RESEARCH REPORT

External Research Program

Testing of Domestic Oil Tanks

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TESTING OF DOMESTIC OIL TANKS

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October 1998

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Testing of Domestic Oil Tanks

By

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PURPOSE

The scope and objective of the research covered by this report is to develop a practical, efficient and economical method of determining the condition and projected remaining life of operational above ground domestic oil tanks.

ACKNOWLEDGEMENTS

The writer would like to acknowledge the assistance and support of Mr. Richard Hale, P. Eng. of Professional Project Engineering Limited in Halifax. Mr. Hale's help with research and in the testing of tanks is much appreciated.

EXECUTIVE SUMMARY

This report covers a research project to attempt to find a method to test domestic fuel oil tanks for potential leaks and suitability for future service. After an introductory statement the first section offers a description of the construction of the type of tank under study, an explanation of the failure mode addressed as well as some assumptions concerning the tests investigated. The next section explores inspection techniques currently practised by various organisations. The final section examines a number of potential test methods.

RÉSUMÉ

Le présent rapport traite d'un projet de recherche visant à tenter de trouver un moyen de procéder à des tests d'étanchéité sur des réservoirs à mazout domestiques, afin de vérifier s'ils peuvent encore servir. Dans la première section qui suit l'introduction, on décrit la construction du type de réservoir à l'étude, on explique le mode de défaillance et on aborde certaines hypothèses au sujet des tests examinés. Dans la section suivante, on se penche sur les techniques d'inspection appliquées actuellement par divers organismes. Dans la dernière section, on examine plusieurs méthodes d'essai possibles.

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1.0 INTRODUCTION

There are hundreds of thousands of steel tanks storing home heating oil, indoors and out, above ground and below, currently in use in Canada. In the Atlantic provinces, because of the region's high reliance on oil for space heating and hot water generation, the proportion of tank usage is much higher than the rest of the country. Over a period of time tanks deteriorate, generally due to interior corrosion. There are currently few guidelines or methodologies to test the soundness of tanks that are in service. The first indication of a defective tank, sometimes with disastrous results, is a petroleum leak.

2.0 TANK FAILURE MODE AND RESEARCH GUIDELINES

2.1 Tank Failure Mode

Home heating oil tanks are almost always fabricated of plain carbon steel based on Underwriter's Laboratories of Canada Standard S-602[i]. The most common type of tank in the Atlantic Provinces is above ground and obround (rectangular except that the two shorter sides are rounded) in cross section, with nominal dimensions of 690mm wide, 1270mm high and 1550mm lengthways and a nominal metal thickness of 1.5mm to 2.0mm. Four threaded brackets are welded to the bottom of the tank for placing of 300mm long by 42.2 mm outside diameter pipe, leg supports. Capacities are 700 to 1200 litres.

After a period of time in service domestic heating oil tanks start to corrode, usually from the inside. Corrosion of this kind is an electrochemical process whereby metals progressively lose the atoms of their base elements, in the presence of a suitable electrical conductor, to areas of a different electrical potential[ii]. Corrosion cells are set up within the tank - regions of higher potential, called anodes, lose their iron atoms to regions of lower potential, called cathodes. Water, sediments and other contaminants act as the electrical conductor or electrolyte. Water in tanks installed outside above ground can enter the oil from condensation as temperatures change, particularly when the tanks are not kept filled; or from leaking fill and vent pipes. Sometimes water and sludge is carried into the tank with the fuel itself due to improper handling at bulk terminals or in transport. This water combines with sulphur or other components to become acidic and corrosive[iii]. Dissimilar metals (copper piping verses steel tank for example or rust particles from an old tank pumped into a new tank) can initiate corrosion cells, as can metallurgy differences at the heat-affected zone of welds. Although less common, tanks can corrode on the outside. An example is a tank sitting directly on the ground or one where water, ice or snow are trapped under the tank. In this instance areas with lower oxygen concentrations become anodic and areas with higher oxygen concentrations become cathodic leading to corrosion.

2.2 Research Guidelines and Focus

The purpose of the research covered by this report is to attempt to find a method to test operational domestic oil tanks. Since internal and unseen corrosion is the major cause of tank leakage, this failure mode is the main focus of the report. The problem of associated heating system piping or fitting leaks was not addressed.

While several potential procedures were considered, certain criteria were taken into account when judging inspection methods. The technique had to be practical and relatively inexpensive. While not necessarily a limiting factor, the cost of a new replacement tank including installation is in the order of five hundred dollars. As well the inspection process had to be non-intrusive. For potential liability reasons there could be no additional stress or strain put on the tank under test. Because of the sometimes hazardous condition of an existing tank and its consequent inability to hold its contents, no methods involving external or internal pressure /vacuum were investigated. Similarly any methodology that necessitated undue scraping, grinding or filing was dismissed.

3.0 EXPLORATION OF EXISTING TEST METHODS

3.1 Discussions with Government Personnel

A number of provinces were approached to determine regional regulations in place covering the inspection of home heating oil tanks. Questionnaires were sent indicating that a study on methods to test 900-1200 litre domestic tanks for leaks was being conducted and information on provincial codes or guidelines would be appreciated.

None of the provinces appear to have developed specific regulations pertaining to management of small above ground domestic fuel oil tanks. Installations and inspections are based on CSA Standard B139[iv]. The brief section covering inspection in this code simply states: "inspect the fuel oil tank and lines for leaks and repair if required". All provinces have regulations covering the handling of petroleum products stored in tanks larger than those used for home heating oil. Tanks smaller than 4000 litres and those above ground are specifically exempted from such regulations.

Because of their reliance on other forms of energy, such as natural gas, the Western and Central Provinces are not particularly concerned with home oil tanks. For example an official in the Pollution Prevention section of the British Columbia Ministry of Environment stated that there are only about 10,000 tanks still in use in the province, installed in the 1950's and 1960's, and most are underground. He indicated that problems are minimal and have been declining over time as more areas are converted to natural gas.

In the State of New York, 54 percent of spills reported to the spill hot line relate to residential oil tanks, both underground and above ground[v]. Testing to determine if the tank is leaking is required only for underground tanks. Tanks that are above ground are exempt from testing.

The Atlantic Provinces, due to their reliance on oil for heating and hot water generation, are very concerned with domestic fuel system management. In the Maritimes there are more than 300,000 small heating oil tanks installed in people's basements or outdoors beside a building? The estimated 30,000 tanks in Prince Edward Island alone can be contrasted to the 10,000 in British Columbia. Fifty percent of Maritimers rely entirely on ground water for their drinking water: 100 percent in Prince Edward Island 65 percent in New Brunswick and 45 percent in Nova Scotia[vi].

All three Maritime Provinces have produced homeowner's guidelines covering various aspects of heating systems. Two of these brochures from New Brunswick and Prince Edward Island detailing Oil Tank Safety are included in this report as Appendix A. It is noted that the guidelines focus on installation details. Inspection receives minimal attention. Both brochures suggest that a water-finding paste be used to determine if a tank contains water and that exterior rust is controlled with regular touch up painting. Mention is made in one of the publications of water in a tank causing corrosion and subsequently a black area on the exterior of the tank. This phenomenon was discussed with a tank installation contractor and is commented upon elsewhere in the report.

3.2 Discussions with Insurance and Banking Personnel

Several insurance companies were contacted to determine requirements if any, for inspection of oil tanks prior to issuance or renewal of homeowners coverage. Leaking oil tanks are a serious and costly problem for the insurance industry. Officials provided general details of costs and numbers of incidents. It was suggested that expenditures for an average incident are approximately twenty thousand dollars and that occurrences have increased dramatically over the last number of years. One company indicated that the number of claims had increased in 1997 by a factor of ten over the average of previous years. The reasons cited for this growth ranged from the age of the tanks (thirty some years based on a housing construction boom in the nineteen sixties), inferior steel (recycled), lack of adherence to fabrication standards (steel below minimum specified thickness) to contaminants in fuel oil (offshore supply containing sulphur).

Some insurers specifically exclude, whether homeowner or third party, all oil pollution costs from their coverage. Others limit protection in some way, for example only leakage within the dwelling's "concrete envelope", that is from basement floor up, is covered. If oil spill protection is included in the insurance package, in an attempt to reduce company liability, firms ask the homeowner to complete an "Oil Storage Tank Report" (copy attached as Appendix B). One of the items limiting insurance and the major determining factor dictating tank replacement is the age or estimated age of the tank. A tank is assumed to have reached the end of its service life after fifteen to twenty years and must be replaced after that period for continued insurance protection. Other than the visual inspections outlined no other examination methods are specified.

Banking industry personnel contacted in Nova Scotia, rely on building appraisers to evaluate properties. These individuals set a market value on the home, noting any possible problem areas such as oil system deficiencies. The potential owner would then be responsible for obtaining the services of a home inspector, usually a professional engineer, architect or technologist, to provide a detailed assessment for mortgage purposes. These home inspectors base judgements concerning oil tanks on considerations similar to those detailed in the "Oil Storage Tank Report" mentioned in the previous paragraph. No specific inspection techniques have been identified. "As is common to most investigative techniques, the ability to identify indications of contamination or the potential for contamination lays as much in keen observational skills as in technical competency."[v]

3.3 Discussions with Contractors and Installers

Two system installation contractors were contacted to obtain comments regarding heating oil tanks. Conversations confirmed that almost all tanks failed in the bottom area and the majority of failures were due to internal corrosion. If there was external corrosion it was because the tank was resting on the ground or installed in such a way that water was trapped adjacent to the tank, for example as ice or by vegetation.

For tanks taken out of service to be accepted for disposal by the local authority (Municipality of Halifax) they must be cut in two pieces and cleaned of sludge or residue. Thanks to one of the contractors and this disposal method, the opportunity was afforded to examine the interior and exterior of tanks as well as allowing for the application of various test procedures.

