FIRE DEPARTMENT • CITY OF NEW YORK

STUDY MATERIAL
CERTIFICATE OF FITNESS FOR
SUPERVISE FUEL-OIL TRANSFER IN BUILDINGS

P-98

This booklet is provided for free to the public

All applicants are required to apply and pay for an exam online before arriving at the FDNY. It can take about 30 minutes to complete.

Simplified instructions for online application and payment can be found here:

http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf

Create an Account and Log in to:

http://fires.fdnycloud.org/CitizenAccess

INCLUDED IN THIS BOOKLET YOU WILL FIND THE FOLLOWING:

- **THE P-98 NOTICE OF EXAMINATION (NOE)**
- **P-98 STUDY MATERIAL, INCLUDING AN APPENDIX**

TO HELP YOU UNDERSTAND WHICH CERTIFICATE OF FITNESS YOU SHOULD APPLY FOR, PLEASE NOTE THE FOLLOWING:

- If you are: SUPERVISING THE TRANSFER OF FUEL OIL BY A **TRANSFER PUMP OR AUTOMATIC PUMP** FROM A TANK ON THE LOWEST FLOOR TO A TANK OR EQUIPMENT INSTALLED ABOVE SUCH FLOOR → **YOU NEED THE** P-98 C of F

- If you are: SUPERVISING THE TRANSFER OF DIESEL FUEL OIL TO FILL AN EMERGENCY GENERATOR STORAGE TANK BY **MANUAL MEANS** IN A BUILDING CONSTRUCTED PRIOR TO DECEMBER 6, 1968 → **YOU NEED THE** C-92 C of F

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EXAM SPECIFIC INFORMATION FOR
P-98 CERTIFICATE OF FITNESS

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REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION

General requirements:
Review the General Notice of Exam:
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special requirements for the P-98 Certificate of Fitness:
Individuals who renew their W-98 Certificate of Fitness will receive P-98 Certificate of Fitness cards. The P-98 Certificate of Fitness card must indicate the COF holder's work address on the new COF card. W-98 COF cards are no longer renewable.

Application fee (Cash is NO LONGER ACCEPTED):
Pay the **$25** application fee online or in person by one of the following methods:

- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)
- In person: Personal or company check or money order (*made payable to the New York City Fire Department)*

A convenience fee of 2% will be applied to all credit card payments.

For fee waivers submit: ***(Only government employees who will use their COF for their work- related responsibilities are eligible for fee waivers.)***

- A letter requesting fee waiver on the Agency's official letterhead stating applicant full name, exam type and address of premises; ***AND***
- Copy of identification card issued by the agency

REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE (AIP)

The P-98 Certificate of Fitness can be obtained by the alternative issuance procedure. Qualified applicants should review and complete the P-98Certificate of Fitness Alternative Issuance Procedure Application Affirmation Form:

https://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-p98-aip.pdf

The AIP applicants must submit the application, required documents and payment on **FDNY Business**:

