

BUILDING HEATING FUEL STORAGE OPERATING METHODS

	CONTENTS	PAGE	
			1. GENERAL
1.	GENERAL	1	1.01 This section lists requirements for building heating fuels; describes the use of additives to the fuels; recommends fuel storage system operating practices; and covers methods of detecting and removing water and inorganic solids in fuel tanks.
2.	FUEL USE	1	
3.	RECOMMENDED FUEL STORAGE PRACTICES	2	1.02 Whenever this section is reissued, the reason(s) for reissue will be given in this paragraph.
4.	FUEL OIL PREHEATING	2	1.03 The preferred fuels for building heating are those fuels conforming to the American Society for Testing and Materials (ASTM) Standards D-396; grades 1, 2, 4, 5, and 6 as certified by the supplier.
5.	FUEL OIL ADDITIVE	2	1.04 See Section 065-320-301 for Engine Fuel Storage.
6.	FUEL TESTING	3	
7.	WATER DETECTION AND REMOVAL	3	
8.	HEATING OIL SAMPLING PROCEDURES	3	
9.	SECURITY OF STORAGE TANKS	5	
10.	SAFETY PRECAUTIONS	5	2. FUEL USE
Figures			2.01 Grade 1 is a light distillate intended for use in burners of the vaporizing type in which the oil is converted to a vapor by contact with a heated surface or by radiation.
1.	Typical Configuration for Sampling Grades 1, 2, and 4 Heating Oil	6	2.02 Grade 2 is a heavier distillate used in burners of the atomizing type which spray the oil into a combustion chamber.
2.	Typical Sample Identification Label	7	2.03 Grade 4 is either a light residual or a heavy distillate or a mixture of these fuel cuts. It is intended for burners equipped with devices that atomize oils of higher viscosity than domestic burners can handle.
3.	Typical Configuration for Sampling Grades 5 and 6 Heating Oil	7	2.04 Grade 5 fuel oil is available as light or heavy residual fuel oil more viscous than number 4 and can require preheating in colder climates.
Tables			2.05 Grade 6 (Bunker C) is a high viscosity residual oil used in commercial and industrial heating plants only. It requires preheating for both pumping and atomizing.
A.	GUIDELINES FOR INTERPRETING HEATING OIL TEST RESULTS	4	
B.	SAMPLE TEST REPORT FORMAT	5	

3. RECOMMENDED FUEL STORAGE PRACTICES

3.01 The first consideration in designing a fuel oil tank storage installation is adherence to the National Board of Fire Underwriters requirements. These standards classify fuels as Class I, II, and III, depending on their flash point. Any storage tank serving an oil burner in a building is known as a Class B installation.

3.02 The maximum permissible size of outside tanks depends upon the location and distance from the building. Construction and piping of storage tanks are subject to local codes, safety requirements, and/or insurance regulations.

3.03 Storage tanks should be located so that piping to oil burning installations is as short as possible. They can be equipped as follows:

- (a) **Fill Line:** This line should terminate outside any building in a curb box at least 2 feet away from any building. The line should be extended to near the bottom of the tank then turned 45° to create a turnover with each delivery.
- (b) **Vent:** The diameter of the vent should not be less than 1-1/4 inch and should be larger than the diameter of the fill line. The pipe should be provided with a flame arrestor and installed high enough to protect against blocking by snow, ice, or water. It may be equipped with a scavenging line for exhausting oil vapors in the event a man must be sent inside the tank. A vent whistle may also be provided for protection against overflowing of the tank.
- (c) A portable sludge pump connection is not always provided but can be of considerable service if sludge accumulates.
- (d) A steam smothering line for filling the tank with steam in case of fire or a foam system operated by city water.
- (e) A measuring well is provided for "sticking" of the tank to determine the amount of its contents.
- (f) A manhole is a very desirable provision. Should the fuel sludge, because of instability or abnormal length of storage, access to the tank for cleaning is required.
- (g) **Return Line:** Burner supply pumps usually discharge more fuel than required by the burners, and the excess is returned to the tank.