Both of the contractors stated that there was almost always a black sludge in the bottom of a used tank when taken out of service. This sludge is noted when the tank is first cut open. In the tanks inspected under this report it was located in what seemed to be random patches of varying sizes over the tank bottom. The evidence of sludge is not necessarily an indication of underlying corrosion. Once the soft residue is removed, with a cloth for example, there is not necessarily erosion beneath.

The attached series of photographs (Figures 1 through 5) illustrate the process of cutting a tank as well as typical sludge build-up and representative types of defects.

Other than a visual inspection, neither of the contractors use or could suggest a method of testing an operational oil tank. One was asked about the "black spot" on the exterior of a tank mentioned in a Provincial Government publication as an indication of a potential leak and referred to previously in this report. He stated that sometimes on particularly old tanks the steel has deteriorated to such an extent that the interior sludge is actually visible through the outside tank wall and this sludge is in itself keeping the contents from leaking out. A metallurgist was approached to determine if such an occurrence was possible or had been observed in his experience. While he had tested a number of relatively new oil tanks as part of insurance claims he has never observed the condition. He did indicate that he had seen a similar black spot in a thinned area during the recent testing of a used oil pan from a truck engine. He acknowledged that it was thus also likely to be likely in the case of a home oil tank. The phenomenon was never observed as part of this research project.

A local Halifax area inspection company listed in the telephone book under "Tank Testing" was contacted and asked to carry out an inspection on an operational heating oil tank. This investigation was based on ultrasonic techniques and is covered under that heading elsewhere in the report.

In addition another contractor, who specialises in the construction and renovation of petroleum bulk plants and service stations, was contacted to elicit views on the testing of home heating oil tanks. Generally the test methods that this company employs involve the application of pressure or vacuum to a tank to determine leakage. Although such procedures were considered and are reported on elsewhere in this report, there is the possibility that they could apply undue stress and consequent damage and leakage to a suspect oil tank.

4.0 ANALYSIS OF TEST METHODS

4.1 General

The following is an account of the evaluation of various test procedures. While it was quickly apparent that certain techniques were not applicable to the testing of home oil tanks these techniques have nevertheless been listed so that the reasoning behind their non-suitability is recorded. A discussion on relative costs for some of the test methods is also included.

4.2 Dye-Penetrant Examination

In this inspection method a liquid dye is applied to the surface of the material being tested. The liquid is drawn into cavities in the object by capillary action. When the surface of the material is then wiped clean a small quantity of liquid re-emerges to become visible, indicating a crack or other flaw. The technique does not give any indication of the depth of the crack. The surface to be tested must be free of corrosion. For these reasons and the fact that internal rather than surface corrosion is the principal cause of domestic tank failures, an external test method such as dye penetrant was not considered appropriate.

4.3 Magnetic Particle and Magnetic Flux Leakage Examinations

A magnetic particle examination is used to detect surface flaws in materials that can be magnetised, such as regular carbon steel used in the manufacture of most home heating oil tanks. The technique involves magnetising the piece to be examined. Flaws on the surface of the material cause discontinuities in the magnetic force lines created by this magnetism. Applying fine magnetic particles, either in a liquid or by air to the surface reveals the discontinuities. Magnetic flux leakage techniques are somewhat similar except that an electronic sensor detects the discontinuities.

Again, as in the case of dye-penetrant inspections - magnetic particle and magnetic flux leakage examinations require clean surfaces and can only generally pick up surface defects. Both methods are qualitative and no reliable quantitative indications of defects are possible. There are also the difficulties of physical access to the bottom of a tank, commonly installed against a wall on legs less than 150cm above the supporting ground or basement floor. As well, there is the impossibility, due to the technique, of examinations of the area where the ends meet the shell of the tank. For these reasons magnetic particle and magnetic flux leakage inspections were not considered practical test methods.

4.4 Video Inspection

Another method that that was considered was the use of video to inspect the interior of a tank. Access would be gained through an existing top opening after removing fittings or piping as necessary. To eliminate the need for intrinsically safe or explosion proof equipment within the tank, it was proposed to use a fiberscope rather than a miniature camera. The fiberscope would be articulated to allow viewing in all directions and have an integrated light source. Such an inspection would present a video image indicating that there was a defect. To assess the severity of the defect an additional test method would be necessary.

As noted previously, upon inspecting the interior of tanks taken out of service, there is a black sludge covering areas of the bottom. Without removal of this residue it would be impossible to view and appraise the condition of the bare metal of the tank interior. A video investigation was consequently felt to be an unrealistic inspection method.

4.5 Pressure Testing

As part of Underwriters Laboratories of Canada fabricating standard for new above ground steel tanks for domestic fuel oil, S602-M92, a production air test is obligatory. After the application and maintenance of a low internal air pressure, all welded seams, fittings, joints as well as the shell surface itself are examined externally by applying a liquid soap type solution. Resulting bubbles indicate a defect.

Tanks larger than home heating oil tanks can be tested using hydrostatic or pneumatic pressure. After the initial erection or major repair of a tank at a petroleum refinery or bulk storage terminal it is filled with water. The height of water in the tank acts to apply pressure or a hydraulic head to the tank shell and bottom. No resulting loss of water or no visible leaks during a specified test period demonstrates the integrity of the tank and its suitability for future use.

Sometimes, although less common nowadays, service station tanks are tested in a similar manner. The contents of the tank are used as a test fluid and over a period of time accurate measurements are recorded to determine any volumetric change, which would indicate a leak.

The concern in utilising a pressure, or for that matter a vacuum test, when inspecting an existing operational home heating oil tank, lies in disturbing what already may be a near leak situation. Tanks are often in very poor condition but not leaking. The additional strain of cleaning and a pressure test could possibly cause a rupture to an empty and cleaned tank, or loss of product and a spill to a tank containing fuel. In both cases the liability would rest with the tester.

4.6 Radiography

The principal of radiographic inspection is based on the ability of X-rays or gamma rays to pass through certain solid materials. As these rays penetrate steel for instance, the intensity of radiation lessens, this reduction is dependent on the density and thickness of the substance. A flaw can have the effect of tending to decrease the thickness of the material. Hence when a flawed test piece is positioned between a radiation source and a photographic film the exposed film will record the three-dimensional flaw as a two-dimensional silhouette.

Radiographic testing does not give a reliable indication of the depth of the defect and is highly dependent on the orientations of the flaw, as well as the radiation source and photographic film. The intensity and energy of radiation sources used for the inspection of steel pipelines and pressure vessels is much higher than that used for medical X-rays or airport security devices. Severe disability or death can result from exposure to this radiation. For these reasons radiographic testing is of questionable practicability when consideration is given to testing domestic fuel oil tanks. It may be possible to design or modify equipment to overcome the noted limitations and this should be explored further with a manufacturer.

4.7 Acoustical Test Methods

Some times underground service station tanks are tested using sensitive listening devices to detect the sound of water or air entering the tank through a hole. In this procedure the tank is placed under a slight vacuum and the listening instrument inserted into the tank through an opening. Another type of test used to test pressure vessels is called acoustic emission. Here a flaw in a tank under a varying pressure test may emit sonic impulses due to the release of strain energy. For a number of reasons - intrusive nature, not quantitative results, equipment expense - neither of these techniques were considered for the testing of home oil tanks.

4.8 Ultrasonic Examination

The technique of ultrasonic investigation is based upon the principle of introducing high frequency sound or ultrasonic waves into a material. These waves are reflected by various interfaces in the substance and subsequently analysed by electronic means, to permit a representation of the interior of the material. In the case of a steel plate the reflected wave analysis is used to detect the thickness or the existence and location of flaws. The technique is widely used in petro-chemical industries to inspect operating piping, pumps and pressure vessels. It allows for the calculation of interior corrosion and/or erosion and the resultant evaluation of suitability for continued use of the equipment. Because of this experience it was felt that ultrasonics might prove to be a method that could be adapted to the testing of home heating oil tanks.

As was mentioned previously a local company was contacted and asked to carry out an inspection of an operational oil tank. This firm employed two types of ultrasonic instruments for determining the condition of a tank. One was a spot tester and the other a scanning type. The spot tester was used to determine typical metal thickness at various locations on the shell. The other instrument, with a wheeled head approximately 10cm by 15cm, was used to scan sections of the tank shell to identify any changes in thickness. It was noted also that the scanning head was of such a configuration and size that it could not be used to inspect under the tank, which was mounted on short legs approximately 15cm above the ground. The tank under test was relatively new and free of any corrosion and no thin or rusted areas were identified.

To determine the effectiveness and practicality of ultrasound testing, contact was made with a number of suppliers of equipment and the requirements for the proposed testing of domestic oil tanks presented. Based on their input one manufacturer [vii] was selected and arrangements made to lease apparatus for test purposes. Two tanks that had been taken out of service due to leaks were used for testing; one had been installed inside and one outside. They were cut in half and cleaned of sludge. Figures 6 through 11 detail the procedures employed in the evaluation of ultrasonic inspection. It should be pointed out that the individuals who carried out the testing were not experienced ultrasonic equipment operators. The aim was to demonstrate the process of ultrasonic testing so that meaningful questions could be directed to appropriate individuals.

The first step was to determine the exact location of leaks using a hydrostatic tank test. Any openings were plugged; the tank halves filled with water and areas of seepage or drips noted (Figures 6 and 7). After emptying the tanks the ultrasonic instrument was used to try to detect and evaluate the defective areas.

