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Domestic Fuel Oil Storage Tanks

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Statistics

Statistics Canada notes that approximately 14% of homes in Canada use oil for heating with at least 1,000,000 homes being east of the Ottawa Valley of which approximately 400,000 are located in Atlantic Canada where fuel oil is the region's most common heating fuel.

When domestic fuel oil spills occur, the results can be disastrous not only for the environment, but property owners, insurance companies, and government who are left with the costly burden of cleaning up the spills.

Spills from indoor fuel oil tanks cause extensive damage to the home, its contents and the presence of harmful vapours can make the home unliveable for a considerable period of time. Spills from outdoor fuel oil tanks often result in the contamination of soil and groundwater. Fuel oil fumes can infiltrate homes through the sewer system, basement floor slab or foundation walls and groundwater can be rendered unusable for more than 20 years. The cost of clean-up can vary from a couple of thousand dollars to well over the value of the property depending the topography and geology of the affected area.

Even if affected properties have been properly cleaned up and restored to pre-loss condition, there can still be a significant decrease in their value due to a perception of damaged goods.

Although accurate statistics were unavailable at the time of this publication, the occurrence of domestic fuel oil spills continue to be on the rise with the vast majority of insurers having experienced pollution related claims as a result of tank failure.

The Domestic Fuel Oil Tank

Domestic fuel oil tanks in Canada are manufactured, tested and certified in compliance with an approved testing and certification agency, such as Underwriters Laboratories of Canada (ULC) and their installation is dictated by the Canadian Standards Association B139 *Installation code for oil-burning equipment*.

For over 60 years, domestic fuel oil tanks have been predominantly fabricated from 14 gauge rolled carbon steel with no pre-treatment for corrosion. They are available through most home building centres and fuel suppliers at an average cost of $250 for a 900 litre (200 gal.) tank. The cost of having it professionally installed including the cost of the tank, required hardware and all components typically ranges from $ 1,000 to $ 1,500. One can therefore conclude that many installations are carried out by the homeowner or novice for cost saving considerations.

Domestic Fuel Oil Tank

Conversely, many European nations have banned the installation of the common rolled carbon steel tank since the early 1970s and have opted for a stainless steel, double walled or polyethylene lined tanks. Unfortunately, Canada has not reacted to the issues associated with single walled carbon steel tanks until recent years with the adaptation of a new standard for non-metallic domestic tanks.

Unfortunately for the Canadian homeowner, along with improved technology comes an increase in cost. For those who can afford or are willing to install these types of tanks, a solution to corrosion induced failure already exists. For the remainder of the population, corrosion of fuel oil storage tanks remains a reality.

The Problem

Until the mid 1990's, oil tanks were not viewed as an issue or a hazard until we better understood the environmental impact and became more sensitive to the increasing fragile nature of the environment. Tanks need to be viewed as a maintenance item by the homeowner and, in the same manner as roof covering materials; tanks are not designed to last a lifetime and will need to be replaced. It is therefore the homeowner's responsibility to ensure that their equipment is in compliance with regulations to minimize these risks.

Leaks can be gradual, undetected for many years, or catastrophic, resulting from the sudden rupture of the fuel oil tank often being attributed to one or several of these factors:

- Manufacturing defects
- Physical damage
- Corrosion
- Fuel delivery issues

Manufacturing Defects

Manufacturing defects, although possible, accounts for the minority of tank failure since manufacturers are required to pressure test their tanks before sending them to market.

Physical Damage

Any tank is susceptible to physical damage; therefore its location is a prime consideration. Tanks must be set level and plumb on a non-combustible surface. They must be away from vehicular access routes or be substantially protected from vehicular impact.

The valve, fuel line and gauge are all susceptible to mechanical damage caused by the elements such as falling ice or other. Valve metals can be brittle and easily broken by ice falling off rooftops. Fuel lines are usually made of copper, which is a relatively soft metal susceptible to puncture and rupture. Care in protecting the valve, fuel line and gauge should be taken by installing adequate protection or using materials that are less susceptible to damage such as brass valves and larger steel fuel lines.

CORROSION

Corrosion induced tank failure is the most common cause of leaking. A corrosive sludge, which often contains significant concentrations of dissolved salts and is acidic, can develop at the inside bottom of oil tanks by the condensation and accumulation of atmospheric moisture. Since the majority of oil storage tanks are fabricated from rolled carbon steel, they are therefore susceptible to both short-term and long-term corrosion from both the inside out and outside in.

- **Short-term corrosion**

Short-term corrosion can induce new tank failure in as little as 8 months. In order to minimize corrosion, water and sludge that accumulates at the bottom of tanks must be eliminated. Since water can be transferred from the old tank to the new one during installation, only 'fresh' or new oil should be used to fill the new tank and the old oil should be disposed of according the regulated practices.

- **Long-term corrosion**

Water can also accumulate as a result of condensation. Exterior tanks are particularly susceptible to this type of water infiltration due to variance and extremes in exterior temperatures. It is therefore important to make sure that the tank is kept full during the summer months in order to will minimize condensation. Another cause of water accumulation is a direct result of broken gauges or missing fill and vent pipe caps. Unavoidably, water will find a way to infiltrate a tank; therefore it is necessary to eliminate any water accumulation. Using a bottom outlet tank instead of the traditional side outlet tank sloped ¼" per foot will help prevent the accumulation of water by allowing it to be vaporized by the burner along with the oil during the combustion process.

