Fuel Oil Heating Installation Inspection Report

Prepared for the:

Yukon Government:

Yukon Housing Corporation, and
The Energy Solutions Centre

Prepared by:

Rod Corea
NRG Resources Inc.
95 Napier St. West
Thornbury, ON N0H 2P0
519-599-3923
rodcorea@nrgresources.ca

Contents

Executive Summary

NRG Resources Inc. conducted 55 inspections of oil-burning appliances and supply tanks in Whitehorse between January 20 and February 3, 2007 as part of a survey for the Yukon Government, Yukon Housing Corporation, and Energy Solutions Centre. The survey was conducted to determine the level of compliance with the B139 *Installation Code for Oil-Burning Equipment* and to identify safety and efficiency issues and their possible solutions.

The inspection survey identified 319 infractions of the B139 Code of which 174 were considered to be significant concerns that either posed an imminent hazard (6 cases) or could reasonably be expected to develop into a problem in the future. The average number of code infractions per site was 5.8 and the average number of significant infractions was 3.2/site.

The major safety and efficiency issues identified by the survey and listed in order of importance are:

1. Lack of maintenance.
2. No indication that the installers or service technicians are trained and qualified as licenced Oil Burner Mechanics.
3. Spillage of flue gases indoors due to improperly installed or improperly maintained positive venting systems.
4. 45% of appliances were improperly set-up for safe, efficient combustion.
5. Oversized and improperly installed vents.
6. Clearance to combustible material is not maintained.
7. Aboveground tanks not installed properly to prevent internal corrosion or damage to outlet piping.
8. Aboveground tanks not secured to prevent toppling or damage due to a seismic event.
9. Lack of monitoring of underground tanks for leakage and corrosion
10. Appliances and tanks without rating plates indicating that they have not been tested and approved to recognized standards.

The report recommends the following solutions to the identified safety and efficiency concerns:

- An advertising campaign should be conducted to advise owners about the legal and practical need for annual maintenance of oil-burning equipment.
- An Oil Burning Devices Act, Regulations, and enforcement agency should be developed and implemented to encourage the oil heating industry to comply with the B139 Code.
- A practical and effective method for training and certifying Oil Burner Mechanics in the Yukon should be developed and implemented.

Survey Procedure

The inspection sites were selected by Energy Solutions Centre and Yukon Housing Corporation from a list of home owners who responded to an advertisement concerning the inspection program. The selection criterion was primarily a "first call – first chosen" basis although some consideration was given to selecting a wide variety of ages and types of installations.

All 55 inspections were conducted by Rod Corea from NRG Resources Inc although various employees from Yukon Housing or the Yukon Government assisted Rod Corea during these inspections. The inspections were conducted between January 20 and February 3, 2007.

The inspection forms developed by NRG Resources and approved by Yukon Housing and Energy Solutions Centre were employed to record the inspection results. Blank copies of these forms are found in Appendix A and the completed forms for each site are found in Appendix B.

Only a visual inspection of the oil-burning appliances, supply tanks, and supply lines was conducted at each site. No adjustments or changes to the equipment were made during the inspection. Combustion analyses were conducted on 60 of the 63 appliances inspected. Two of the appliances not tested would have required significant changes to the appliances to conduct the tests.

The owner or occupant was in the house at the time of the inspection. A summary of the inspection findings was provided verbally to the owner/ occupant at the time of the inspection along with a copy of the combustion test print-out. Any safety or efficiency concerns were discussed with the owner/occupant. Where corrective action was warranted, the owner/occupant was advised to have a qualified heating contractor of their choice conduct the work.

Inspection Criteria

The inspection criteria regarding code compliance was the B139 Code in effect at the time of the installation. This criteria required reference to four editions of the B139 Installation Code for Oil Burning Equipment, namely: B139-1976 (in effect from 1976 to 1991); B139-M91 (in effect from 1991 to 2000); B139-00 (in effect from 2000 to 2006); and the current B139-04 in effect in the Yukon since April 2006). Installations dating from before 1976 have all been upgraded in some way and therefore were judged by the Code in effect at the approximate time of the upgrade.