4. FUEL OIL PREHEATING

4.01 The heavy grades of fuel oil require conditioning by the application of heat before use. Preheating is employed to reduce the viscosity so that it can be pumped and atomized properly by the burner.

4.02 A number of factors affect the selection of a fuel oil preheating method. Three basic factors are:

- (a) Type of installation (commercial, industrial, etc)
- (b) Type of operation (automatic, semi, manual)
- (c) Type of fuel.

4.03 Four media for preheating fuel oil are in common use: steam, hot water, gas, and electricity.

- (a) With steam as the heating medium, the heater may be of the shell and tube or the bayonet type inserted in the tank. The steam method has several limitations; mainly, it is dependent on continuous firing of the boiler.
- (b) The hot water preheating method utilizes equipment similar to that used for steam. Because of the possibility that oil may penetrate into the boiler through a faulty heat exchanger, double transfer heaters are used. Steam condensate from preheaters should not be returned to the boiler.
- (c) The indirect gas fired preheating method is a package arrangement that uses gas as the primary energy source. It generates its own supply of low pressure steam in a closed vapor condensate cycle.
- (d) The electrical preheating method involves use of immersion heaters along with special designs for heating fuel oil circuits.

5. FUEL OIL ADDITIVE

5.01 KS-22565 is a combination of materials containing a detergent, a stabilizer, a metal deactivator, a corrosion protectant, a demulsifier, a biocide, and a combustion improver. It should be added at a rate of 1 gallon to 8000 gallons of fuel. Ideally, it should be added before each fuel drop to take

advantage of the natural mixing. If this is not practical, it should be added as soon as possible after delivery.

Caution: *While the vapor is nontoxic, adequate ventilation should be provided and contact with the skin, eyes, or clothing should be avoided. While contact with the skin generally will not produce excessive irritation, such contact should be held to a minimum. In case of contact with the skin, wash the skin thoroughly with kerosene and then with soap and water. In case of contact with the eyes, the eyes should be flushed with water for 15 minutes and then given medical attention.*

6. FUEL TESTING

6.01 The testing of fuel oil should be scheduled to ensure that the fuel oil in the storage facility remains acceptable for use.

6.02 Grades 1 and 2 should be tested annually by an approved testing laboratory as follows:

- (a) American Petroleum Institute (API) gravity at 60°F
- (b) Pour point
- (c) % Sulfur
- (d) Water and sediment.

6.03 Grades 4, 5, and 6 should be tested annually by an approved testing laboratory for:

- (a) Viscosity Saybolt at 100°F
- (b) Water and sediment
- (c) Pour point
- (d) % Sulfur.

6.04 Table A contains guidelines for interpreting heating oil test results. A suggested test report format for heating oil test results is shown in Table B.

7. WATER DETECTION AND REMOVAL

7.01 Free water (water not in emulsion with the fuel) will settle to the bottom of fuel storage tanks and must be pumped out.

7.02 Each storage tank should be checked for water accumulation at least once a year and prior to taking a fuel sample for testing. Water accumulation can be determined with a dipstick or gauging tape coated with water finder paste. The dipstick should be coated with water finder paste for at least the bottom 6 inches of the stick. The dipstick should be inserted through the measuring well until it touches the bottom of the tank.

Caution: *Do not drop the dipstick into the tank. Even though some tanks contain local reinforcement below dipstick openings, the bottom of the tank could be damaged.*

The instructions provided by the water finder paste manufacturer should be followed in the application of the paste and in interpreting paste color changes.

7.03 Some fuel tanks have water drain off piping built into the tank; and in some cases, this pipe is the only tank opening available for inserting the dipstick. In all cases, remove and discard the water drain off pipe prior to measuring the amount of water in the bottom of the tank.

