a material or within an air space to establish how far the restoration needs to go to help avoid unnecessary costs.

For surface sampling there are two common options. The first is undertaking surface swab samples using laboratory grade Kimwipes saturated in either laboratory grade Hexane or Isopropyl Alcohol, depending on the surface material being sampled. Tape lift samples for microscopic evaluation of smoke/soot are also a good option, which can typically be analyzed by the laboratory more quickly and cost effectively. This is helpful prior to a fire restoration being completed to establish the scope of work required and following the restoration to identify if the project was completed successfully.

For air sampling there are several options available. Solid Phase Micro Extraction Fibre (SPME) sampling and more conventional Charcoal Tube sampling are viable options prior to the fire restoration being completed. However, often our eyes, a white glove test or olfactory systems

are enough to tell what is contaminated as gross levels of contamination are often present. Laboratory calibrated SUMMA air canisters for total volatile organic compounds (TVOC) and target volatile organic compounds (VOC's) can be collected for an 8 hour or more conventional 24 hour air sample, which is a very useful tool to establish if building clearance has been achieved following the fire restoration prior to the building being reoccupied.

The results of a 24 hour clearance air test can be compared to available Health Canada Residential Indoor Air Quality Guidelines and other guidelines or industry recognized levels where available. Even if contents have been removed from the building and cleaned and building restoration was properly completed, occupants may still think an issue exists. Whether the issue is psychosomatic or legitimate, we can assess buildings and contents to get you the answers you need. There will always be people that want everything brand new no matter what you tell them and costs can rise very quickly. There are also people who may have hypersensitivities to certain contaminants which may complicate the process. A consultation with a medical doctor in that instance may also be required.

The samples (other than surface tapelift samples) are analyzed by Gas Chromatography Mass Spectrometry (GCMS) at an accredited laboratory. Our laboratory experts can identify the compounds found within the samples and can even assist us with determining the source of the particular compounds identified in special circumstances.

A professional report is then generated outlining the results of the testing to assist you with making an informed decision. These may be the critical answers you need to handle a claim both quickly and economically.

In addition to soot and smoke from fire claims, we offer pre-remediation and post-remediation assessments and sampling of marijuana grow ops and clandestine drug labs such as homes used for the manufacture of methamphetamine. Following a pre-remediation assessment, a remediation protocol can be provided for contractors when problems are identified.

We also offer testing, remediation protocols and clearance sampling for fuel oil spill cleanups, mould or asbestos claims, or microbial jobs such as sewer backups. Homeowners can then have the peace of mind they need prior to reestablishing occupancy of the building. We are always here to answer your questions and hope to see you on your next claim.

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