Four exceptions were made to the above inspection criteria regarding reference to the Code in effect at the time of the installation. In all three cases (listed below) the current Code requirements were employed to identify the infraction since the condition poses a potential hazard that should be corrected even though it technically is in compliance with the Code at the time of installation. The four exceptions were:

1. The slope of the tank toward the outlet.
    - Although this requirement only appears in the B139-04 edition, it has been required by manufacturer's instruction in compliance with the S602 tank Standard since the early 1990's. Significant corrosion can occur inside the tank due to the collection of water and sludge when the tank is sloped away from the outlet.
2. The height of a tank fill pipe shall be at least one meter (3') above grade.
    - Again, this requirement only appears in the B139-04 edition. However, the corrosion problems posed by snow or water entering a tank warrant the identification of this poor installation practice as a code infraction.
3. Piping, valves, or filters shall not extend below the tank foundation.
    - Although this requirement only appears in the B139-04 edition, it has been required by manufacturer's instruction since the early 1990's. Since piping, valves, or filters that extend below the tank foundation could snap off as the tank settles, it is reasonable and responsible to identify this problem as a code infraction.
4. Piping and tubing shall not be buried in cement unless installed in a duct.
    - This requirement was explicitly made in the B139-00 edition but previous code requirements to protect oil lines from corrosion could be interpreted as prohibiting this practice. The potential for corrosion and leakage warrants the identification of this poor installation practice as a code infraction.

Combustion Efficiency Criteria

The criteria for judging whether the combustion efficiency of an appliance was "acceptable" was the guideline established in Canada's Energy Efficiency Act and Regulations which requires oil-fired furnaces with an input of $\leq$ 225,000 Btuh to have an efficiency of 78% or greater.

The combustion setup requirements established by the B139 Code and the appliance manufacturer's certified instructions were also factored into the assessment as to whether the efficiency of an appliance was "acceptable". Inefficient appliances (i.e. <78%) were not considered to be an infraction of the B139 Code unless they were in non-compliance with the combustion setup requirements of the B139 Code or the manufacturer's certified instructions.

Code Infraction Reporting Criteria

The criteria for identifying the code infractions found during the survey can be characterized as reasonable and practical. Not all code infractions found during the inspections are identified. Only those code infractions that could reasonably be considered as safety or efficiency issues are identified on the individual inspection reports found in Appendix C and summarized on the table found in Appendix B.

Minor code infractions that could not affect the safety or efficiency of the installation are not identified in this report. For example, the B139-1996 Code and

Code Infraction Reporting Criteria (continued)

the B139-M91 Code both required that a tank vent pipe terminate at least seven feet above grade. The B139-00 and B139-04 editions of the Code only require the vent pipe to terminate 150mm (6") above the fill pipe.

The recent code requirements were employed to identify infractions related to vent pipe termination since the technical or legal requirement to comply with the code in effect at the time of installation would "clutter" the report with inconsequential infractions that might obscure the important safety and efficiency issues identified in the survey.

In regards to underground storage tank (UST) requirements, the 2004 edition of the B139 Code is the first fuel oil code that has no requirements regarding the installation, maintenance, or removal of underground tanks. Currently, USTs must only comply with the National Fire Code of Canada and the CCME Environmental Code. The same is true for aboveground tanks with a capacity greater than 2500L.

For the purpose of this report, the requirements for underground tank installations from previous editions of the B139 Code were employed since all 13 of the UST inspected during this survey pre-date the current B139 Code.

The Code infractions summarized on the table found in Appendix B are separated into two categories as follows:

1. Significant Code Infractions: These are code infractions that were considered to be safety concerns that either posed an imminent hazard or could reasonably be expected to develop into a problem in the future.
2. Minor Code Infractions: These are code infractions that were considered to be worth identifying since they should have been corrected during installation or maintenance of the appliances. However, they should not pose a problem under "normal" conditions.