7.04 A certain amount of water may be expected in any storage tank due to condensation of atmospheric moisture. The accumulation of water is an undesirable condition and any water should be pumped out as often as practicable. In any event, water must be pumped out before it reaches a maximum depth of one-half the distance from the bottom of the tank to the bottom of the suction line. Pump the water from the fill port by using a flexible suction hose or tube.

8. HEATING OIL SAMPLING PROCEDURES

Grades 1, 2, and 4 Heating Oils

8.01 For best results, samples from heating oil storage tank(s) should be taken at the same level as the bottom of the suction line, using the suction pump furnished with the sampling kit. Do not use the water drain-off pipe for sampling. If no other access port is available, remove and discard the water drain off pipe and use this tank port for sample taking. Consult the testing laboratory selected as to obtaining a sample kit, sample containers, quantity of sample required, and assistance in taking sample, if required.

TABLE A
GUIDELINES FOR INTERPRETING HEATING OIL TEST RESULTS

<u>TEST</u>	<u>Fuel Grade #1 and #2</u>		<u>RECOMMENDED ACTION</u>
	<u>CONDITION</u>		
	<u>#1</u>	<u>#2</u>	
API Gravity, °@60°F—not less than	35	30	See note.
Water & Sediment, %, maximum	0.05	0.05	Remove water & sediment.
Pour Point, °F, maximum	0	20	See note.
Sulfur, %, maximum	legal	legal	See note.

<u>TEST</u>	<u>Fuel Grades #4, #5, and #6</u>			<u>RECOMMENDED ACTION</u>
	<u>CONDITION</u>			
	<u>#4</u>	<u>#5</u>	<u>#6</u>	
Viscosity, Saybolt @100°F, sec.	45—125	>125—900	>900—9000	See note.
Water & Sediment, %, maximum	0.5	1.00	2.00	Remove water & sediment.
Pour Point, °F, maximum	20	—	—	See note.
Sulfur, %	legal	legal	legal	See note.

Note: Inform supplier fuel does not meet specifications for grade. Appropriate corrective action must be taken.

8.02 Use Fig. 1 as a typical sampling configuration; obtain fuel sample using the following set of instructions:

- (a) Check for water accumulation, as in Part 7, and pump all water from the bottom of the tank, if possible.
- (b) Unpack sampling kit and clean contents with a soft, dry cloth.
- (c) Wipe and clean dipstick used for water detection.
- (d) Attach flexible hose to dipstick using the tape provided with the kit and making sure that end of hose is about the same distance from the end of the dipstick as the bottom of the suction line is from the tank bottom.
- (e) Lower dipstick into tank through sample port until it touches bottom of tank.
- (f) Insert stopper securely into neck of test container.
- (g) Insert top portion of flexible hose securely into stopper.
- (h) Insert hand pump securely into stopper.
- (i) Operate hand pump until test container is half filled with fuel. (To stop fuel flow, break vacuum by carefully removing stopper.)
- (j) With a swirling action, empty contents of test container into oil waste container. (Do not empty container into heating oil tank.)
- (k) Reconnect sampling kit and once again operate hand pump until test container is half full. (Break vacuum by carefully removing stopper.)
- (l) Transfer heating oil sample from test container to sample container furnished by test-

TABLE B

SAMPLE TEST REPORT FORMAT

HEATING OIL TEST RESULTS REPORT

Lab. No.
Sample Date
Sample ID data

Fuel Grade

API Gravity, @60° F	*
Water & Sediment, %	*
Pour Point, ° F	*
Sulfur, %	*
Viscosity, Saybolt sec.	*

*Fuel does not conform to specifications for grade.
For recommended action, see Table A.

ing laboratory. Leave 25 percent air space in container to allow for vapor expansion. This will prevent leaking from internal pressure.