Something ought to be said about the operation of the particular ultrasonic instrument employed for the testing. It consisted of a hand held electronic readout attached by a wire to a transducer held against the surface. This arrangement can been seen in Figure 8. The transducer transmits and receives back the sonic pulses. The requirement that the transducer be positioned under an operating tank meant the one provided by the supplier was relatively small. Because the strength of ultrasonic waves passing through air is greatly decreased a "couplant" is required between the transducer and oil tank to effectively eliminate the air gap. Couplants are usually viscous liquids or greases that fill the surface voids. The layer of couplant must be maintained relatively thin; accordingly moderate pressure has to be applied to the transducer as readings are taken. Once an examination is complete the couplant can be wiped off the inspected surface with a cloth.

Without cleaning the exterior of the tank in any way the transducer and appropriate couplant were applied to the previously identified leaking areas. No readings could be obtained. The regions were then wire brushed to remove surface rust. Again there was no reading. It was only when emery paper was used to bring the surface down to bare metal that a thickness reading was achieved (Figure 9). The instrument however was not precise enough to identify interior pitting in the area where this reading was taken. As verification of this latter point a portion of the tank that was badly corroded inside (Figure 10) was identified and a grid set up on the exterior. Spot ultrasonic readings were then taken from the outside after the region had been cleaned. No definitive areas of pitting could be detected (Figure 11). As another experiment, tank exterior areas that were uncorroded and painted were ultrasonically tested. Sometimes a thickness reading could be obtained and sometimes not, apparently dependent on the thickness of paint and sensitivity of the instrument.

The ultrasonic equipment supplier was contacted to discuss the test results. He said that areas to be inspected must be free of corrosion and relatively flat. He suggested that perhaps a different transducer could diminish this smoothness requirement and also said that adjustments in instrument calibration could help in obtaining indications of internal pitting and readings through paint. However he indicated that no ultrasonic instrument could operate over corrosion. This latter point was confirmed in a subsequent conversation with an inspector of refinery tankage, experienced in ultrasonic testing methods.

Consideration was given to utilising transducers with other characteristics or calibrating the ultrasonic test instrument differently. However the fact remained that ultrasonic instruments were apparently not able to take readings through corrosion, as typically found on the bottom of a home oil tank after a period of use. The removal of the corrosion so that an examination could be made would require mechanical scraping, sanding or grinding and consequent concern of damaging a suspect tank. Perhaps further study could be undertaken with the assistance of an ultrasonic test instrument manufacturer to attempt to find a workable device. The scope of this research project however does not include for such additional exploration.

4.9 COSTS

While not studied in great detail, the relative costs to carry out various types of tests were considered. To be viable the ideal test method would involve a minimum amount of time to perform as well as a modest equipment capital cost outlay. To eliminate time and costs required to dismantle piping or remove tank fittings for internal access, the inspection should be from the outside and be able to be accomplished by one technician.

Based on the experience with ultrasonic examinations outlined above and assuming that a practical method could be developed, it is estimated that one hour would be needed for a test by a single individual. A radiography type examination would be similar. The cost of this latter equipment however is approximately ten times that of an ultrasonic unit.

Any test method that involved the removal of piping, fittings or tank cleaning such as video, pressure or vacuum would take at least twice as much time and most probably require two people. Such an inspection would approach the five hundred dollar expense of a new tank.

5.0 SUMMARY

A number of stakeholders: government agencies, insurance and banking personnel, contractors as well as installers, were approached to determine what type of testing was being utilised to determine the condition and projected life of in-service home oil tanks. Other than general non-specific visual inspections no special examination procedures were identified as being mandated or employed by these groups.

Seven test methods were examined and evaluated as potential techniques that could be applied to the inspection of operating tanks. Based on current technology none were found to be suitable. Two procedures, ultrasonic testing and low intensity radiology, warrant further study in conjunction with equipment manufacturers.

One matter arose during work associated with the research that was not included in the scope of the project but nevertheless because of its importance would justify more investigation. What are the roles of residual sludge and water in a tank? Should they be removed to prolong tank life? Can the residue be tested for corrosion causing contaminants? Can a protective coating be applied during tank fabrication that would limit interior corrosion?

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[i] "Standard for Above Ground Steel Tanks for Fuel Oil and Lubricating Oil, CAN/ULC-602-M92", Underwriters Laboratories of Canada

[ii] "Corrosion Fundamentals of Tank Shells", Charles Henderson ,Corrosion Service Company Ltd., Proceedings of the Above Ground Fuel Oil Storage Systems Workshop, North River PEI, September 1994

[iii] "Leaky Oil Tanks", D. J. Friedman, ASHI Technical Journal, Vol.2 No.1, Winter 1992

[iv] "Installation Code for Oil Burning Equipment, CAN/CSA-B139-M91", Canadian Standards Association

[v] "A Primer on Petroleum Bulk Storage Tanks and Petroleum Contamination of Property", Paul H. Ciminello, ASHI Technical Journal, Vol.3 No.1, Spring 1993

[vi] "Identification of Implication Issues", Mark Victor, PEI Department of Environmental Resources, Proceedings of the Above Ground Fuel Oil Storage Systems Workshop, North River PEI, September 1994

[vii] Nova Eclipse TG-2, Hand Held Ultrasonic Thickness Gage as manufactured by NDT Systems Inc, Huntington Beach CA