Types of Sites and Equipment Inspected

All but two of the 55 sites inspected were single family dwellings. One site was a multi-residential building [redacted] and one site was a Day-Care Centre [redacted]

The ages of the buildings ranged from the 1967 to early 2005. All sites were in Whitehorse.

The types and age range of equipment inspected are listed below:

Appliance Type	Total	1960 to 1979	1980 to 1989	1990 to 1999	2000 to 2005	2006
Forced air furnace	44	17	1	13	10	3
Boiler	7	3		1	2	1
Combo Water heater/Space heater	2				2	
Water heater	3			3		
Space heater	7			2	5	
Aboveground Indoor tank	10	7	1	1		1
Aboveground Outdoor tank	34	2	3	6	22	1
Underground tank	13	5	2	5	1	
Total Appliances	63	20	1	19	19	4
Total Tanks	57	14	6	12	23	2

General Overview of Inspection Results

The inspection of 55 sites in Whitehorse with oil-burning equipment found a large number of code infractions and efficiency concerns as listed in the table in Appendix B and summarized below.

- None of the 55 sites completely complied with the B139 Installation Code for Oil-Burning Equipment.
- Code infractions related to the oil tank and supply lines were found at all but one of the sites.
- Code infractions related to the appliances and venting systems were found at all but two of the sites.
- A total of 319 contraventions of the B139 Code were found at the 55 sites. This constitutes an average of 5.8 code infractions per site.
- 157 or 49.2% of the total number of code infractions were related to the tank and supply lines. As such, the average number of code infractions per site related to the tank and supply lines was 2.9. A focused discussion of these code infractions is provided in the next section of this report (page 7).
- 162 or 50.8% of the total number of code infractions were related to the appliances and venting systems. This represents an average of 3 code infractions per site related to the appliance and venting system. More information regarding these code infractions is provided on pages 9 to 12 of this report.
- 6 of the 55 sites (11%) had at least one serious code infractions related to the appliance and venting system. A “serious” code infraction is one that was considered as posing a hazard to life or property if not addressed. In all cases, the owners or occupants were advised about these problems. More information regarding these code infractions is provided on pages 9 and 10 of this report.
- 53 of the 55 sites (96%) had at least one significant code infraction. A total of 174 significant code infractions were identified. A “significant” code infraction is defined on page 4 of this report.

- 27 of the 60 appliances (45%) tested for proper combustion were found to be inefficient and/or in non-compliance with the code requirements related to combustion set up.
- 33 of the 55 sites (60%) were not being maintained annually as required by Section 14 of the B139 Code.
- Proof that the technician who recently installed or serviced the installation was a licenced Oil Burner Mechanic was found at only one of the sites.

Discussion of the Tank Inspection Results

As noted above, the inspection of 55 sites with 57 oil supply tanks identified 157 code infractions related to the oil tanks and supply lines. This represents an average of 2.9 code infractions per site related to the oil supply systems. All but one of the 55 sites inspected (i.e. 98%) had at least one code infraction related to the tanks and supply lines.

73 (46%) of these 157 code infractions were considered to be "significant" in that they could reasonably be expected to develop into a problem in the future.

The following is a complete list of the types of infractions related to the oil tanks and supply lines as identified on the summary table in Appendix B and the individual inspection forms in Appendix C. Infractions are listed in order of importance with those considered "significant" identified in bold print.