- (m) Place insert and cap securely onto sample container.
- (n) Dismantle sampling kit and clean all components with a soft, dry cloth.
- (o) Repack sampling kit to make ready for next test sample location.
- (p) Fill in mailing label on sample container, furnishing as much of the information as possible, as shown in Fig. 2.
- (q) Indicate on the label the port from which the sample was taken and distance from the tank bottom.

Grades 5 and 6 Heating Oils

8.03 For best results, samples from the heating oil storage tank(s) should be taken at the same level as the bottom of the suction line. A sampler called a "thief" is recommended for use in obtaining a sample. This device should be operated in accordance with the manufacturer's instructions.

8.04 Using Fig. 3 as a typical tank configuration, obtain heating oil sample using the following set of instructions:

- (a) Check for water accumulation, as in Part 7, and pump all water from the bottom of the tank, if necessary.
- (b) Lower clean, dry thief into tank to obtain sample at the same level as the bottom of the suction line.
- (c) Remove thief and transfer contents to the sample container. Close container immediately, and fill in sample identification label (Fig. 2) and forward to the testing laboratory.

8.05 Heating oil samples should be sent to the testing laboratory as soon as possible after the sample is taken. Samples that are contaminated in some way or mishandled (eg, subjected to excessive temperatures for long periods of time) will not give meaningful test results.

9. SECURITY OF STORAGE TANKS

9.01 All fuel oil filler pipes should be equipped with the proper type of locking device. Arrangements for the key distribution should be in accordance with acceptable security measures.

9.02 Annual physical checks should be made of all tank fill points, vents, and manholes.

9.03 Manhole entrances to fuel oil storage tanks should be equipped with a safe method of entering the tank.

10. SAFETY PRECAUTIONS

10.01 Contract fuel oil suppliers must take all precautions to protect the public against injury while delivering fuel oil to Telco buildings. Particular attention must be directed towards proper filling procedures to eliminate any possibility of overflowing of fuel oil in vent pipes.

10.02 The supplier must place adequate warning signs and protection against tripping hazards introduced by tank truck delivery hose.