Figure 1 – Cutting a Domestic Oil Tank in Half Prior to Disposal

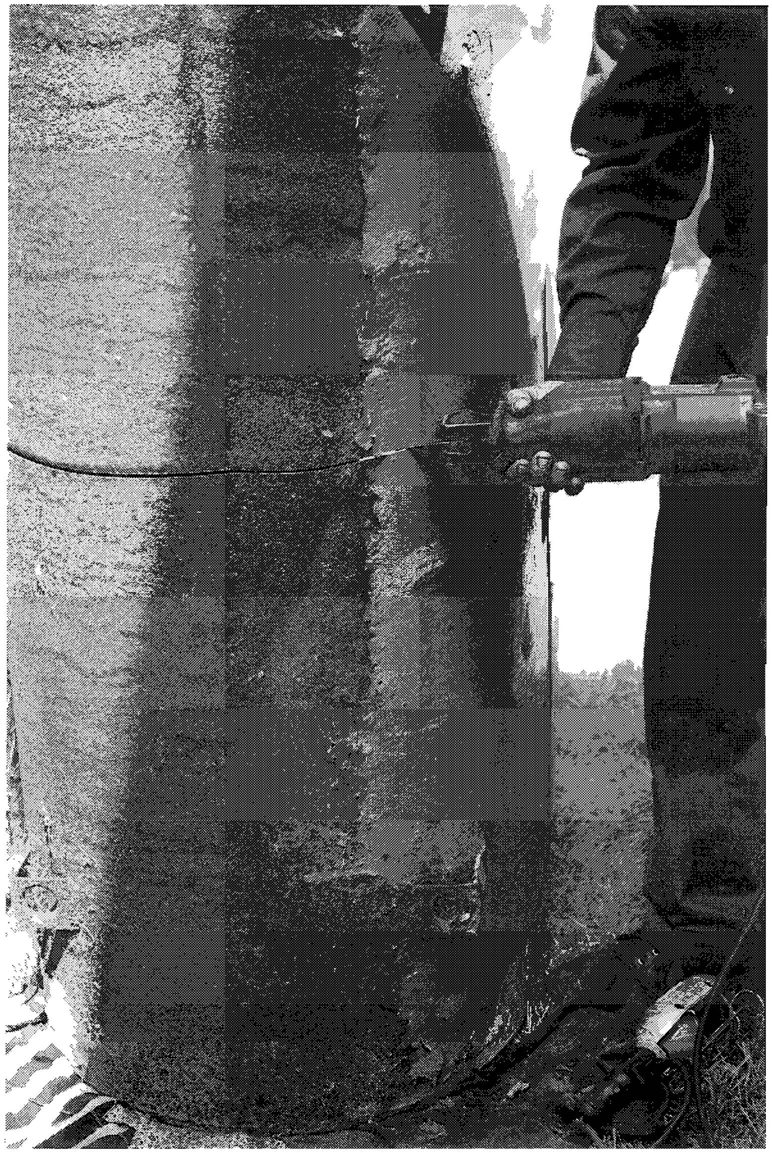


Figure 2 – Two Halves of Tank Prior to Disposal

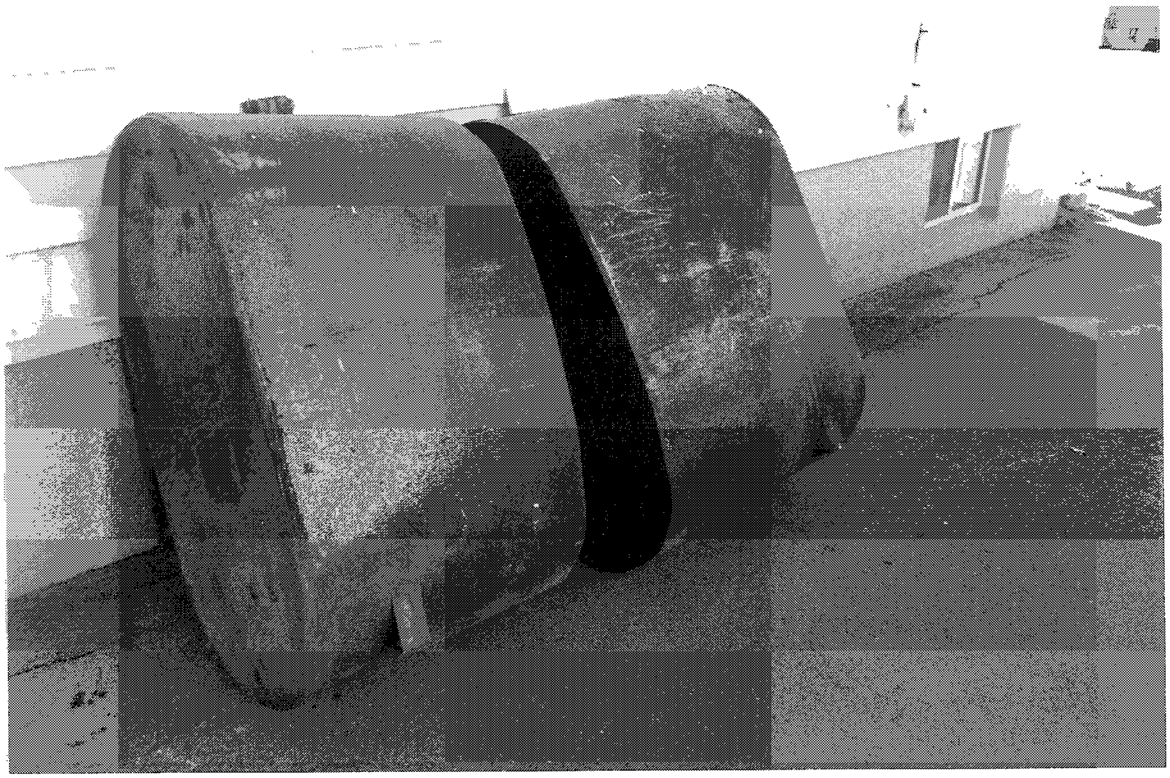


Figure 3 – Typical Interior Sludge Encountered Upon Taking A Tank Out of Service

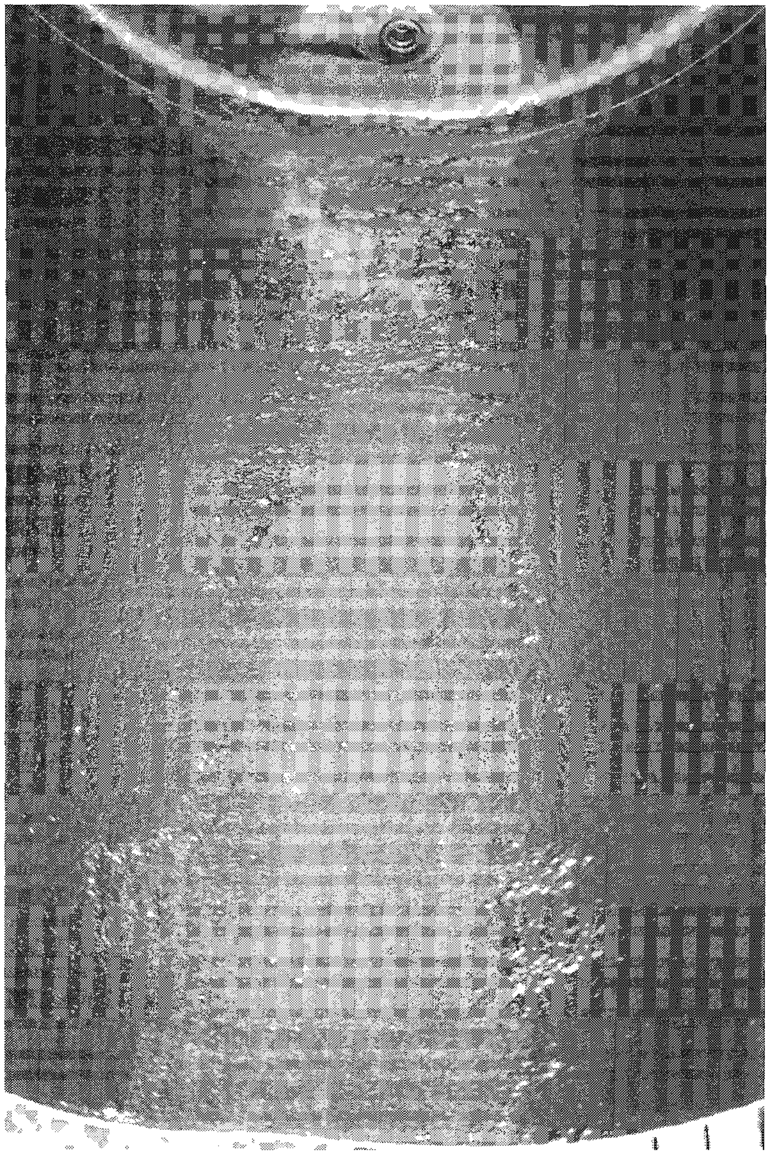


Figure 4 -- Typical Interior Corrosion

Figure 5 – Typical Exterior Corrosion

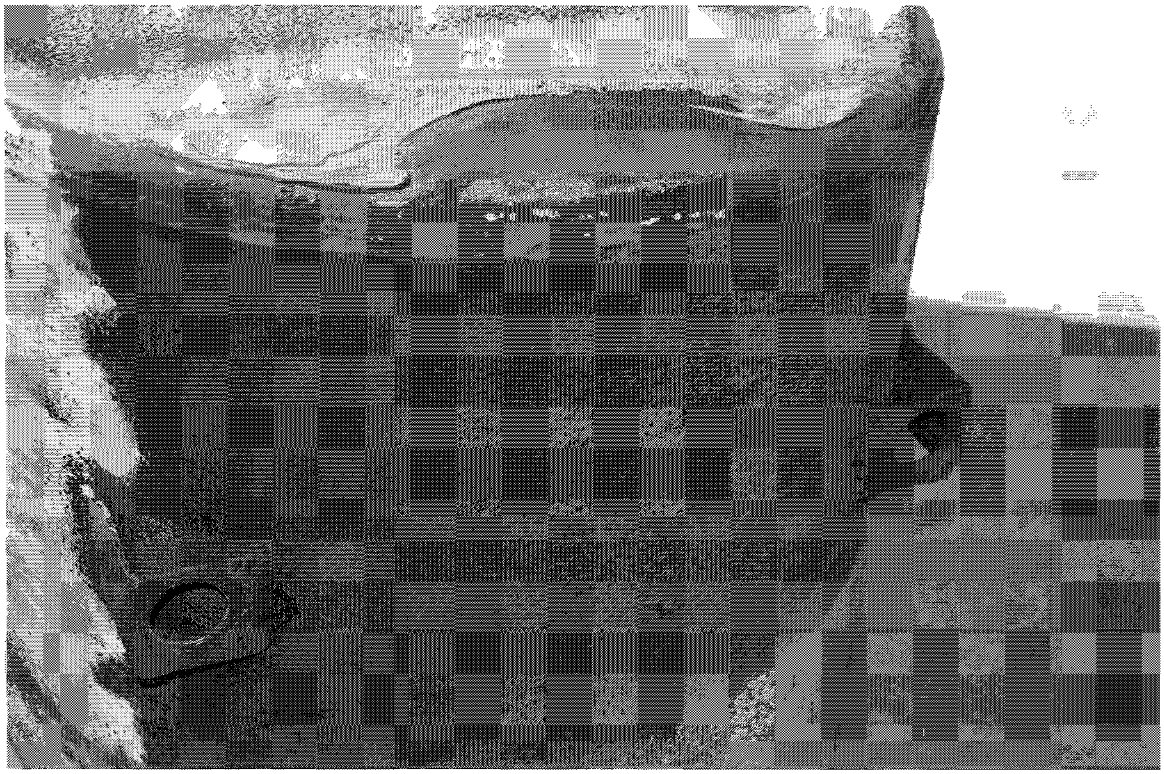


Figure 6 -- Hydrostatic Test of Tank Half to Determine Leak Location

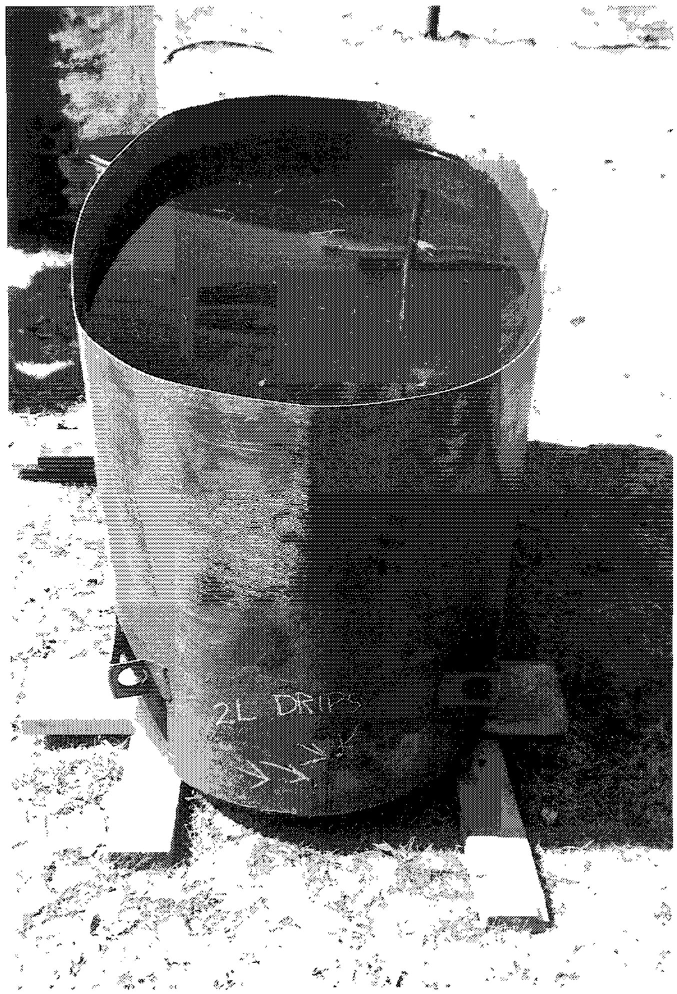


Figure 7 – Location of Leaks (Due To Internal Corrosion)