Type of infraction	Number of sites with this infraction	Code Reference	Comments
Signs of oil leakage	3	14.2.2	One case of dripping oil on outside tank and two cases of weepage through tank.
Indications of water in UST	1		Recent service found water in filter but did not investigate possible tank problem
Oil lines cemented in or under floor	8	8.3.5	See Note #4 on page 3
Tank not sloped toward outlet.	25	6.3.9.2 (c)	See Note #1 on page 3
Piping at tank is improper.	10	6.3.9.2	See Note #3 on page 3
Single wall underground lines used after 2000	3	8.3.2.1.2	2000 edition of B139 required the use of double-walled underground piping. These new installations did not comply.
Tank not protected from corrosion or physical damage	3	6.5.4 (a)	Two cases of significantly rusted outside ASTs and one case of tank in risk of damage from ice on eaves.
Oil lines not protected from physical damage	2	8.3.1.5	One case of tubing being subject to door hitting it. Other case of unsupported tubing under strain.
Filter location improper.	6	3.10.2	Code requires filters to be indoors wherever feasible. Five of these cases did not comply with this requirement. Sixth case had in accessible filter.
Tank supported on combustible material	2	6.3.8	Both cases used wooden blocks for no good reason.

Discussion of the Tank Inspection Results (continued)

Type of infraction	Number of sites with this infraction	Code Reference	Comments
UST is not buried deep enough	1	Previous Codes	Exposed UST may rust easier and may float out of ground.
Indications of an abandoned UST	2	Previous Codes	Vent pipes from UST found close to newer AST. Previous Codes reasonably required removal of abandoned USTs.
Tank vent pipe not properly capped	1	6.9.1.6	Tin cup placed over vent pipe on UST one foot above grade
Tank vent does not terminate above fill	2	6.9.1.6	Code requires vent to terminate at least 6" above fill
No seismic restraint on aboveground tank	44	6.3.11	3 of these sites are considered significant infractions since the tanks were elevated
Tank vent or fill pipe terminates within 2' of opening	8	6.8.6 (b) 6.9.1.7 (d)	This is a nuisance problem since oil odours may enter building during fill operations.
No Rating Plate on Tank	15	6.2.1.1	10 of these cases were on pre-1980 tanks. Lack of approval may indicate that tanks were not built to a Standard.
Fill and/or vent pipe too close to ground	11	6.8.6 (c) 6.9.1.7(b)	See Note #2 on page 3
Tank vent pipe is too far away from fill pipe	1	6.9.1.7 (e)	Delivery driver may not hear vent whistle and overfill tank.
Underground lines under foundation	2	8.3.2.1.9	Stress may be placed on oil lines by house settling.
Outlets on top of tank not plugged properly	2	6.2.1.4	Shipping plugs not replaced on two tanks as required.
No level gauge in tank	2	6.10.2	Gauge allows for troubleshooting
Tank within 5' of property line	3	6.5.4 (b)	In all three cases the tanks were between 3 to 5 feet of the property line
Tank within 5' of exit doorway	1	6.3.12	Tank does not impede egress from building.
Compression fittings on oil lines	1	8.3.4 (d)	The 2000 edition of the Code prohibited the use of compression fittings. This case used compression fittings after 2000.
Copper tubing used for vent/fill lines	2	6.8.1 6.9.1.1	Although permitted at the time of installation, these installations may pose a problem due to strain or fire.
Tank within 20' of two propane tanks	1	Clause 7.1.8 of the B149.2-05 Propane Storage and Handling Code. This is a fire-fighting safety concern.	

Discussion of Appliance Inspection Results

As noted on page 6, the inspection of 55 sites with 63 appliances identified 162 code infractions related to the appliances and venting systems. This represents an average of 3 code infractions per site related to the appliances and venting systems. All but two of the 55 sites inspected (i.e. 96%) had at least one code infraction related to the appliances and their venting systems.

Discussion of Appliance Inspection Results (continued)

101 (58%) of these 162 code infractions were considered to be "significant" in that they either posed an imminent hazard (6 cases) or could reasonably be expected to develop into a problem in the future.

The following is a complete list of the types of infractions related to the appliances and venting systems as identified on the summary table in Appendix B and the individual inspection forms in Appendix C. Infractions are listed in order of importance with those considered "significant" identified in bold print. The 6 cases that were considered as imminent hazards are highlighted in the first four rows of this table.