https://fires.fdnycloud.org/

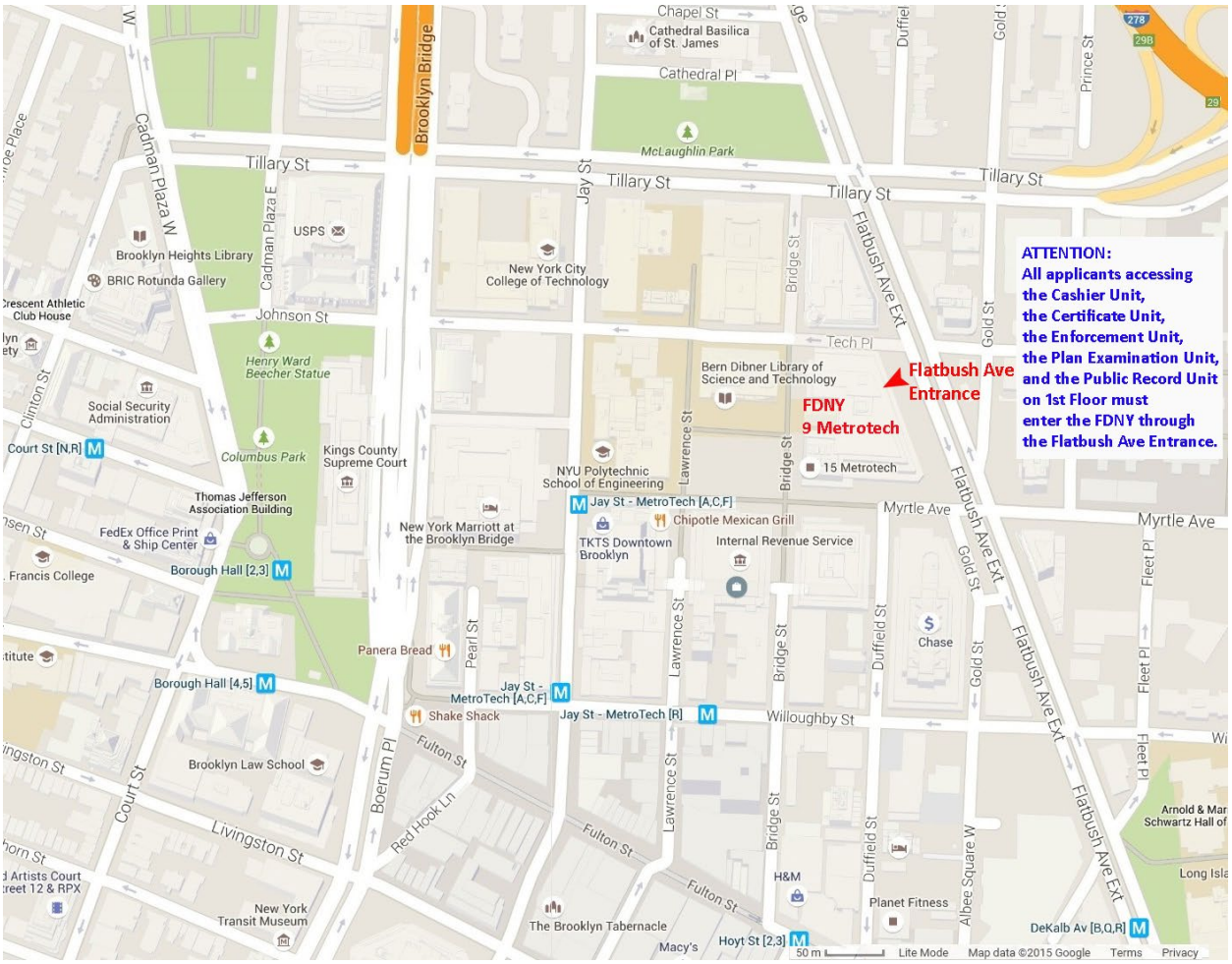
EXAM INFORMATION

The **P-98** exam will consist of **35** multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limit exam. Based on the amount of the questions, you will have 53 minutes to complete the test. A passing score of at least 70% is required in order to secure a Certificate of Fitness.

Call (718) 999-1988 for additional information and forms.

Please always check for the latest revised booklet at FDNY website before you take the exam.
http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-p98-noe-study-materials.pdf

EXAM SITE: **FDNY Headquarters,** 9 MetroTech Center, Brooklyn, NY. Enter through the **Flatbush Avenue entrance (between Myrtle Avenue and Tech Place)**.



RENEWAL REQUIREMENTS

General renewal requirements:
Review the General Notice of Exam:
https://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf

Special renewal requirements. P-98 Certificate of Fitness: None

QUESTIONS?

FDNY Business Support Team: For questions, call 311 and ask for the FDNY Customer Service Center or send an email to FDNY.BusinessSupport@fdny.nyc.gov.

ABOUT THE STUDY MATERIAL

This Study Material contains some of the information you will need to prepare for the consolidated examination for the Certificate of Fitness for Supervision of Fuel-oil Transfer in Buildings (P-98). The study material includes information taken from the relevant sections of the Chapter 6 of the New York City Fire Code and Chapter 13 of the New York City Mechanical Code. Other study material information provides guidance on the proper operation and maintenance of fuel-oil piping and storage systems.

All questions on the Certificate of Fitness examination are multiple choice, with four alternative answers to each question. Each question has only one correct answer. If you do not answer a question or if you mark more than one answer you will be scored as incorrect. A score of not less than 70% correct is required on the examination in order to qualify for the Certificate of Fitness. Read each question carefully before marking your answer. There is no penalty for guessing.

SAMPLE QUESTIONS

The following questions represent the "format" of the exam questions, not the content of the real exam.

1. Which of the following are allowed to be used while taking a Certificate of Fitness examination at 9 Metro Tech Center?

I. cellular phone
II. study material booklet
III. reference material provided by the FDNY
IV. mp3 player

A. III only
B. I, II, and III
C. II and IV
D. I only

Only reference material provided by the FDNY is allowed to be used during Certificate of Fitness examinations. Therefore, the correct answer would be A. You would touch "A" on the computer terminal screen.

2. If the screen on your computer terminal freezes during your examination, who should you ask for help?

A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. the computer help desk

If you have a computer related question, you should ask the examiner in the testing room. Therefore, the correct answer would be C. You would touch "C" on the computer terminal screen.

3. If you do not know the answer to a question while taking an examination, who should you ask for help?

A. the person next to you
B. the firefighters in the testing room
C. the examiner in the testing room
D. you should not ask about test questions since FDNY staff cannot assist applicants

You should not ask about examination questions or answers since FDNY staff cannot assist applicants with their tests. Therefore, the correct answer would be D. You would touch "D" on the computer terminal screen.

1. INTRODUCTION

Fuel-oil is generally used in buildings in stationary equipment for two purposes, either to fuel emergency generators or to fuel equipment used to heat the building. Regardless of the use, the person supervising the **Fuel-Oil Transfer in the Building** from one floor to another must hold a P-98 Certificate of Fitness. Certificate of Fitness holders must maintain all qualifications and comply with all requirements applicable to such certificate holders throughout the term of their certificate. The P-98 Certificate of Fitness is premise-related.

The use of the word **"should"** throughout these study materials generally refers to policies, procedures and/or best practices recommended by the FDNY, and may not be a codified requirement.

The use of the word **"shall"** throughout these study materials generally refers to a requirement of the Fire Code or the FDNY.

1.1 SUPERVISION OF FUEL-OIL PIPING AND STORAGE OPERATION

A stationary fuel-oil storage tank, and related piping, that is installed on the lowest floor of a building and that transfers fuel-oil through piping to another stationary fuel-oil storage tank, or to fuel-oil burning equipment, installed above such floor, shall be **under the GENERAL SUPERVISION** of a P-98 Certificate of Fitness holder. The periodic inspection and testing of such tanks and piping shall be conducted **under the PERSONAL SUPERVISION** of such P-98 Certificate of Fitness holder.

1.2 MAINTENANCE REQUIREMENTS

Periodic Inspection and Testing

- Fuel-oil storage tanks and piping systems shall be inspected at least once **WEEKLY** for any evidence of leaks.
- Fuel-oil storage tanks subject to this section shall have their float switches tested at least once **WEEKLY** to ensure that they are in good working order.

1.3 LICENSES AND CERTIFICATES

No oil burning equipment may be operated until a certificate of compliance has been issued by the NYC Department of Buildings (NYCDOB), the requirements of the NYC Department of Environmental Protection (NYCDEP) air pollution control code have been met, and a permit for the storage and use of fuel-oil has been issued by the NYC Fire Department.

This COF is required for all existing and new buildings where fuel is being transported from the lowest levels to tanks or equipment on upper floors pursuant to the new NYC Fire Code and Mechanical Codes.