Figure 8 – Ultrasonic Test Instrument

Figure 9 – Leak Areas after Cleaning with Emery Paper

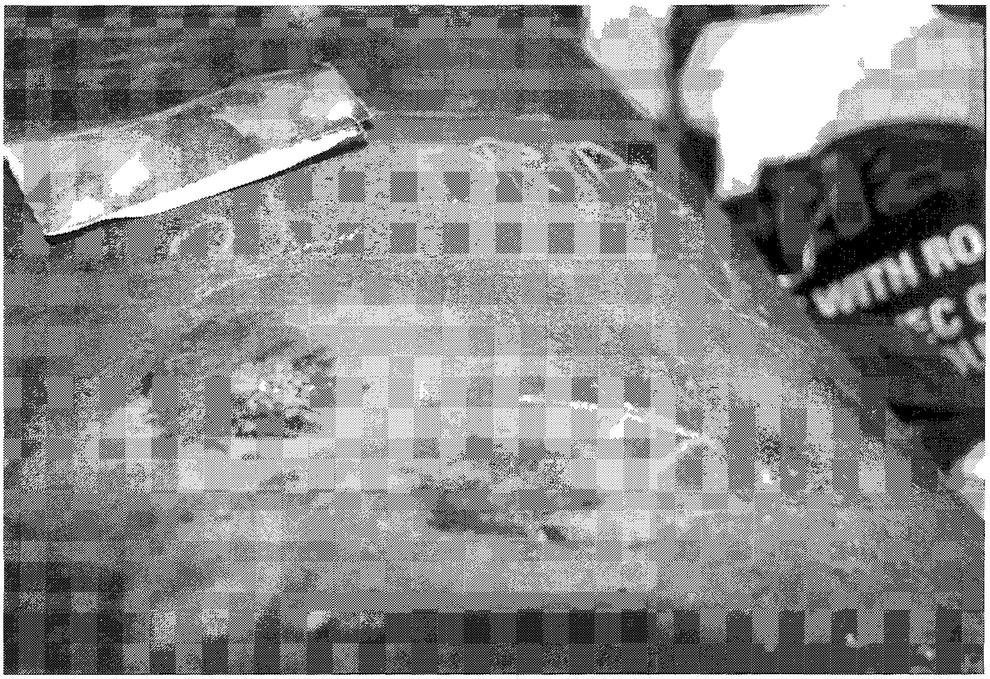


Figure 10 – Interior Corroded Area

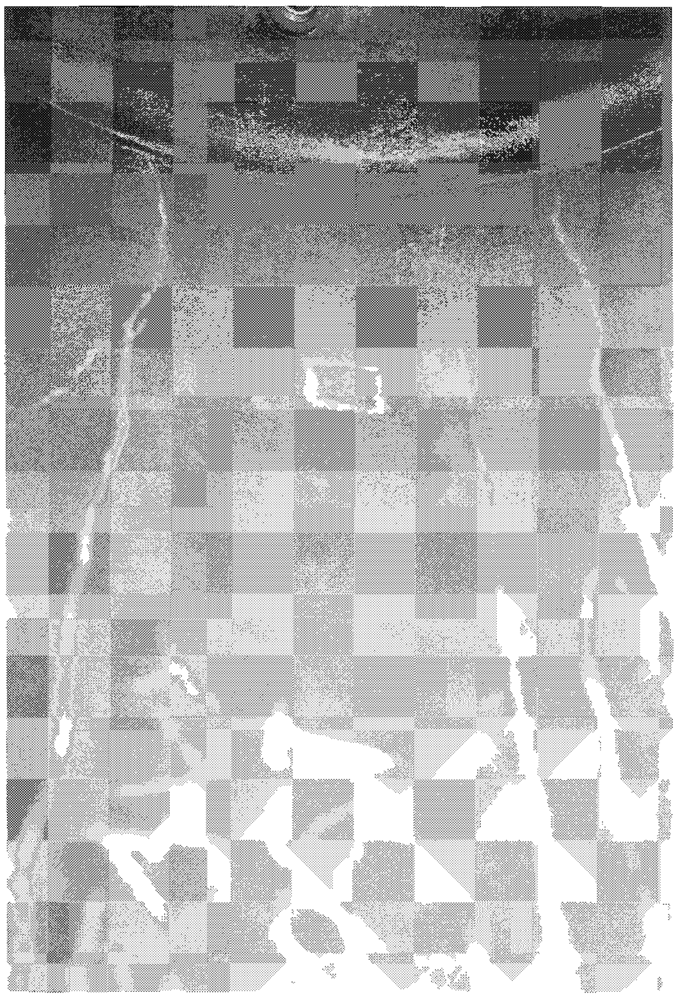
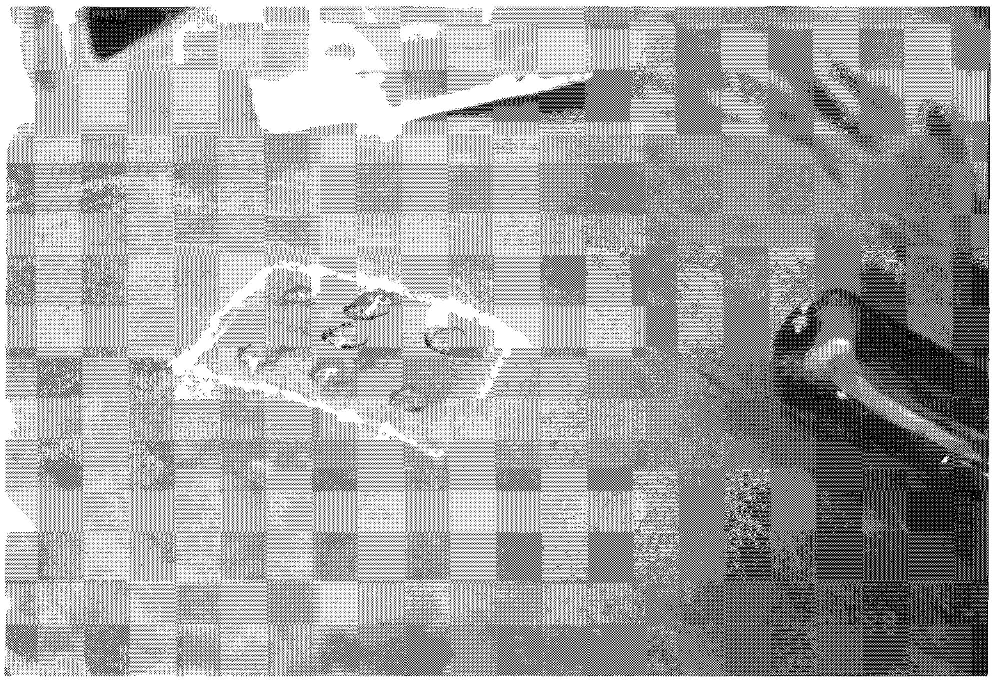


Figure 11 – Exterior of Area Shown in Figure 10 Showing Test Grid Set-up (Note Couplant Application)



APPENDIX A

A Homeowner's Guide to Oil Tank Safety
Environmental Protection Division
P.E I Department of Environmental Resources

A Homeowner's Guide to Oil Tank Safety
New Brunswick Environment

APPENDIX B

Oil Storage Tank Report

A Homeowner's Guide to

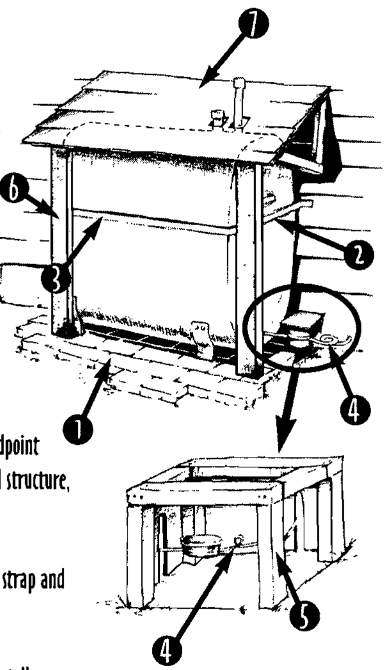
Oil Tank Safety

New Brunswick
Nouveau-Brunswick
ENVIRONMENT

Your Environmental Trust Fund at Work!

Installing Your Tank

Whether you put your tank inside or outside your home, you will need to support the tank to prevent it from shifting, settling or falling over.



- Prepare a non-flammable base (concrete block, poured concrete or patio block) for the tank to sit on. Another reason to avoid constructing a wooden base, is that wood can contract and hold water, which can contribute to the rusting process.
- Wrap a metal strap around the midpoint of the tank and attach it to a solid structure, like wall studs.
- Place a rubber gasket between the strap and tank to prevent corrosion
- Loop the burner supply line horizontally between the filter and the building to allow for frost heaving.
- Cover the supply line and filter to keep away snow, ice and any other objects, and to discourage vandalism. To construct a supply line cover use 50x50 mm (2x2 in) wood ano 12.5 mm (1/2 in) plywood. Make sure that the cover doesn't touch the supply line, and that it can be easily removed for inspection
- Protect the tank with a structure made of 12.5 to 19 mm (1/2 to 3/4 in) plywood and 50x100 mm (2x4) wood;
- Paint both covering structures to protect them from bad weather.

For more detailed information about required installation standards (CAN/CSA-B139) contact the Canadian Standards Association (CSA), 1-800-463-6727. Please note that the CSA charges a fee for copies of its standards.

Maintaining Your Tank

Careful inspections of your oil tank should become a part of your regular home maintenance program. Whatever the fuel level, it's smart to have a container on hand, in case your tank develops a leak during the inspection.

- Check for water in your oil tank every year by applying "water finding" paste to a clean stick and dipping it into the tank. This paste can usually be purchased at service stations or stores which carry petroleum products.

Note:
If water is causing corrosion, the outside bottom corner of the tank (near the supply line) will slowly turn black.