Type of infraction	Number of sites	Code Reference	Comments
Flue gases leaking indoors	2	4.2.1 4.2.5.3	Two sidewall vent connectors found leaking flue gases at improper joints [redacted] Both of these cases were considered imminent hazards since CO_2, CO, and heat were escaping. The vent connections were improperly installed by two local heating contractors in 1995 and 2004. Both situations have been corrected.
Combustion tests results do not meet requirements of the Code and/or manufacturer	23	5.1 5.2.2 5.2.3 5.2.5	Numerous problems including - Soot plugged heat exchanger - High CO or smoke readings - Insufficient or excessive draft readings 23 out of 60 appliances tested constitute a 38% non-compliance rate. Two of these cases [redacted] were considered imminent hazards. In one case, the furnace was plugged with soot and spilling soot from every joint and opening. In the other case, high levels of carbon monoxide (CO) were found in the flue gases of an older boiler. The vent was oversized and spilling at start-up. In both cases, the owners agreed to not use the appliance until it was fully cleaned & setup by a qualified technician.

Discussion of Appliance Inspection Results (continued)

Type of infraction	Number of sites	Code Reference	Comments
Appliance not installed as per manufacturer's instructions	1	3.1.1	This was a 2006 installation by the building owner [redacted] – [redacted] The boiler was **not** completely installed before being put into steady use. This case is considered as an imminent hazard since the vent and burner were improperly installed. The owner committed to correcting the deficiencies.
Common venting with unapproved wood appliance	2	4.1.4	One of these two cases [redacted] was considered as an imminent hazard that was corrected before it was allowed to develop. The owners were about to install a wood stove and common vent it with an oil–fired furnace within the next week. This work was reported being conducted by a local heating contractor with the approval of the City of Whitehorse. The wood stove was not approved for common venting with an oil appliance. It was also found that the oil furnace installed in 2003 was not connected to a properly constructed or sized chimney. The other case was considered significant but not an imminent hazard since the owner had not used the wood stove for 3 years. The owner was advised that the common venting of the stove was illegal and the chimney should be lined.
Sidewall vent installation does not meet requirements of the Code &/or manufacturer	8	4.3	Numerous problems including - Vent termination too close to ground - Vent termination too close to opening - Improper joint sealant used - Parts of vent kit not installed - Damaged vent termination Only one of these 8 infractions was considered minor.
Appliance too close to combustibles	6	7.1.1	All 6 of these infractions were considered significant. Three of the cases involved storage of material too close to the appliance.
Vent and/or vent connector too close to combustibles	8	4.2.5.5 (f)	All 8 of these infractions were considered significant. Four of the cases involved storage of material too close to the vent pipes.

Discussion of Appliance Inspection Results (continued)

Type of infraction	Number of sites	Code Reference	Comments
Installation of vent liner in chimney or factory vent does not meet Code &/ or manufacturer's requirements	4	4.2.2.5.1 4.2.2.9	Infractions included: - No base-tee on liner (installed 2006) - No base-tee on L-Vent (installed 2004) - No chimney cap (old installation) All 4 of these infractions were considered significant.
Vent connector improperly installed	9	4.2.5	Infractions included: - Vent sections not securely joined - Insufficient slope toward vent - Too many elbows - Reduction in size at wrong location - Improper vent material employed 7 of these infractions were considered significant.
Vent and/or vent connector too large	22	4.2.2.4	11 of these 22 infractions were considered significant. 6 of these installations were completed after 2000. Only 43 of the appliances required vents to be sized. As such 22 infractions constitutes a 52% non-compliance rate.
Barometric damper improperly installed	6	4.2.7.1 4.2.7.3	Infractions included: - No damper installed when required - Damper opening smaller than damper - Damper smaller than vent pipe - Damper in wrong location - Improper vent material employed 3 of these infractions were significant.
Return air opening too close to furnace	3	14.3.2	All 3 of these infractions were considered significant. This condition may starve the burner of air or cause flue gas spillage.
Electrical wiring does not meet Code requirements	6	3.7	Infractions included: - Emergency disconnect switch in wrong location or missing - Appliance wiring not secured - Appliance wiring modified All 6 of these infractions were considered significant.
Pressure relief on boiler improperly installed	1	3.1.3	The relief valve was not piped to within 1 foot of the floor as required by the Code. This was the previously discussed installation that was left uncompleted by the owner/installer.