2. OIL CIRCULATION IN THE SYSTEM

The following material provides an overview description of the process of oil circulation from the tank at the lowest floor of a building to the burner on the floor above such floor through the pump. When reading the following, refer to **DIAGRAM #1** on the APPENDIX page.

The oil storage tank provides the supply of oil for combustion in the oil burner. It is inside a dike. In case of a leak the diked area will contain the oil. In its normal condition, #2 fuel-oil is thin and light and is easily pumped through the circulation system.

A suction pump circulates the oil throughout the system. Dirt and sediment are present in the fuel-oil coming from the oil storage tank. The oil filter removes most of these contaminants from the oil before the oil reaches the burner's strainer. The suction line has to be 6 inches from the bottom of the tank for sediments not to be absorbed. The vacuum gauge is a device that measures pressure below atmospheric pressure. Excessive vacuum readings indicate that there is an obstruction in the suction line (such as dirty oil strainer). When this occurs the flow of oil can be stopped by closing the shut-off valve. This permits the operator to clean the filter/strainer or to perform other maintenance.

MAIN OIL STORAGE TANK ON THE LOWEST LEVEL

MAIN OIL STORAGE TANK DIKE

The main fuel valve is electrically operated and will open or close the line leading to the atomizer **only for oil burners.** It will shut down the burner system if there is a failure of ignition or combustion.

Oil circulates through the piping system back to the storage tank through the oil return line. A back pressure relief valve is provided for safety if the pressure becomes too great. Day tanks may be located throughout the building above the lowest floor.

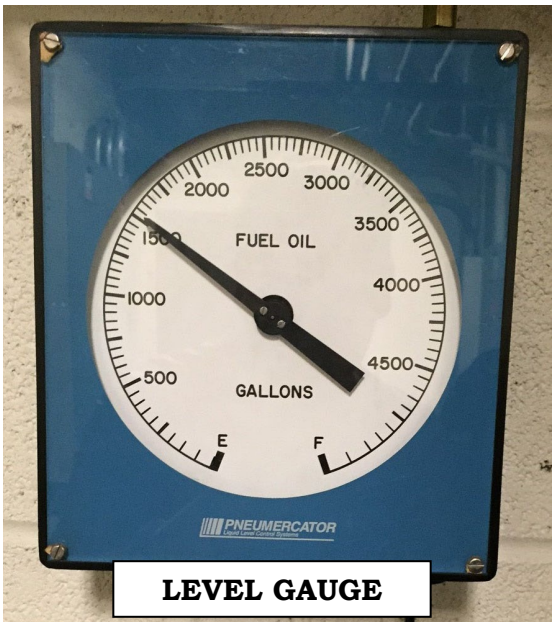
A separate pump is required for each day tank to supply each floor. In case of a leak in the piping, leak collector is provided. Leak collector is stored by the storage tank. It has a oil level gauge which shows the amount collected.

DAY TANK FILTER

LEAK COLLECTOR INSIDE THE WALLS

LEAK COLLECTOR WITH OIL LEVEL GAUGE

A gauge will show how much fuel oil is inside a main storage tank/day tank. An example can be seen on image.



LEVEL GAUGE

2.1 OIL BURNER OPERATION

Combustion is the chemical union of the oxygen in the air with combustible elements in fuel-oil (hydrogen and carbon). The end result of this process is the production of heat energy. Oil firing equipment is used to liberate heat energy from fuel-oil. Oil burners are the principal components of the oil firing equipment and provide the means of supporting the process of combustion.

Carbon and hydrogen are the two principal elements of fuel-oil. During the combustion process, the carbon content of fuel-oil (about 85%) unites with the oxygen in the air and forms carbon dioxide and carbon monoxide. The hydrogen content of the oil (about 14%) unites with the oxygen and produces water. The objective is to have a complete combustion process. This objective is met when fuel-oil combines with the greatest possible amount of oxygen.

It must be changed to a gas or vapor and mixed with air in order to support combustion. An oil burner is primarily a device for processing the liquid fuel for combustion by accelerating the change from liquid to a vapor that can be mixed with air and burned. This process of breaking down or atomizing the oil is necessary to ensure prompt ignition and rapid combustion. Although there are various types of oil burners, i.e. generator or boiler, they all vaporize or atomize the oil before it enters the combustion chamber where it is mixed with air in predetermined proportions.

An oil burner uses an oil pump and mixes air and oil within the nozzle itself. In oil burners, the oil and air mixture is delivered to the nozzle at a pressure dependent upon the make of the burner. The air that contacts the oil prior to its leaving the nozzle is referred to as primary air. The introduction of air from the blower or fan into the combustion chamber after the oil has left the nozzle is referred to as secondary air. Every brand of oil burner is essentially different from that of other manufacturers. Diesel generators use injection nozzles without primary air, thus it is important that an operator of a system understand the functions of his/her particular system completely.

Oil burners require approximately 2000 cubic feet of air per gallon of oil consumed. The mixture of oil and air is sprayed in vapor form into a firebox area (the combustion chamber) where combustion takes place. The mixture of air and fuel in the burner must be strictly controlled; otherwise it could become an explosive mixture. During the process of combustion, one part of carbon unites with two parts of oxygen to produce carbon dioxide (CO_2). Each time 1 pound of carbon is burned, 14,544 BTU of heat are liberated. Carbon dioxide is recognized as the end product of complete combustion. Should fuel be supplied without the proper amount of oxygen, carbon dioxide and soot will be produced.

It would be produced at 4,480 BTU at heat liberated. Carbon monoxide is considered as the end product of incomplete combustion. In addition to being inefficient in the production of heat, the presence of carbon monoxide is highly dangerous.

If the proper amount of air has been thoroughly mixed with the oil, and the temperature of the flame is correct, the free carbon burns completely. A correctly adjusted oil burner flame will have an:
Orange-colored flame body with small red tips. The tips will be slightly cloudy.