- From time to time, look for rust on the outside of the tank. After cleaning off the rusted area, apply a rust-proof paint.
- If your tank is installed outside, always remove any snow from under the tank after a storm, and clean off the covering structures so the snow doesn't get too heavy.
- Regularly check the covering structures and metal holding straps to make sure they're still in the right positions.
- If you are replacing your tank, and/or installing a more fuel efficient furnace, avoid using the old copper supply and return lines, unless they are in good condition. Older lines are often the source of leaks which can go unnoticed for long periods of time.
- When transferring oil from an old tank to a new one, take care not to transfer the sludge in the bottom of the old tank.

With the right information and a little common sense, you can ensure your home and the environment are better protected.

For additional copies of this brochure, contact the nearest regional office of the

Department of the Environment:

• **Bathurst**

275 Main Street
Harbour View Place
Bathurst, NB E2A 1A9
(506) 547-2092

• **Miramichi**

Williston House
296 Water Street
Miramichi, NB E1N 1B3
(506) 778-6032

• **Fredericton**

12 McGloin Street
P.O. Box 6000
Fredericton, NB E3A 5T6
(506) 444-5149

• **Moncton**

35 Runnymeade Drive
P.O Box 5001
Riverview, NB E1B 1C8
(506) 856-2374

• **Grand Falls**

385 Broadway Street
Godbout Bldg., 1st Floor
Grand Falls, NB E0J 1M0
(506) 473-7744

• **Saint John**

8 Castle Street
P.O. Box 5001
Saint John, NB E2L 4Y9
(506) 658-2558

Please Note:

Provincial environment departments across Canada are now reviewing installation standards for home oil tanks, and homeowners will be made aware of any new standards as they take effect

To report a fuel tank leak or spill,

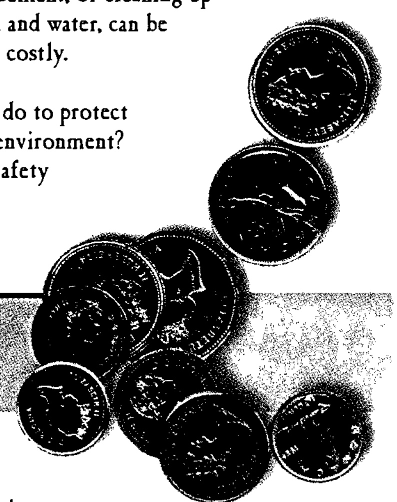
call (free of charge): 1-800-565-1633
(24 hour emergency service)

If you're like most people, you probably haven't given your oil tank a second thought since you bought it, except to have it filled with fuel. But you are also responsible for protecting yourself and your environment by purchasing the right tank, having it properly installed, and maintaining it.

Nearly 40 per cent of all oil spills reported to the New Brunswick Department of the Environment each year are from domestic oil tanks at private homes.

A leaking oil tank in your basement can become a serious fire and environmental hazard. Inside or outside your house, it can contaminate groundwater, affecting your well or other drinking water supplies near by. Trying to remove oil that has leaked or spilled in your basement, or cleaning up contaminated soil and water, can be difficult and very costly.

So, what can you do to protect yourself and the environment? Start with these safety guidelines:



Purchasing Your Tank

First, look for the approval label on top of your tank which gives the date it was manufactured, and indicates that it meets construction standards, such as the National Standard of Canada CAN4-S602-M81.

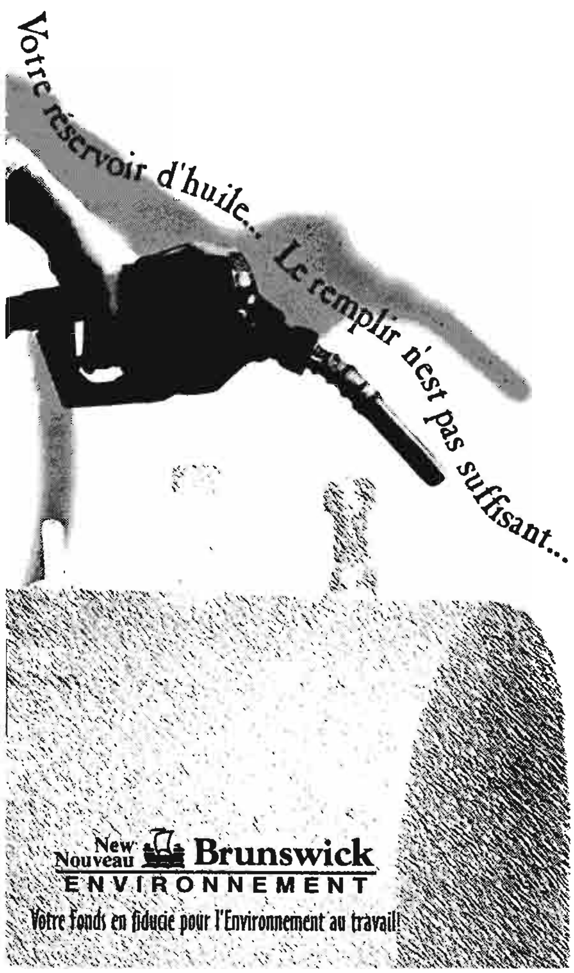
Be sure to check that all piping (supply lines, fill, and vent) is made of metal. Plastic piping is not acceptable.

Newer tank models are now available with a plastic inner liner, installed by the manufacturer and designed to keep air, fuel and water away from the steel outer shell.

Talk to your insurance company about oil spill coverage. Most importantly, don't look to save money by buying a sub-standard or used oil tank. Paying to clean up an oil spill you cause could end up costing you far more.

Guide du propriétaire concernant la

Sécurité des réservoirs d'huile



Pour recevoir des exemplaires supplémentaires de ce dépliant, communiquer avec un des bureau régionaux de

ministère de l'Environnement:

- **Bathurst**
  275, rue Main
  Place Harbour View
  Bathurst (N -B) E2A 1A9
  (506) 547-2092

- **Miramichi**
  Maison Williston
  296, rue Water
  Miramichi (N -B) E1N 1B3
  (506) 778-6032

- **Fredericton**
  12, rue McGloin
  C P 6000
  Fredericton (N -B) E3A 5T6
  (506) 444-5149

- **Moncton**
  35, promenade Runnymeade
  C P 5001
  Riverview (N -B) E1B 1C8
  (506) 856-2374

- **Grand-Sault**
  385, rue Broadway
  Édifice Godbout, 1e étage
  Grand-Sault (N -B) E0J 1M0
  (506) 473-7744

- **Saint-Jean**
  8, rue Castle
  C P. 5001
  Saint-Jean (N -B) E2L 4Y9
  (506) 658-2558

Nota:

Les ministères provinciaux de l'Environnement du Canada révisent actuellement les normes d'installations des réservoirs domestiques d'huile, et les propriétaires seront avisés des nouvelles normes dès leur entrée en vigueur

Pour signaler une fuite d'un réservoir d'huile ou un déversement d'huile

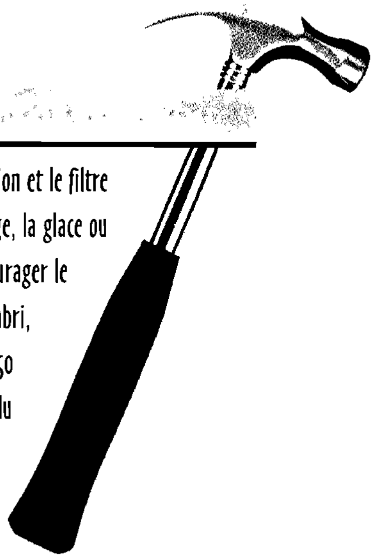
composez, sans frais,
le 1-800-565-1633.
(Service d'urgence 24 heures)

Comme tout le monde, vous n'avez probablement pas pensé à votre réservoir d'huile depuis que vous l'avez acheté, sauf peut-être lorsque vous l'avez fait remplir. Vous avez cependant la responsabilité de vous protéger et de protéger l'environnement en achetant le réservoir qui convient et en veillant à ce qu'il soit bien installé et entretenu.

Près de 40 p. 100 des déversements d'huile qui sont signalés au ministère de l'Environnement du Nouveau-Brunswick chaque année proviennent de réservoirs d'huile domestiques de maisons privées.

Un réservoir qui fuit dans votre sous-sol peut non seulement provoquer un incendie grave, mais aussi constituer un danger pour l'environnement. Un réservoir situé à l'intérieur ou l'extérieur qui fuit peut contaminer les eaux souterraines et menacer les sources d'approvisionnement en eau potable. Il peut s'avérer difficile et très coûteux d'enlever l'huile qui a coulé ou qui s'est déversée dans votre sous-sol, ou de nettoyer l'eau ou le sol contaminé.

Alors, que pouvez-vous faire pour vous protéger et protéger l'environnement? Voici quelques conseils de sécurité pratiques :



5. Recouvrez le tuyau d'alimentation et le filtre pour les protéger contre la neige, la glace ou tous autres objets et pour décourager le vandalisme. Pour construire l'abri, utilisez un morceau de bois de 50 mm x 50 mm (2 po x 2 po) et du contreplaqué de 12,5 mm (1/2 po). Assurez-vous que l'abri ne touche pas le tuyau d'alimentation et qu'il puisse être enlevé facilement pour inspection.

6. Protégez le réservoir avec une structure faite de contreplaqué de 12,5 mm à 19 mm (1/2 po à 3/4 po) et de bois de 50 mm x 100 m (2 po x 4 po).

7. Peignez les deux abris pour les protéger des intempéries.

Pour obtenir de plus amples renseignements concernant les normes d'installation (CAN/CSA-B139), communiquez avec l'Association canadienne de normalisation (ACN), 1-800-463-6727. Veuillez notez que les copies des normes de la ACN ne sont pas gratuites.