Discussion of Appliance Inspection Results (continued)

Type of infraction	Number of sites	Code Reference	Comments
Appliances not maintained annually	33	14.2.1	Annual maintenance was not conducted on 33 of the 53 sites that required annual maintenance (2 of the 55 sites had appliances that were recently installed). This represents a 62% non-compliance rate. 8 of these infractions were considered significant since the appliances had either never been maintained or showed obvious signs of problems due to lack of maintenance.
No air supply or improperly sized air supply to appliances	24	4.4.2.1	11 of these 24 infractions were considered significant since they were in confined spaces or in newer, more tightly constructed houses.
Combustion chamber damaged	2	14.2.9	Both of these cases were older appliances that were suffering deterioration due to age and lack of maintenance.
Appliance modified from original design.	9	3.1.1	Eight of these cases involved upgrades to older burners and controls. Although Codes prior to 1991 allowed this activity under strict guidelines, it is worth highlighting as a minor infraction since it affects the approval of an appliance as discussed in the next row. The ninth case was the only one of the nine that was considered a significant infraction. This 2005 installation in a mobile home had a hole in the furnace casing for ventilation air from outdoors. This modification could damage the heat exchanger and may void the appliance warranty.
No rating plate on appliance	1	3.1.1	This 1971 vintage furnace had no signs of a rating plate having ever been installed. The lack of a rating plate calls into question whether the appliance was tested and approved to a recognized safety standard. There were numerous other infractions at this site [redacted] and this one was considered minor in comparison.

Conclusions and Comparisons

The inspection survey of 55 sites in Whitehorse in January 2007 identified 319 infractions of the B139 Code of which 174 were considered to be significant concerns that either posed an imminent hazard (6 cases) or could reasonably be expected to develop into a problem in the future. The average number of code infractions per site was 5.8 and the average number of significant infractions was 3.2 per site.

Based on the writer's experience (see Appendix D for details), the number and nature of the infractions indicate that a significant portion of oil heat users are not aware of the legal and practical need for annual maintenance of oil-burning equipment and that the oil heating industry is not responding responsibly to self-regulation as required in the Yukon. Although there are good installations, technicians, and contractors, a large number of oil heating installations are in non-compliance with minimum safety and efficiency standards.

Based on discussions held with home owners, oil burner technicians, and heating contractors while conducting the inspections and during various courses in the Yukon, there is a general lack of knowledge of code requirements and practical issues related to the safety and efficiency of oil burning equipment.

Those discussions have also indicated that the lack of incentive, consequences, and/or opportunity to become licenced as Oil Burner Mechanics are important factors in regards to this general lack of knowledge. The lack of consequences for not complying with the code requirements has been identified by a number of technicians, contractors, and users as a major cause of the problems found at new and old installations.

The major safety and efficiency issues identified by the survey and listed in order of importance are:

1. **Lack of maintenance.** 33 of the 53 surveyed sites (i.e. 62%) that required annual maintenance were in non-compliance with the B139 Section 14 requirements regarding annual maintenance. Very few of all the appliances inspected had been cleaned on a regular basis. In many cases, the appliances had never been cleaned or properly maintained. Lack of maintenance is universally recognized as the primary cause of fires, leaks, and other incidences for all fuel-fired appliances.