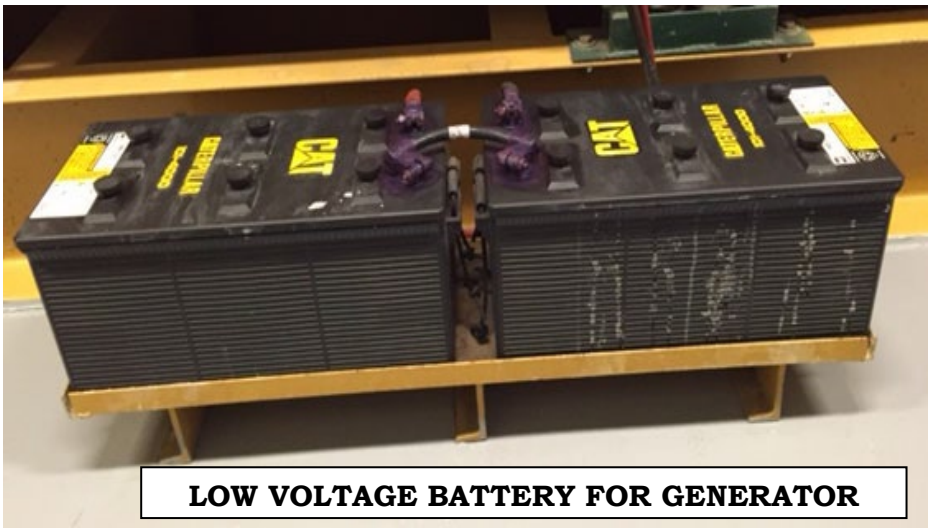
A red, smoky flame is an indication of a lack of air.
A white, almost dazzling flame is an indication of a great amount of excess air.

An insufficient air supply is one cause of dense, black smoke and soot; an excessive air supply can put out the flame.

The oil spray entering a combustion chamber burns in suspension. If any part of the spray mixture contacts the walls of a combustion chamber, it will cause a smoky fire. Over a period of time carbon deposits may build up in the combustion chamber and cause a burner failure.

Insulated firebrick makes up the walls of a combustion chamber. Insulated firebrick is lightweight firebrick that becomes cherry red 15 seconds after the burner starts. The refractory material in a combustion chamber should be closed to the flame and the oil should be burned by the reflected heat. Reflected heat, which increases combustion efficiency, is heat that is reflected back into the combustion chamber and maintains the fire after the ignition is turned off.

1. Diesel generators operate differently. They have an internal combustion engine. Air is compressed by a piston and diesel fuel is injected into the cylinder. The mixture ignites and turns the engine. Insufficient compression air or a clogged ignition nozzle will result in improper combustion. The output will be black smoke and excessive vibration of the engine. Diesel generators should be tested at minimum monthly.



LOW VOLTAGE BATTERY FOR GENERATOR

2. Generators are used as an emergency power supply if the grid fails. They range from 1k VA - 10k VA for small portable diesel generators and 8kVA – 2000k VA for large office complexes, factories and power stations. Diesel generators also provide back up power to utility grids. Power failures are particularly critical for hospitals and large offices. Computer service centers have emergency power generators which are typically powered by diesel fuel and configured to start automatically, as soon as a power failure occurs. Power generators are selected based on the load they are intended to supply. Ideally diesel engines should run at least around 60-75% of their maximum rated load, and at around 75% of their maximum speed, and must be test run every month to avoid damage under certain conditions that occur when an engine is left idling as a 'standby' generating unit ready to run up when needed.

Fuel-oil comes in several grades, from range oil or no. 1 fuel-oil, to diesel oil or no. 2 fuel-oil; to the heavier no. 4, no. 5, and no. 6 fuel-oils. Strainers and or filter are required in the oil line to separate dirt and sediment. The grade of fuel-oil used in a burner shall be that for which the burner is approved and as stipulated by the burner manufacturer. Oil containing gasoline shall not be used. Waste crankcase oil shall not be used, except when such waste oil is mixed with number six fuel-oil in bulk or waste oil recovery plants. The resultant mixture meets the minimum specifications for number six fuel-oil set forth in the NYC Building Code, and the use of such waste oil complies with all laws, rules and regulations relating to smoke and other emissions and is approved by the NYC Department of Environmental Protection. Approval from the NYC Department of Buildings and FDNY is required before changing any grade of fuel-oil.

2.2 OIL BURNER CONTROLS

The following information describes the various controls and devices of an oil burner system.

1. As described earlier, the fuel-oil is stored in the oil storage tank.
2. The tank shut-off valve permits the operator to stop the flow of oil to clean the strainer and to perform other maintenance.
3. An oil filter/strainer separates dirt and sediment from the fuel-oil coming from the storage tank.
4. A vacuum gauge is used to indicate to the operator whether there is an obstruction in the suction line (e.g., the oil filter/strainer is dirty and requires cleaning).
5. The main fuel valve is an electrically operated valve that will open or close the line leading to the atomizer of the oil burner. An oil burner is activated by the primary control. The burner shut-off valve is located as close as possible to the burner to reduce the amount of oil remaining in the burner line after an emergency shutdown.
6. The mixture of fuel-oil and air is ignited at first by electric ignition. After ignition, combustion is maintained by retained heat in the combustion chamber.
7. A photoelectric cell is a flame detection control. It is a device that will shut down an oil burner if a flame is not visible to the scanner or photoelectric cell. A dangerous condition will arise if oil is pumped into the combustion

chamber, but not burned. Atomized, unburned fuel could cause an explosion if a spark or other source of ignition occurs.