Fuel Delivery Issues

There have also been a number of spills into household basements caused by miscommunication with the fuel supplier. Often fuel has been delivered via a fill pipe that was no longer connected to a basement tank. It is therefore important to not only remove the tank from the premises, but also remove any ancillary components such as the fill and vent pipe to prevent such occurrences.

Indications of Failure

Evidence of a band of corrosion along the very bottom of the exterior of a steel fuel oil storage tank is a characteristic signature of the presence of water and or corrosive sludge. In many cases, there is severe corrosion and many corrosion pits within this band. In all cases of corrosion induced failure, oil leaks through one or more of the pits located within this band.

Some tanks exhibit a lengthwise line of discolouration (often rusty) at the very bottom of the tanks. There is a direct correlation between fuel storage tanks that exhibit this line and tanks that have failed. In addition to this discolouration, bottom inspections sometimes reveal wet spots or weeps, which indicate that the tank has already begun to fail.

While corrosion failures are caused by corrosion from the inside of the tank, excessive clutter under the tank can result in the tank bottom retaining moisture and corroding from the outside.

CONSIDERING THE LOCATION

The condition of a tank will vary depending on its location.

- **Outdoor tanks**

Outdoor tanks that are not protected from the elements will deteriorate at a more rapid rate than indoor tanks as condensation is more likely to occur within an outdoor tank. The rupture of fuel lines caused by the impact of weather related conditions, such as ice or snow falling from the roof, is also a common cause continuing or sudden catastrophic leaks. In some cases the leak may remain unnoticed by the homeowner for days or weeks during the cold winter months.

- **Indoor tanks**

Indoor tanks, being less susceptible to the elements, tend to remain in better condition for longer periods of time. Although water can accumulate due to faulty or improperly installed fill and vent components, condensation is less prevalent due to a more constant ambient air temperature found in basements. Likewise, if a leak should develop, the homeowner is more likely to notice the distinctive odour of oil and take appropriate action.

- **Underground tanks**

Underground tanks are out of site and usually out of mind. A new property owner may not be aware of the presence of an unused oil tank buried on the property, however if oil leaches into the soil, the owner is still ultimately responsible. As they cannot be easily inspected, they may leak their content for years before anyone notices and therefore resulting in greater soil and or water table contamination. In many jurisdictions, underground oil storage tanks for domestic use are no longer allowed to be installed. Furthermore, in many cases, the tank must be removed by a qualified professional if it is no longer in use.

Oil Spill Prevention

It is only in recent years that Provinces who have suffered the greater number of losses have introduced legislation governing the installation and replacement of domestic fuel oil storage tanks. Newfoundland, for example, maintains a province wide database of new installation with a view to mandate replacement when the tank has reached its life expectancy in accordance with legislative requirements. There have also been efforts on the part of other levels of government as well as interested parties such as environmental groups and the insurance industry.

The Canadian Standards Association (CSA)

In Canada, domestic fuel oil systems must be installed and maintained according to the Canadian Standards Association B139 *Installation code for oil-burning equipment.*

This standard governs all aboveground tanks that have a maximum individual capacity of 2500 L (550 gal) and a maximum aggregate capacity of 5000 L (1100 gal), and the piping and tubing systems from the tanks to the oil-fired appliance. Fuel oil tank installations of any size underground, and aboveground installations over 2500 L (550 gal), are covered by the National Fire Code of Canada (NFCC) and the CCME Environmental Code.

Tank installations and replacement may also be governed by the requirements of the authority having jurisdiction such as the Technical Standards & Safety Authority (TSSA) in Ontario.

The Inspection Process

Routine inspection of large oil tanks (> 5000 L) is a requirement in the petroleum industry. Because of this, there are various inspection methods that range from visual inspection to pressure testing, magnetic flux leakage measurements; radiography and ultrasonic examination are utilized. However, most of these methods are either not practical or cost effective for domestic fuel oil storage tanks. A complete and thorough visual inspection of the tank and installed components remains the best method to identify potential failure if performed routinely by a qualified inspector.

CONCLUSION

Domestic fuel oil spills remain a significant problem. However, public education and the implementation of a proper inspection protocol would have a positive impact on identifying and improving the current situation.

Additional reading

Canadian Standards Association – www.csa.ca
TSSA – (Public Safety and Consumer Information) www.tssa.org
Canadian Oil Heat Association – www.coha.ca
Government of Newfoundland and Labrador (search words “oil tanks”) – www.gov.nf.ca
Government of Nova Scotia (search words “oil tanks”) – www.gov.ns.ca

Insurance Business Services
90 Allstate Parkway
Markham, Ontario L3R 6H3

For additional copies please contact: Janice Tonelli-Breen
Toll Free: 1-800-268-8080
Fax: 905-474-1567
E-mail: janice.tonelli-breen@cgi.com