Caskanette Udall
CONSULTING ENGINEERS

FORENSIC ENGINEERING NEWS AND VIEWS

Fall 2010

Oil tank failures

By Rene Caskanette

One of the most feared claims insurers face is a residential fuel oil spill remediation. They are messy, expensive claims with lots of unique aspects to handle. Our firm is in business to help you control the costs on these claims, manage the environmental and structural remediation, and handle the failure analysis to sort out liability for damages.

The vast majority of tanks for home heating oil in Ontario are single wall steel tanks built to conform to the ULC S602 standard. Typical size is around 900 litres. They are above ground and can be either indoors or outdoors. Copper oil lines connect the tank to the appliances in the home. There is a shut off valve adjacent to the tank and an in-line filter is provided along the fuel line.

Tanks are supported on steel saddles or legs. They are required to have fill pipes, site glasses, whistles, vents, etc to allow for safe filling of the tanks by fuel suppliers.

The tank manufacturers have distributers who sell tanks to contractors who then install them. They are to be installed in accordance with the CSA B139 fuel oil code.

Fuel suppliers then contract with owners to periodically fill tanks. They are required to inspect the tanks prior to filling and legislation from the Technical Standards and Safety Authority (TSSA) prevents them from filling tanks which are unsafe. They must periodically perform a comprehensive inspection of tanks and complete a form to comply with the TSSA legislation.

Tank installers and fuel suppliers must be licenced by TSSA in order to perform the work.

With all of these codes, standards and licensing provisions in place, homeowners and insurers may expect that the tanks will never leak. Wrong! Tanks and attachments do leak occasionally and when they do the cost to deal with the remediation of soil and groundwater can be very high. The remediation costs may be insured depending on policy provisions.

The TSSA and the Ministry of the Environment (MOE) are notified of spills as they are reported to the Spills Action Center. Reporting is required by legislation, so fuel suppliers or contractors who are aware of the spill must report it. The enforcement officers then have the power to write an order to the property owner to delineate and/ or remediate the impacted materials.

What causes spills?

The most frequent cause in our experience is internal corrosion at the bottom of the tanks. Pin holes form in the steel and release the oil.

General corrosion of steel is a slow process. Tanks should last 20 years before failure due to this process, but in the field failures are occurring in much less time. Why? Factors causing accelerated corrosion are the accumulation of water and sludge in the bottom of the tanks, acidification of the corrosion cell, microbial actions, and rapid pitting corrosion results.

Design changes have been made to some tanks in recent years, moving the end outlet to the bottom of the tank. This intends to remove water from the bottom of the tank to prevent rapid corrosion cells from forming. This requires that tanks be installed with a slope for drainage to the end where the outlet is located. This design does not eliminate the problem. We have seen cases where these tanks still failed prematurely due to corrosion and other cases where the failure was shifted downstream from the tank to the filter housing where the water then accumulates.

Other types of tanks are now available to deal with corrosion failures and prevent leaks into the environment. Fiberglass tanks are available and they do not corrode. Double bottom tanks with leak detection are available. When the corrosion moves through the inside steel bottom on the tank, it is captured by a second steel bottom below. Oil accumulation in the space then activates an alarm to alert owners to the problem. These tanks are available in Canada but of course they are more expensive so they are rarely seen in use.

In Maine double walled tanks are now required in some potable water areas. An inner plastic tank contains the oil. It is not susceptible to corrosion. A steel tank then completely surrounds the plastic tank, so if the plastic tank leaks the spill is contained inside the steel tank until the problem is corrected.

A similar solution is to install containment around the steel tanks. A plastic containment tank is available for this purpose. Any oil leaking from the steel tank is contained inside the outer plastic tank. In industry it is common to build concrete containment walls around tanks of liquid to contain spillage and prevent environmental impacts.

The technology exists to solve the environmental problems created by oil spills but it will require a driving force such as new legislation to force owners to spend the extra money required to put the technology into use. A homeowner looking to purchase a new 200 gallon single wall steel tank will pay around $870 while a

continued on page 3

Underpinning Structures

By Micheka Caskanette

Oh no! We just had an oil spill claim come in and there's oil under the house. How do we excavate the contaminated soil without having to tear down the house?

There are various scenarios where contaminants can get into the soil beneath a structure. The most common is an oil spill, but other occurrences such as sewer lines breaking beneath the house can be just as complicated to remediate.

Underpinning is often incorporated in these remediation efforts. Traditionally, underpinning consists of panels of concrete that are placed beneath the footings after the soil is removed. This is the most common form of underpinning in Southwestern Ontario.

Helical piers and other specialized methods of underpinning are options when traditional underpins are not feasible or if there are unique, site specific reasons to incorporate them. Helical piers are installed by pushing a pier into the ground with specialized equipment and determining when it has reached good bearing soil based on the resistance the equipment reads.