8. An aquastat operates the oil burner in the summer for domestic hot water needs.
9. The low water cut-off is an automatic electric control that will shut the burner off when the water level is below a safe operating point. A shortage of water in the steam boiler could lead to a dangerous condition.
10. Gauge glass is a device used to indicate the water level of a steam boiler. It is the most important control on the steam boiler. Gauge glass should have water visible when the boiler is in operation.
11. A primary relay control is the main combustion controller. A primary relay control will shut down when no flame is detected. A spark could cause an explosion in the combustion chamber.
12. A smoke alarm is a device mounted on the smoke stack or chimney only if the maximum fire rate is 20 gallons per hour or over. A smoke alarm will shut down an oil burner, and put on an alarm if there is excessive smoke or if the fire is improper. A dangerous condition would exist if all the oil was not being burned or properly atomized, or too much oil was admitted to the combustion chamber. If the condition is not corrected, an explosion may occur. The smoke alarm is also a required combustion and air pollution control.
13. A steam pressure gauge shows the steam pressure inside the steam boiler. The pressure gauge reads in psi (pounds per square inch). It is located on or near the top of the steam boiler. Normal steam pressure for low pressure boilers does not exceed 15 psi. (If the indicated stream pressure is significantly greater than the normal pressure, the best action is to shut down the system and call 911 since this is a serious problem.)
14. The safety or pop-off valve is a device used to relieve excessive steam pressure. It is located on or near the top of a steam boiler.
15. Glazing occurs because of low combustion temperatures and pressures in the engine cylinder.

2.3 EFFECTS OF IMPROPER OPERATION OF AN OIL BURNER SYSTEM

Several conditions can lead to improper operation of an oil burner system and to possibly dangerous situations:

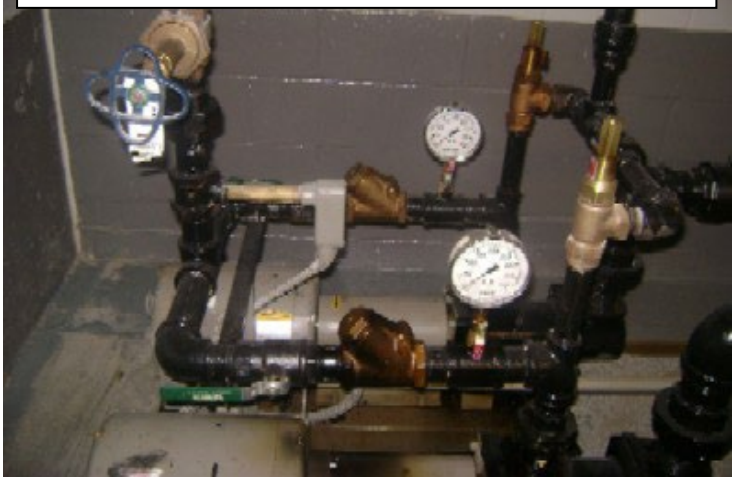
- A defective oil cut-off valve can lead to after-drip. This is a very common condition. The oil drips into the combustion chamber when the burner is off. The excessive oil is absorbed by the combustion chamber floor and walls. This causes the burner to be unusually noisy when it starts up or shuts down. It will eventually lead to a carbon deposit build-up and to a less efficient operation of the burner. After-drip is also dangerous in that it may lead to fire on the floor in front of the heating unit.
- A leaking seal on an oil pump shaft bearing may also cause oil to leak on the floor in front of the heating unit. The leaked oil may lead to fire on the floor in front of the heating unit.
- Dirty or damaged nozzles or rotary cups can cause improper atomization. This will eventually lead to a carbon deposit build-up in the combustion chamber.
- Blockage in the chimney or flue passage will cause the cellar or boiler room to become filled with smoke.
- Water in the fuel-oil or the wrong grade of fuel-oil will cause improper atomization.
- The protective relay is supposed to shut down the oil burner if a flame is not established quickly. A delay in ignition is the most common cause for burner puff-back. Puff-back can cause the boiler door to blow open and the smoke pipe to fall down.

One of the most dangerous conditions that may occur is when the oil burner becomes operational but the source of ignition fails. If proper ignition has not occurred the only indication of flame failure may be a strong odor of fuel-oil in the area. Vaporized oil looks like condensed steam; it is pure white but smells and tastes like fuel-oil. When this condition is present the burner should be shut off immediately and the area should be completely vented. Any possible source of ignition should be eliminated, **NO** attempt should be made to light the burner until the system has been completely cleared of combustible mixtures. Preventive maintenance should be done regularly to maintain reliability of the equipment and control devices. Regular preventive maintenance also reduces the need for repair. Cleanliness and good housekeeping practices will also contribute to the prevention of fire and explosion.

3. FUEL–OIL PIPING AND STORAGE

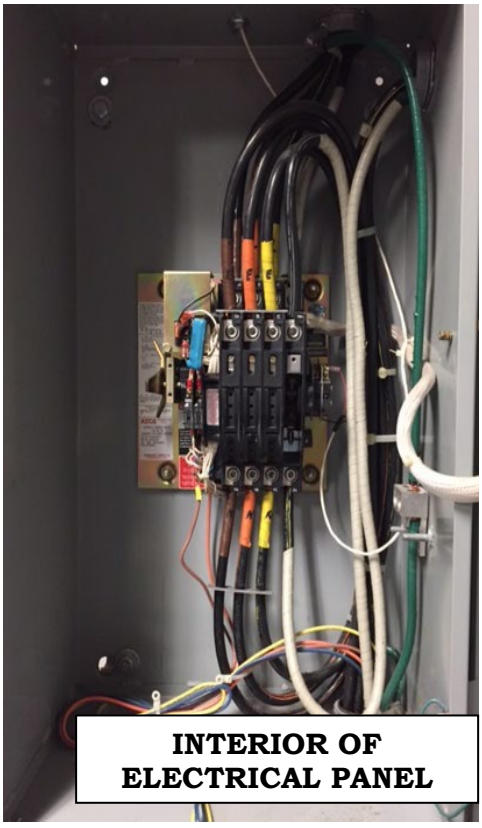
All fuel-oil piping, equipment and appliances must be protected from physical damage. Piping serving equipment at levels above the lowest floor must have adequate clearance from combustible construction, and be secured from any movement.