Entretien du réservoir

Votre programme d'entretien domiciliaire devrait comprendre des inspections soignées régulières du réservoir. Quel que soit le niveau de combustible qu'il contient, il est sage d'avoir un récipient à portée de la main, en cas de fuite pendant l'inspection.

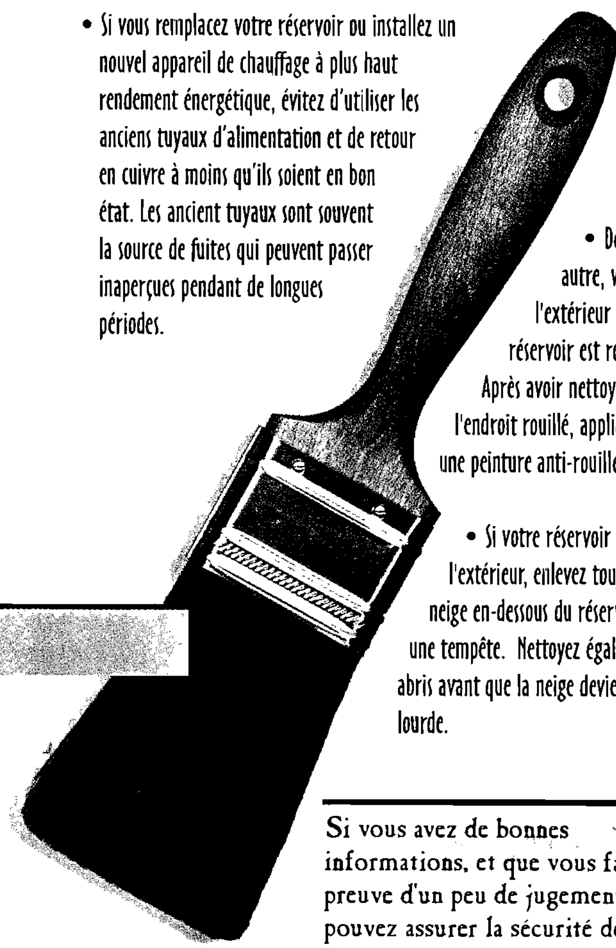
- Chaque année, vérifiez si le réservoir contient de l'eau en y insérant un bâton propre sur lequel vous aurez appliqué une « pâte pour déceler l'eau ». On peut habituellement obtenir cette pâte aux stations–service ou aux magasins qui vendent des produits pétroliers.

Nota:
Si l'eau provoque de la corrosion, le coin inférieur externe du réservoir, près du tuyau d'alimentation, deviendra peu à peu noir

- Vérifiez régulièrement les abris et la bande métallique afin de vous assurer qu'ils sont toujours dans la bonne position.

- Lorsque vous transférez l'huile d'un ancien réservoir à un neuf, évitez de transférer les résidus qui se trouvent au fond du vieux réservoir.

- Si vous remplacez votre réservoir ou installez un nouvel appareil de chauffage à plus haut rendement énergétique, évitez d'utiliser les anciens tuyaux d'alimentation et de retour en cuivre à moins qu'ils soient en bon état. Les ancient tuyaux sont souvent la source de fuites qui peuvent passer inaperçues pendant de longues périodes.

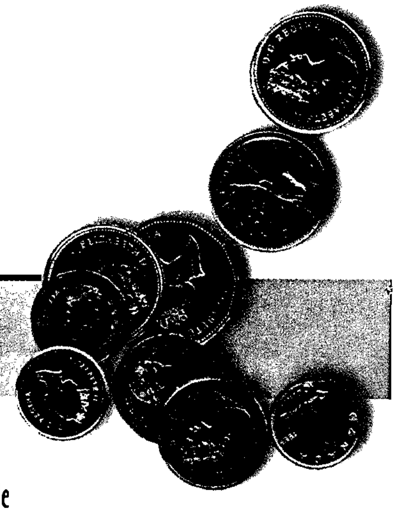


- De temps à autre, vérifiez si l'extérieur du réservoir est rouillé. Après avoir nettoyé l'endroit rouillé, appliquez-y une peinture anti-rouille.

- Si votre réservoir est à l'extérieur, enlevez toujours la neige en-dessous du réservoir après une tempête. Nettoyez également les abris avant que la neige devienne trop lourde.

Si vous avez de bonnes informations, et que vous faites preuve d'un peu de jugement, vous pouvez assurer la sécurité de votre domicile et de l'environnement.

Achat du Réservoir



Premièrement, repérez l'étiquette d'approbation sur le dessus du réservoir qui indique la date de fabrication et confirme que le réservoir satisfait aux normes, telles que les Normes nationales du Canada CAN4-S602-M81.

Vérifiez bien que toute la tuyauterie (tuyau d'alimentation, de remplissage et de ventilation) est en métal. Les tuyaux de plastique ne sont pas acceptables.

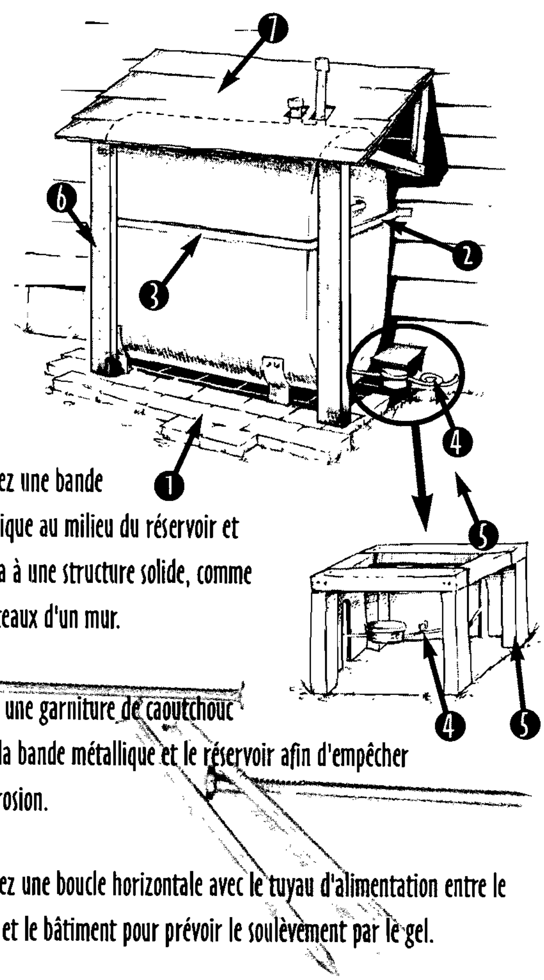
De nouveaux réservoirs munis d'un revêtement intérieur de plastique, installé par le fabricant et conçu pour empêcher l'air, le carburant et l'eau de venir en contact avec l'extérieur en acier, sont maintenant disponibles.

Informez-vous auprès de votre compagnie d'assurance concernant les déversements d'huile. Fait encore plus important, n'essayez pas d'économiser quelques dollars en achetant un réservoir usagé ou de moindre qualité. Cela vous coûtera probablement beaucoup plus cher si vous devez nettoyer un déversement d'huile.

Installation du réservoir

Que vous mettiez votre réservoir à l'intérieur ou à l'extérieur, vous devez avoir un appui pour l'empêcher de bouger, de s'affaisser ou de tomber par terre.

❶ Placez le réservoir sur une base ininflammable (blocs en béton, béton coulé ou dalles de patio). Il y a une autre raison pour laquelle il faut éviter de construire une base en bois. Le bois peut se contracter et retenir l'eau, ce qui risque de faire rouiller le réservoir.



❷ Installez une bande métallique au milieu du réservoir et fixez-la à une structure solide, comme les poteaux d'un mur.

❸ Placez une garniture de caoutchouc entre la bande métallique et le réservoir afin d'empêcher la corrosion.

❹ Formez une boucle horizontale avec le tuyau d'alimentation entre le filtre et le bâtiment pour prévoir le soulèvement par le gel.

- Another option is to have your oil burner supply line installed through the top of the tank. Most oil burners have suction pumps which could easily draw oil from a line installed through the top of the tank. This would eliminate loss of the entire contents of a tank when a line is broken due to frost heaving and vandalism. You should consult your burner repair person to see if this is a viable option for you.

- Check the tank annually for internal water. This can be done by placing "water finding paste" on a clean stick and dipping this into the tank. Consult your oil distributor for "water finding paste".

- Periodically check the tank for external rust. Clean off any surface rust and paint the area with a rust proof paint.

- Periodically check the wooden shelters to ensure they are protecting the tank and line; also check the metal strap.

- Regularly remove snow from around the tank and lines.

- If your tank settles, have it levelled as soon as possible.

In 1992, over 75% of all oil spills reported to the Environmental Protection Division of the P.E.I. Dept. of Environmental Resources were caused by domestic fuel tanks at private homes.

At the very least, a leak generally requires the removal of contaminated soil which must be replaced by clean material. Last winter, a number of these leaks each resulted in contamination of one or more water supplies. Corrective measures are the responsibility of the homeowner and can include costly reconstruction or drilling of a new well for the homeowner and neighbours.