Underpinning moves in stages with a design specific to each individual house that is based on several factors including the condition of the foundation, soil/groundwater conditions, depth of contamination, etc. For example, helical piers cannot generally be used if a foundation is in poor condition, as is often the case with old stone foundations. Traditional underpins cannot generally be used if the contamination extends deep into the groundwater.

There are other considerations, rather than just the exterior walls of a house. Are there interior structural members such as support walls, steel or timber posts that support a beam, or a solid masonry chimney that are impacted? If so, these must also be underpinned.

During excavation, a plan must be put into place so that the various structural supports are not undermined during the excavation below a wall. This is referred to as the angle of repose, and is an important factor to consider. For example, if you have contamination at a wall and you are excavating eight feet below the foundation, but there is a steel jack post in the basement, how will it be impacted? Can you dig the full eight feet without causing the post to collapse or does it need to be temporarily reinforced or underpinned?

Remember that underpinning a structure is considered to be altering the structure, and therefore a building permit needs to be applied for prior to beginning underpinning work!

Underpinning can be difficult work that is often unpredictable and results in several design changes throughout the duration of the project, as further contaminant delineation or other unknown site conditions develop. It is important that you have competent, qualified individuals with experience in underpinning working with you. This includes the engineer that will be designing the underpinning, the contractor that will be performing the work, and the environmental personnel that will be working at the site.

If you think you might need underpinning but aren't sure how to proceed, we can work with you from the structural and/or environmental side of things and help you determine the best course of action. If underpinning is required, we can help you select a competent contractor that has the capabilities to perform the underpinning work, and manage the project from beginning to end.

On the Links

Rene, Bob and Micheka were out, enjoying a beautiful day, at the London Claims Association Golf Tournament on August 19, 2010.

Greg Robson – Higgins Pro Team, Micheka Caskanette – Caskanette Udall, Sharron Corlett – Economical, Jason McGuire-Higgins Pro Team

Rene Caskanette-Caskanette Udall, Mike Conlon-Guarantee, Rick Morse – Intact, Bob Caskanette-Caskanette Udall

Marijuana Grow Ops and Clandestine Drug Labs

By Bob Caskanette

For those of you who live in suburban areas, I'm sure many have heard police sirens blaring through their streets and have often wondered what may be going on. A trend that is on the rise is the use of upscale homes in suburban areas for the production or manufacture of illegal drugs such as marijuana, methamphetamines, ecstasy and many others. The previous notion that only rural areas and rundown housing communities were involved has long since passed.

The production and manufacture of illegal substances is against the Building Code Act, S.O. 1992 (Section 15.9) and the Criminal Code of Canada.

Criminals are becoming more evasive and better educated. They're learning ways to bypass electrical meters or otherwise obtain hydro, ventilate a building through filters to eliminate suspicious odours, hide heat sources within a building from police infrared scans and remain secretive within an otherwise innocent looking community. They are learning to blend in and stay off the radar while making the operations more complex and elaborate, constantly trying to stay one step ahead of the law.

But it comes with a cost to insured buildings. Water and moisture damage, mould growth, chemical contamination, pesticides, remaining materials left behind, and possible contamination of plumbing/septic systems, surrounding soils, sediment and ground water are major concerns.

These concerns can often add significant cost to the remediation of a building. A detailed building assessment should be undertaken to evaluate what is required to restore the building to its previous condition when feasible. Too often we've seen consulting reports claiming the building must be torn down and rebuilt with no other alternative mentioned. These consultants are typically hired by the banks which take over the buildings along with an acting property manager.

We caution you in using these reports as the only answer as many buildings do not require complete demolition, but rather interior finish material removal, specialized cleaning, testing and eventual restoration. Often the costs to strip and restore the building are far less than that of demolition and rebuild, particularly in the higher end suburban residential communities where homes can incur a significant cost to rebuild and logistical issues with building demolition may be present.

It is worth a consultation to see what your options are on such a project before it is too late and the decision to level the building has already been carried out. We're available to help answer your important questions and establish an effective remedial solution.

O.Reg. 511/09 Regulatory Update

By Bob Caskanette

As some of you may already know, the Ministry of the Environment (MOE) is changing environmental legislation in the Province of Ontario. Ontario Regulation 153/04 under the Environmental Protection Act is being replaced by Ontario Regulation 511/09, which comes into effect on July 1, 2011.

What does this mean? Well it means many things for environmental remediation projects, but we'll just highlight a few.

The new regulation makes amendments to the Record of Site Condition (RSC) submission process and general Environmental Site Assessment (ESA) requirements as well as Risk Assessment (RA) criteria and changes. Conceptual site models have also been addressed in the new standard.