PUMP CONNECTED TO PIPING WITH THE PRESSURE GAUGE AND CONTROL VALVES



The installation shall be readily accessible for cleaning hot surfaces; removing burners; replacing motors, controls, air filters, chimney connections, draft regulators, and other working parts; and for adjusting, cleaning and lubricating parts. The equipment must have the means of access for ordinary operation and maintenance.

Working clearances between oil-fired appliances and electrical panel boards and equipment shall be in accordance with the NYC Electrical Code. Clearances between oil-fired equipment and oil supply tanks shall be in accordance with the construction codes, including the NYC Building Code and the Mechanical Code.



INTERIOR OF ELECTRICAL PANEL

The Mechanical Code requires that all fuel-oil piping and storage tanks be *hydrostatically* tested for tightness by the installing contractor before the work is closed-in and before the system is operated. The piping shall be tested at 150% percent of the maximum working pressure applicable to that part of the piping system, but at a pressure less than the test pressure required for the storage tank. The hydrostatic pressure shall be maintained until all joints and connections have been visually inspected for leaks, but in no case for less than for half an hour. A record shall be kept of the pressure tests showing the name of the contractor and the pressures at which the piping and tank were tested. Supply piping must connect to the top of the fuel-oil tank. Piping from a transfer pump to a day tank is required to be enclosed in a shaft of 4-inch thick concrete or masonry with a 4-inch clearance to the fuel pipe. The spaces between the fuel pipe and sleeve or shaft must lead to an open sight drain or an open sump so leaks can be detected. The NYC Construction Codes require that pipe shafts containing piping from transfer pumps to

storage tanks above the lowest floors not be penetrated by or contain other piping or ducts.

DAY TANK ALARM PANEL

Non-portable fuel-fired appliances, devices, equipment and systems shall be operated and maintained in accordance with the construction codes, including the Fuel Gas Code and the Mechanical Code.

No combustible materials shall be stored in the equipment or generator room.

GENERATOR CONTROLS

3.1 FUEL-OIL TYPE

All appliances must be designed for the specific type of fuel to be used, such as no. 2, no. 6, diesel, etc. Such appliances must not be converted from the fuel specified on the rating plate for use with a different fuel without securing written approval from the **NYC Department of Buildings**.

3.2 FUEL TANKS, PIPING AND VALVES

The tank, piping and valves for appliances burning oil must be installed in accordance with the requirements of the NYC Construction Codes. When oil burning equipment is served by a tank which is above the level of the burner inlet connection, and where the fuel supply line is taken from the top of the tank, an approved anti-siphon valve or other siphon-breaking device must be located at the highest point in the supply line.

Fuel-oil piping (brass, copper, copper-alloy, steel, nonmetallic) must comply with the applicable ASTM (American Society for Testing and Materials) standard. All nonmetallic piping must be listed and labeled as being acceptable for the intended application for combustible liquids. Nonmetallic piping must be installed only outside, underground. The fuel-oil system must be sized for the maximum capacity of fuel-oil required.

3.3 INSPECTION CHECKLIST

The P-98 Certificate of Fitness holder should make regular inspections of oil burning equipment while in operation. These inspections vary depending on the location and on the equipment installed; however, the following general guideline will apply for all locations:

- The fuel-oil storage tanks and piping systems in which fuel-oil is transferred from a stationary fuel-oil storage tank installed on the lowest floor of a building to another stationary fuel-oil storage tank installed on the lowest floor of a building to another stationary fuel-oil storage tank, or to fuel-oil burning equipment, installed above such floor, shall be inspected for evidence of leaks. Stationary tank float switches shall be tested to ensure that they are in good working order, on **not less than a weekly basis**.
- Any potential malfunction or hazard where oil burning equipment systems are operated must be corrected immediately by the representative of the manufacturer or an authorized professional in accordance with the manufacturer's instructions. Especially repairs such as the replacement of fuel oil pump, piping, or tank. Minor repairs such as replacement of the fill box or replacement of pipe cover may be repaired by COF holder after consulting with the equipment manufacturer.
- Proper and continuous operation of the indoor mechanical ventilation systems must be checked, and the environmental conditions and operating temperature must be monitored.
- Rubbish and other combustible waste must not be allowed to accumulate indoors. This is a fire hazard, and may be easily ignited. All rubbish and other combustible waste should be promptly removed from the premises.
- Manufacturers specified clearances, minimum ceiling heights for indoor units and minimum unobstructed floor area around units must be verified and maintained.

3.3.1 Instruction Cards

For oil burning systems, cards giving complete instructions for the care and operation of the system shall be furnished and shall be permanently located in an easily visible and accessible location by the P-98 Certificate of Fitness holder.

3.3.2 Inspections and Tests

All oil burning equipment and piping must be inspected **AT LEAST ONCE A WEEK,** and the **float switch** tested **weekly** by the P-98 Certificate of Fitness holder. Shall the inspection identify any malfunction, the system must be shut down immediately and the results of such inspection must be recorded in the logbook.

AIR LOUVER WITH ELECTRICAL MOTOR

Environmental conditions are critical; the air louver seen above helps to regulate the temperature in the room for the generator, and also helps to regulate in extreme weather conditions.

3.3.3 Operator's Inspection after Repair

After any repair is made to the piping or oil burner equipment by a licensed or qualified contractor(s), the system must be checked by the Certificate of Fitness holder to determine whether all required controls and safety devices are functioning properly.

3.4 TERMINAL OPENING

The fill opening must be equipped with a tight metal cover to discourage tampering, and must be routinely inspected by the P-98 Certificate of Fitness holder.