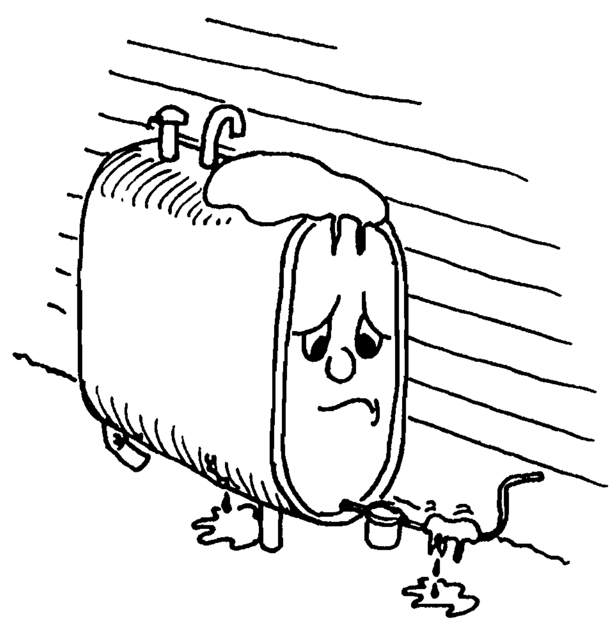
Contact your home insurance agent to determine if you are covered for clean up costs in the event of a fuel spill. Some insurance companies do not provide coverage for these types of incidents.

TO REPORT A FUEL LEAK DIAL:
1-800-565-1633 (24 hours)
For more information call the Environmental Protection Division of the P.E.I. Dept. of Environmental Resources 368-5057.

Prince
Edward
Island
Department of Environmental Resources

Contains Recycled Paper

A Homeowner's Guide to Oil Tank Safety



If not properly installed and maintained, the common domestic heating oil tank found at most Prince Edward Island homes can become a serious safety hazard and pose a threat to the environment, particularly our groundwater.

This pamphlet explains how to avoid the dangers associated with above ground heating oil tanks.

Produced by the Environmental Protection Division of
the P.E.I. Dept. of Environmental Resources
Barry Hicken, Minister

The Problem

Oil from a leaking tank contaminates the soil and can become a threat to your drinking water. The odor is unpleasant and difficult to remove, especially if the oil flows into your basement.

The common 200 gallon domestic tanks in use across the province are designed for inside use. If used outside, they must be properly installed and protected from the elements.

How to Protect Yourself and the Environment.

- Properly support the tank to prevent it from shifting, settling, or falling over. Remember, a full tank of oil weighs about 1000 kg or over one ton.
- Pour concrete or place patio blocks over gravel or sand bed. Place the tank on this base. (See diagram).
- Install a metal strap around the midpoint of the tank to secure the tank to a solid structure i.e. wall studs.
- Place rubber gasket between the metal strap and the tank to prevent corrosion of the strap and the tank at the contact point.
- Protect the supply line and filter leading from the tank to the building from the weight of snow, ice or other objects which could cause it to break and spill fuel. Heaving frost or an application of 20lbs of force can snap the supply line. A supply line cover may also deter vandalism.
- Construct a supply line cover using 2" x 2"'s and 1/2" plywood. Ensure the cover does not touch the supply line; clearance between the cover and supply line must be maintained.
- Ensure that all piping (fill, vent and supply lines) are constructed of metallic materials (plastic is not acceptable).
- Ensure that tanks conform to a construction standard such as National Standard of Canada CAN4-S602-M81. All approved tanks will have a label on the top of the tank.
- Protect the tank with a suitable structure using 2" x 4"'s for the frame and 1/2" to 3/4" plywood.

DIAGRAM 1 Tank sheltered & supply line cover

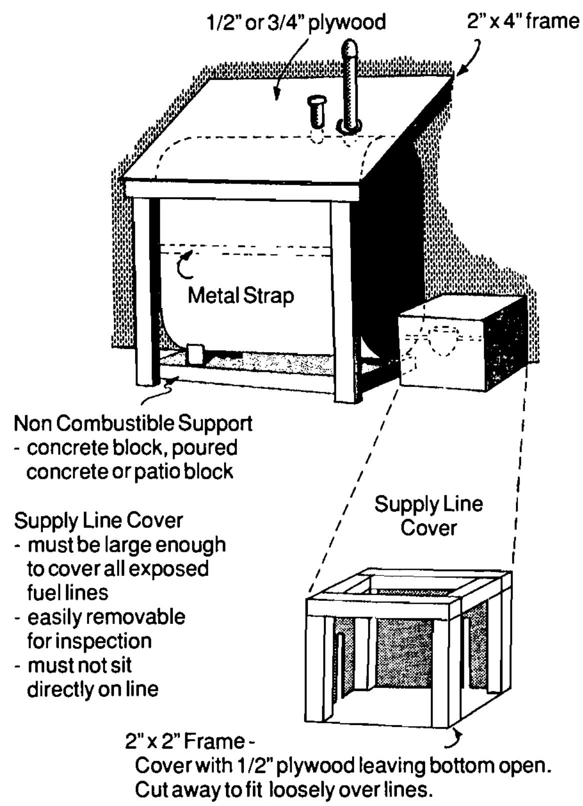
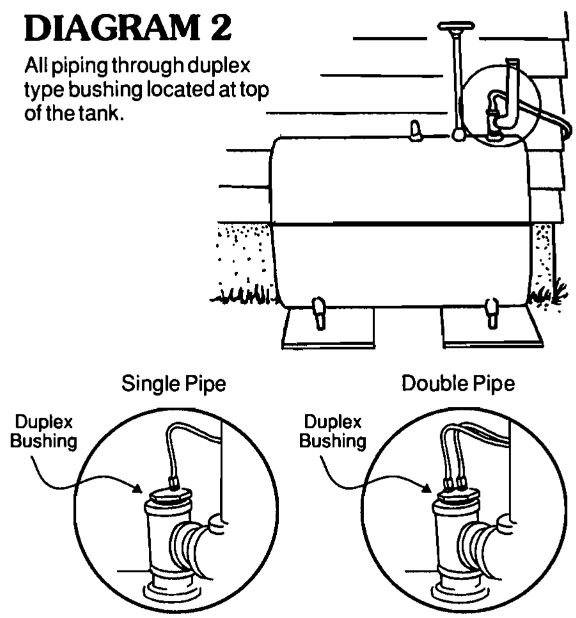


DIAGRAM 2



Oil Storage Tank Report

Broker Name ______________________ Broker # ______________________
Policy # ______________________ Date ______________________
Name ____
Address ____

Type of Fuel ______________________ Location of Storage Tank ______________________
Capacity ______________________ Age ______________________

Supported in a stable manner	☐ Yes	☐ No	☐ N/A
Protected from vehicle impact	☐ Yes	☐ No	☐ N/A
Any rusts, dents, evidence of corrosion	☐ Yes	☐ No	

Remarks ____

____

Signs of leaks at tank connectors	☐ Yes	☐ No	☐ N/A
Signs of spills/overfilling	☐ Yes	☐ No	
Fumes or Odours evident	☐ Yes	☐ No	
If oil			
• vented outside to atmosphere	☐ Yes	☐ No	☐ N/A
• vent located higher than fill pipe	☐ Yes	☐ No	☐ N/A

Remarks ____

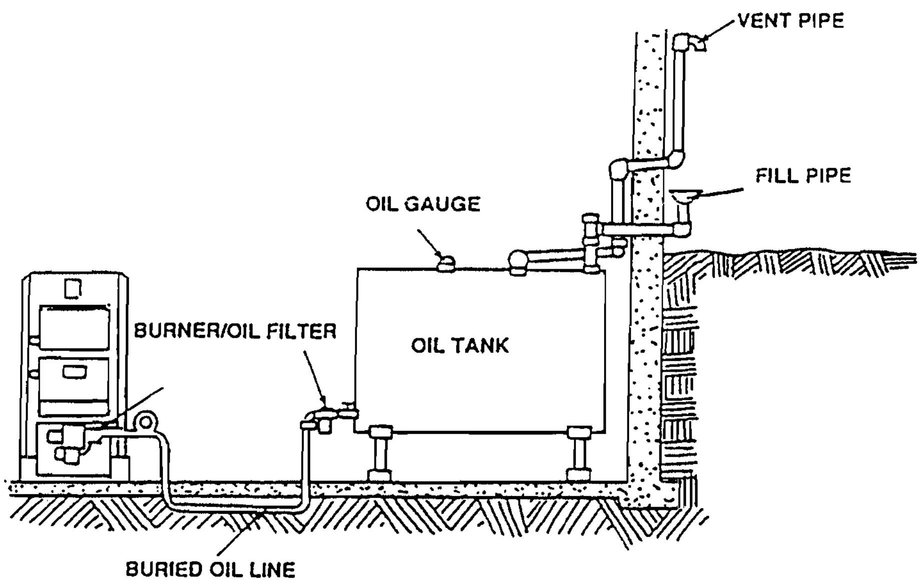
____

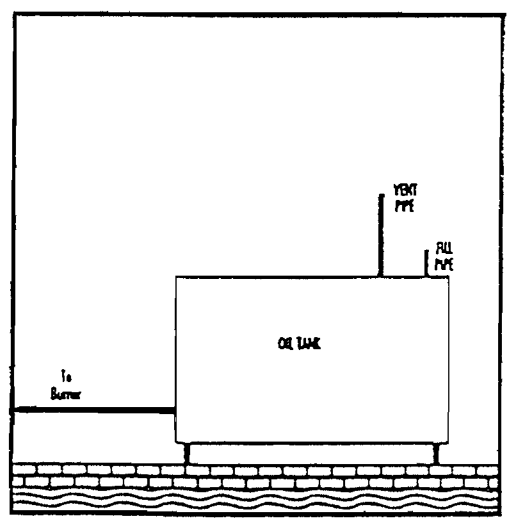
Signs of leaks at burner connection	☐ Yes	☐ No
Located at least 5ft from ignition source	☐ Yes	☐ No
If no, enclosed in non-combustible wall	☐ Yes	☐ No
Is fuel supply line protected	☐ Yes	☐ No

Diagram (indicate on diagram where leak was noted)

☐ Indoor Aboveground

☐ Outdoor Aboveground





Tank installation seen by Broker:

Signed ____________ Broker # ____________ Date ____________