Perhaps the most interesting part of the proposed changes from our point of view is the new soil, ground water and sediment standards that will come into place. The change was needed for several reasons, including new toxicity data available, improved science and previous out of date science just to name a few.

Overall, the new standard will be more stringent for many contaminants of concern. Approximately 65% of contaminants will have more stringent remedial criteria. Also, there are new standards in place for a few contaminants that were not previously accounted for, which is an approximate 5% overall increase. It's also worth noting that 23% of contaminants will actually have less stringent criteria, and 8% will remain equally stringent, which means changes were not made.

For some projects, remedial criteria will be compared to both the current standards in place (O.Reg. 153/04) and the new proposed standard (O.Reg. 511/09) set to take effect July 1, 2011. For more information, please feel free to contact us or we encourage you to do a little research on your own for further clarification. There is a lot of information available for those interested.

Oil tank failures

continued from page 1

fiberglass tank the same size will cost around $1800. Government incentive programs or insurance premium reductions are other tools available to encourage home owners to spend the extra money required for the fiberglass tank.

Spills can result from other problems such as failure of tank supports, failure of fuel lines, failure of filters, failure at oil burner connections, and other odd events such as contractors delivering fuel into a basement where the tank has been removed.

Each case requires careful investigation to determine the root cause of failure and contributing factors. Liability for the leak may rest with tank manufacturers, tank installers, fuel delivery companies, maintenance contractors, or other parties. As with any case where subrogation is anticipated, the evidence must be carefully documented and preserved for testing by all interested parties.

Corrosion of Roof Truss Gusset Plates in Farm Buildings[1]

By Jeff Udall

Truss plates are light gauge metal plates used to connect prefabricated wood truss sections in roof assemblies. Truss plates are produced by punching light gauge galvanized steel so teeth protrude from one side. Because the truss plates are galvanized prior to punching, numerous metal edges are left unprotected from corrosion. The truss plates are pressed into the lumber with either a hydraulic press or a roller to fully embed the teeth.

Deterioration of metal truss gusset plates is a major concern in buildings that contain high humidity and corrosive environments. Normal galvanized steel plates exposed to moisture, condensation and ventilation air containing manure gases, will corrode rapidly. Many of these buildings show severe corrosion within five to ten years. This corrosion can weaken the building and could potentially lead to structural failure, especially during the winter months when the cold conditions promote condensation and there are higher roof loads present.

The buildings most affected by this corrosion are cold, naturally ventilated beef and dairy barns with slatted floors and deep manure storages. Warm, naturally ventilated, swine barns are also affected.

The truss plates show the greatest deterioration near the building air exchange openings – typically at the heel and peak joints of the truss. These are very critical joints in the structural integrity of the truss.

There are several design elements that can prevent corrosion and reduce the chance of a roof collapse. A good ventilation system should move fresh air through the building to reduce the levels of moisture, gas and dust (all contributing factors for corrosion) to acceptable levels. Often, an owner tightens up a barn to raise the building temperature or to save on supplemental heat. Unfortunately, this reduces the ventilation rate and allows the humidity level to increase.

Another design element to consider is to apply a protective coating to the plates by brush either before or after truss installation. This coating must cover each metal plate including its edges.

If the truss assembly is completely partitioned out of the animal environment, it will not be influenced by the high humidity condition and related problems. A vapour barrier in the ceiling is necessary to prevent moisture migration into the attic space where it can affect the trusses.

Owners should inspect their buildings periodically for signs of wetness and corrosion on the truss plates. A repair should be initiated if necessary. The Ontario Building Code requires roof systems to be engineered, so a consulting engineer should be approached for an assessment and repair specification. A building repair or retrofit expenditure undertaken now will be cheaper than replacing the structure after a catastrophic collapse.

1. Fact Sheet #714, Order #94-035; J. Johnson – OMAFRA http://www.omafra.gov.on.ca/english/engineer/facts/94-035.htm#Repair

Contact Us

519-745-5066
1-800-920-5854
www.caskanette.on.ca

Rene Caskanette
B.A.Sc., P.Eng
rene@caskanette.on.ca
519-489-2901

Jeff Udall
B.Sc., B. Eng., M.A.Sc., P.Eng
jeff@caskanette.on.ca
519-342-6491

Bob Caskanette
B.A.Sc., C.E.T., AMRT
bob@caskanette.on.ca
519-618-9044

Micheka Caskanette
B.A.Sc., P.Eng, CFEI
micheka@caskanette.on.ca
519-488-5454

Gail Tomka
Office Manager
gail@caskanette.on.ca
519-745-5066

Caskanette Udall
Consulting Engineers

608-675 Queen Street S.
Kitchener, ON N2M 1A1