3.5 FLOW CONTROL DEVICES TO OIL BURNER:

1. The pressure in oil lines to oil-burning equipment located above the lowest floor must not be more than is required to circulate oil to and from the burners, and all parts of the oil system must be capable of withstanding the maximum working pressure in that part of the system.
2. A remote control must be provided to stop the flow of oil to any burner. Such control must be located outside the entrance to the room in which the burner is located and as close to such entrance as practicable, except that when an outside location is impracticable, such control may be located immediately inside the room in which the burner is located, provided such location is accessible at all times. All such controls must be permanently labeled: "***REMOTE CONTROL FOR OIL BURNER***".
3. In systems where air is used for atomizing the oil, the oil and the atomizing supply must be interlocked. In case the system fails, such as when the supply is interrupted, both shall be immediately shutdown.

3.6 FUEL-OIL STORAGE

Quantities of fuel-oil storage in a building shall be limited in accordance with the requirements of the NYC Construction codes. Fuel-oil stored on roofs or below grade must be deemed inside the buildings. A total of not more than **100,000 gallons** shall be stored inside any building. **Fuel-oil above the lowest floor inside of a building** shall be limited to **330 gallons per story**. These "day tanks" must be provided with secondary containment of a capacity at least **two** times the capacity of the tank served. The float switch provided within the containment area shall be arranged so as to sound an alarm and stop the transfer pump in case of failure of the tank or the control in the tank. Fuel-oil tanks and fuel-oil burning equipment must be located in a dedicated room or enclosure having a fire resistance rating of at lease 2 hours.

DAY TANK INSIDE A DIKE

3.7 ABATEMENT OF AIR CONTAMINANTS

All heating and combustion equipment that is fired with fuel-oil shall be vented and comply with the requirements of the NYC DEP (Department of Environmental Protection) air pollution control code.

3.8 EQUIPMENT CLASSIFICATION:

(1) **LOW TEMPERATURE EQUIPMENT**

Equipment whose products of combustion at the point of leaving the equipment have a temperature of 600 deg Fahrenheit or less under normal conditions.

(2) **MEDIUM TEMPERATURE EQUIPMENT**

Equipment whose products of combustion at the point of leaving the equipment have a temperature between 600 and 1000 deg Fahrenheit under normal operating conditions.

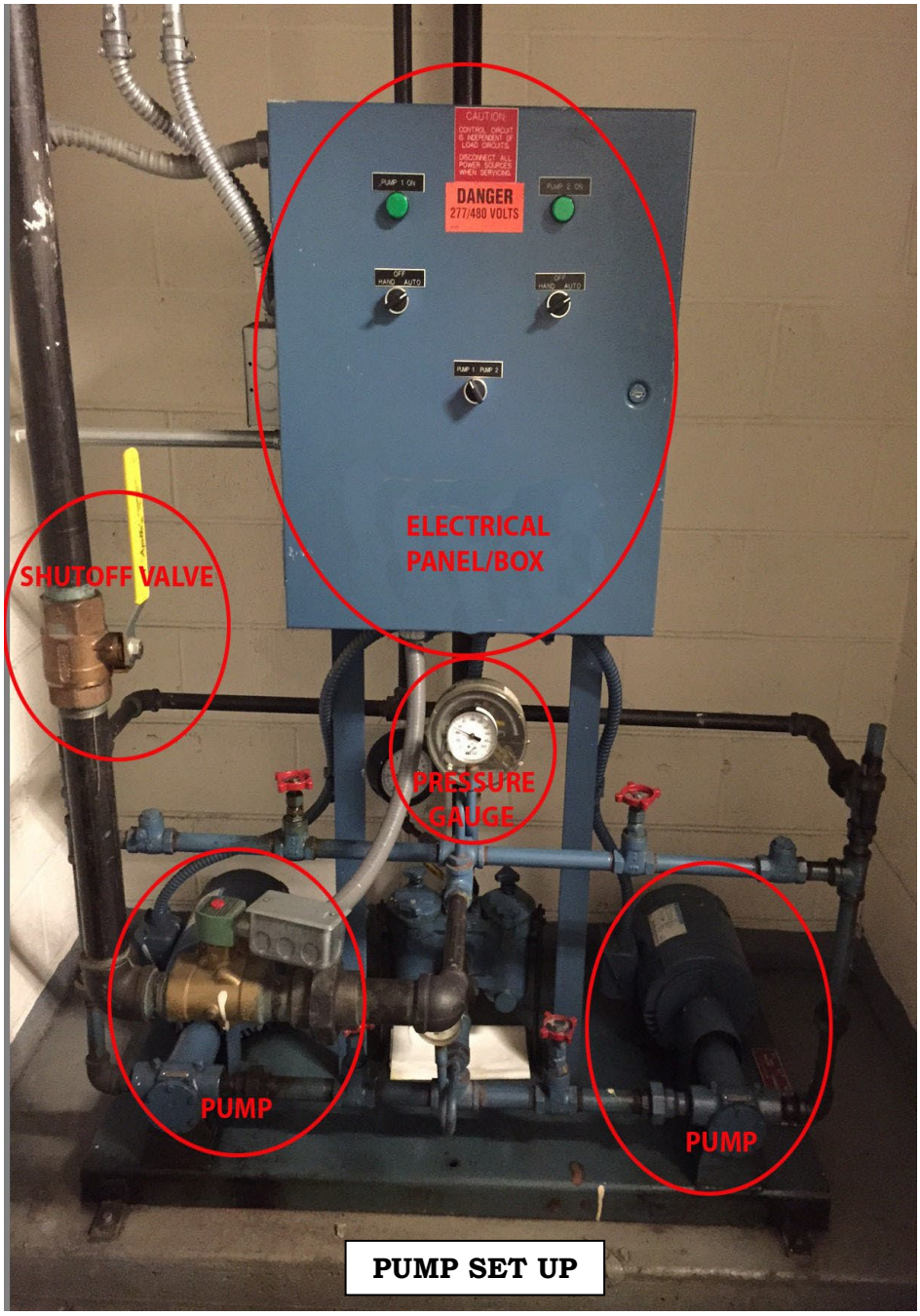
(3) **HIGH TEMPERATURE EQUIPMENT**

Equipment whose products of combustion at the point of leaving the equipment have a temperature of 1000 deg Fahrenheit or greater under normal operating conditions.