10.03 No smoking shall be permitted in the area of truck or building while fuel tanks are being filled.

SECTION 770-210-306

10.04 All contract suppliers must produce sufficient insurance protection in keeping with Company policy.

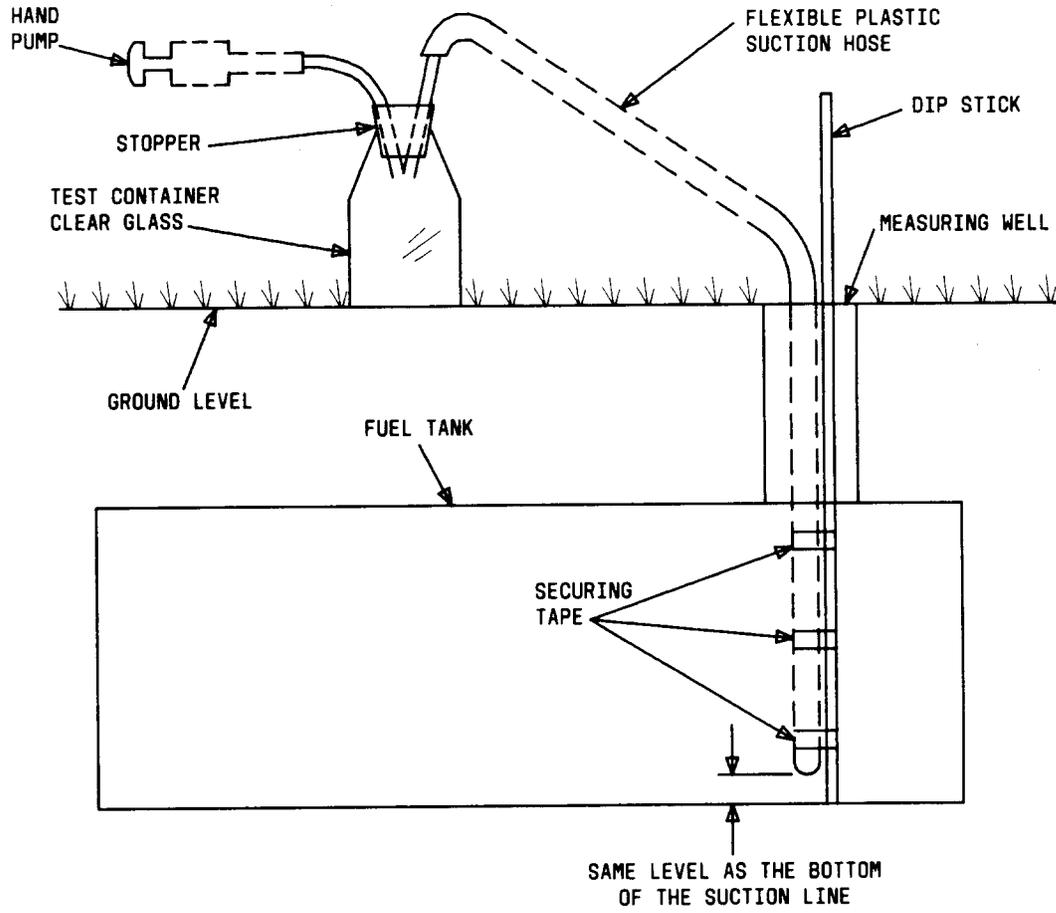


Fig. 1—Typical Configuration for Sampling Grades 1, 2, and 4 Heating Oil

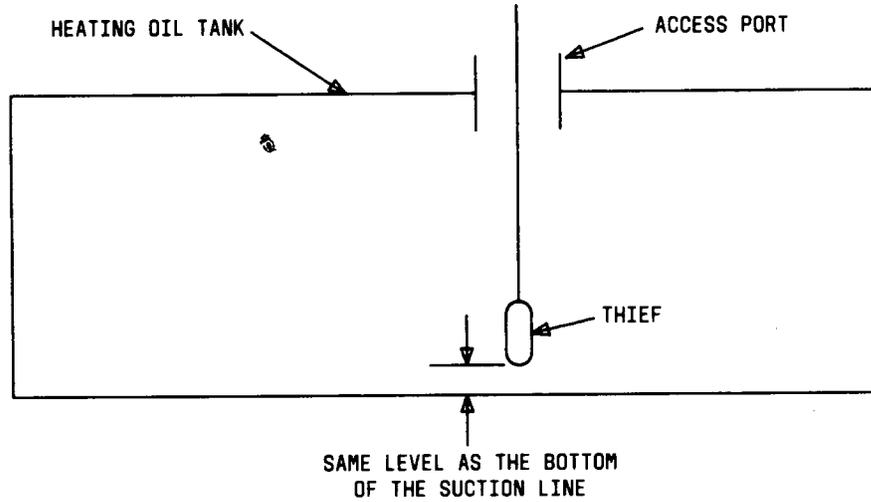


Fig. 2—Typical Sample Identification Label

COMPANY _____ AREA _____ DISTRICT _____
 DISTRICT OFFICE/BOCC ADDRESS _____
 CITY _____ STATE _____ ZIP _____
 DATE OF SAMPLE _____ GRADE OF FUEL OIL _____
 SAMPLE PORT LOCATION _____
 TANK NO. _____ BUILDING LOCATION CODE _____
 ADDRESS OF TANK LOCATION: STREET _____
 CITY _____ STATE _____ ZIP _____
 NO. OF GALLONS IN TANK WHEN SAMPLE TAKEN _____
 TANK CAPACITY _____ PREVIOUS SAMPLE DATE _____
 SAMPLE TAKEN _____ INCHES FROM TANK BOTTON _____

Fig. 3—Typical Configuration for Sampling Grades 5 and 6 Heating Oil