2. **No indication that the installers or service technicians are trained and qualified as licenced Oil Burner Mechanics.** Only one of the 55 sites inspected had the licence number of a technician on <u>any</u> service sticker. This trend has also been evident in the five oil-related courses delivered by NRG Resources in the Yukon over the past two years. Of the 100+ <u>active</u> technicians who have attended these courses, less than 10 have met the minimum trade qualifications required to work on oil installations in the Yukon.

3. **Spillage of flue gases indoors due to improperly installed or improperly maintained positive venting systems.** 6 of the 7 positive vented appliances inspected had venting infractions – 4 of them significant of which 2 were considered hazardous. Positive vented appliances require special venting material and are especially prone to failure if not strictly installed in accordance with the manufacturer's certified instructions and the B139 Code. There was a high level of improperly installed and maintained positive venting systems among the surveyed appliances. Spillage of carbon dioxide and carbon monoxide can cause severe health problems; heat spillage can cause fires.

4. **47% of the appliances were improperly set up for safe, efficient combustion.** 28 of the 60 combustion tests conducted during the survey were operating inefficiently (i.e. <78% efficiency) and/or were not in compliance with the safety requirements for combustion established in the manufacturer's certified instructions and the B139 Code. Five of the 28 were operating efficiently but not in compliance with the Code; 7 of the 28 were not operating efficiently but were in compliance with the Code; and 16 of the 28 were neither efficient nor in compliance with the Code.

5. **Oversized and improperly installed vents.** 43 appliances surveyed had conventional vent systems that required the technician to properly size and install the vent systems without special instruction or components from the manufacturer. 17 of these 43 appliances (i.e. 39%) had vents larger than allowed by the B139 Code. 23 of these 43 appliances (i.e. 53%) had improperly installed vents and/or vent connectors. Oversized and improperly installed vent systems may cause venting problems resulting in flue gas spillage and damage to the appliances. These problems are especially prevalent in cold climates. The most probable reason for oversized and improperly installed vent systems is the lack of trained technicians conducting installations.

6. **Clearance to combustible material is not maintained.** 14 of the 55 sites inspected (25%) had significant infractions related to clearance between combustible materials and the appliance or vent. Half of these problems were related to installation infractions and the other half were caused by the owners storing material too close to the appliance or vent. In both cases, lack of knowledge is the most probably cause of this potentially dangerous infraction of the B139 Code requirements.

7. **Aboveground tanks not installed properly to prevent internal corrosion or damage to outlet piping.** Two related problems are covered by this item: 1/ 25 of the 44 aboveground tanks surveyed (57%) were not sloped toward the outlet as required by the current B139 Code; 2/ 10 of the 44 aboveground tanks surveyed (23%) had piping configurations at the tank outlet that may cause damage to the tank piping. In both cases, the infractions were considered significant since an improper slope has been proven to cause internal corrosion resulting in leakage and the second problem may result in the outlet piping at the tank breaking resulting in leakage. Lack of knowledge among tank installers is considered the most probable cause of these two related problems.

8. **Aboveground tanks not secured to prevent toppling or damage due to a seismic event even though Whitehorse is listed as an earthquake zone.** None of the 44 of the aboveground tanks surveyed were secured as required by the B139 Code and manufacturer's instructions. This infraction was not considered significant in this survey since there the writer was not aware of any reports of tanks toppling over during any of the numerous earthquakes in the Whitehorse area. A preventative program to address this concern should be considered.

9. **Lack of monitoring of underground tanks for leakage and corrosion.** None of the 13 underground storage tanks (UST) surveyed were regularly monitored for water accumulation or for cathodic protection. As discussed on page 4 of this report, the current edition of the B139 Code does not provide any requirements related to UST installation, maintenance, or removal. This is a significant problem since 13 of the 55 sites surveyed (24%) had USTs that would benefit from requirements given in previous Codes.

10. **Appliances and tanks without rating plates indicating that they have not been tested and approved to recognized standards.** 15 of the 44 aboveground tanks surveyed (i.e. 34%) and one of the 63 appliances surveyed did not have a rating plate. The approval of equipment to recognized standards is a primary safety requirement that is being undermined by this high percentage of unapproved equipment found in the survey sample (especially in regards to tanks). Unapproved equipment should be treated as sub-standard and unsafe unless proven otherwise.

Given the writer's knowledge and experience of the Ontario oil heat industry, a comparison of the state of the oil installations in that province to the surveyed installations may be of some value. In general, the number and type of infractions found in the Yukon would have been similar to those in Ontario before 2001 except for the licencing of Oil Burner Technicians which has had a high percentage of compliance since its inception in the 1960s.

Regulatory and enforcement changes in 2001 require oil distributors, oil heating contractors, and Oil Burner Technicians to take action whenever unsafe conditions are found. Oil distributors are required to inspect the installations before supplying oil to a site and to maintain a record of the inspection which must be updated at least every ten years. Technicians are given the power to shut down hazardous equipment and order repairs. Compliance with these new duties and responsibilities is now strictly monitored and enforced by the Technical Standards and Safety Authority which is a private, not-for-profit organization created out of a government department in 1997.

In comparison with the current state of oil-burning equipment installations in Ontario, the surveyed sites have a high level of non-compliance. The non-compliance level in Ontario would be less than 10% compared to the 95%+ infraction rate found during this survey.

It is worth noting that Ontario has not accepted the B139-04 Code due in large part to its perceived deficiencies concerning larger aboveground tanks and all underground tanks. Instead, Ontario created its own Code which CSA publishes as the *B139ON-06 Ontario Installation Code for Oil Burning Equipment.* The concept of customizing the B139 Code to meet local requirements may be an example to follow.

Another equally worthwhile comparison can be made between the Yukon oil heating industry and the Yukon propane heating industry. The latter is tightly regulated by the Gas Burning Devices Act and Gas Regulations as well as being closely monitored by the Gas Inspections Unit of the Building Safety Branch of Consumer and Safety Services.

Although the writer's knowledge of the state of propane installations in the Yukon is limited, the number of licenced Gas Fitters attending any of the courses delivered by NRG Resources in the Yukon has consistently been greater than the number of licenced Oil Burner Mechanics. It is expected that this higher proportion of licenced technicians, together with the requirement for permits and inspections, would result in a higher level of compliance with code requirements at propane installations compared to oil installations in the Yukon.

Recommendations

The following recommendations to improve the general safety and efficiency of oil burning equipment installations in the Yukon are offered for your consideration.

A. An advertising campaign should be conducted to inform owners about the legal and practical need for annual maintenance of oil-burning equipment as well as the necessity of maintaining the proper clearances to combustibles around oil-burning equipment. If implemented, this recommendation would help resolve items #1, #4, #6, and #9 as discussed in the "Conclusion" section of this report.

B. An Oil Burning Devices Act, Regulations, and enforcement agency should be developed and implemented to encourage and ensure that the oil heating industry complies with the B139 Code as well as the Yukon Apprentice Training Act and Regulations regarding training and licencing requirements for Oil Burner Mechanics. If implemented, this recommendation would help resolve all 10 items discussed in the "Conclusion" section of this report.

C. A practical and effective method for training and licencing Oil Burner Mechanics in the Yukon should be developed and implemented. If implemented, this recommendation would help resolve items #2 as discussed in the "Conclusion" section of this report.

I trust that this report meets with your approval. Please do not hesitate to contact me to discuss any of the issues raised in this report.

NRG Resources Inc. is committed to assisting the Yukon in its goal to achieve safer, more efficient oil-burning equipment installations.

Yours Sincerely,

Rod Corea
NRG Resources Inc.
95 Napier St. W.
Thornbury, ON N0H 2P0
Ph: 519-599-3923
Fax: 519-599-6681
Email: rodcorea@nrgresources.ca