4. PUMPS

4.1 TRANSFER PUMPS

Fuel-oil tanks must be filled by a transfer pump supplied from a primary storage tank located on the lowest floor. A separate transfer pump and piping circuit must be provided for each storage tank installed above the lowest floor. Appropriate devices must be provided for automatic and manual starting and stopping of the transfer pumps so as to prevent the overflow of oil from these storage tanks.



PUMP SET UP

4.2 MULTIPLE PUMPS

When two pumps are used to form a duplex pump set, each pump is selected to provide 100% capacity so that there is complete redundancy. When three or more pumps are used, there are more possible options. Very large pump sets often have three 50% pumps so that any two pumps will provide 100% of the maximum required flow. If the load is reduced, say in a burner, one pump may be adequate and the electrical demand will be reduced.

4.3 EMERGENCY VENTS

The NYC Mechanical Code allows fuel-oil to be stored in tanks listed by Underwriter's Laboratory to Standard UL 142. Such tanks are required to be provided with emergency venting in addition to normal venting. The use of a self-closing manway cover, that is with long bolts that permit the cover to lift under internal pressure, or other type emergency relief vent device, to provide for emergency venting is **prohibited**. Emergency venting is required for such tanks to help maintain the integrity of the tank when exposed to fire. If emergency venting is not provided for such tanks, and the tank is exposed to fire conditions for a sufficient period of time, the tank will rupture.

The normal and emergency vents are required to be combined. For tanks installed above the lowest floor, such combined vents must be piped, in an approved manner, into the vent or top of the tank of the lowest floor storage tank that supplies fuel to the tank.

4.4 DISCHARGE PRESSURE REQUIREMENTS

The pressure required at the discharge of the pump will be the pressure required at the point of use plus the friction losses in the intervening piping with the installation of a back pressure regulating valve. Pressure and air atomizing burners may require that relatively high pressure be provided by the pump set if there is no pump on the burner itself. The valve should be sized so that the pressure buildup (in the case of a back-pressure valve) or drop (in the case of a pressure regulator) is small.

4.5 AUTOMATIC PUMP ALTERNATION

When pumps are started and stopped remotely, it is desirable to alternate the operation of the pumps. This way, run time is spread equally between units. In this case, if one unit should fail to operate, the pump that handles the “last call” for operation would be available as back-up.

4.6 AUTOMATIC VALVES

When one fuel-oil pump set is used to maintain the level in multiple day tanks, automatic valves are required to isolate the tanks from one another. This assures that when the pumps operate, only those tanks that require fuel receive fuel.

4.7 OPERATION AFTER REPAIRS

After any repairs are made to a generator or fuel burning equipment for which licensed or qualified operators are required, such operators shall check the repairs, together with the functioning of all control devices and the positioning of the valves. These licensed or qualified operators shall also be present during testing after the repairs have been made.

4.8 INSTALLATION OF PIPING AND TUBING

Overflow pipes, where installed, shall not be smaller in size than the supply pipe. Where a shut-off valve is installed in the discharge line from an oil pump, a relief valve shall be installed in the discharge line between the pump and the first shut-off valve. A relief or pressure regulating valve shall be provided in the oil piping system.

4.9 ABATEMENT OF AIR CONTAMINANTS

All heating and combustion equipment that is fired with solid, liquid, or gas fuels including all rubbish burners and incinerators, shall comply with the requirements of the air pollution control code.

5. FUEL-OIL PIPING HANDLING SYSTEM

A fuel-oil piping system is determined by project specifications. The types of building may vary and the oil burner or generator also may vary. In designing the fuel-oil transfer system, such as diesel and no. 2 oil from the lowest floor to the floor above the tank level, the following factors must be considered: **(a) flow rate, (b) maximum inlet suction (c) discharge pressure, (d) design of oil piping system (e) proper control strategy.**

PIPING SYSTEM DESIGN FOR FUEL-OIL BURNING EQUIPMENT ROOM

5.1 FLOW RATE

The fuel-oil maximum pumping rate depends on the application and overall piping system design. A day tank system is used where a small gravity head is desirable at the inlet of the generator or burner, and is needed to maintain a supply of fuel-oil sufficient for a period of operation without the availability of the remote fuel transfer pump. When a day tank is used with an oil burner or generator, the burner or generator mounted pump draws oil from the day tank and returns oil to the day tank. The use of a vented day tank also ensures that the pressure at the inlet to the burner will not become excessive. In some cases, the emergency diesel generator injector bypass is piped back to the day tank, and the oil is heated by the engine and must be cooled before it is returned to the main tank. Manufacturer recommendations should always be followed for fuel piping and cooling installations. For fuel-fired appliances and equipment, where it becomes necessary to change, modify or alter a manufacturer's instructions in any way, written approval shall first be obtained from the manufacturer.

5.2 BURNER "LOOP" SYSTEMS

The pump set runs continuously so that the entire piping system is continuously primed, and air kept out of the burners. Any air entering the system is returned to the tank where it can settle out harmlessly. The pump set pulls oil from the main tank and supplies it to the burners when the burner pumps themselves may be inadequate, for example where the burners are too high above the bottom of the tank or too far away to pull directly. In multiple burner installations, the use of a common fuel-oil pump in conjunction with a burner loop system eliminates the need for each burner to be piped individually back to the main tank. To increase reliability, fuel-oil pressure may be incorporated into the system, so that an impending loss of oil supply to the burners can be prevented before a shutdown occurs. A back pressure regulating valve is added to keep the header full and to prevent oil siphoning out of the header. The level switch is used for pump control on pressurized header systems; a check valve prevents oil from flowing back to the fill line. See diagram # 2 in the APPENDIX.

5.3 STAND-BY GENERATOR "LOOP" SYSTEMS

The pump control portion of the control system would provide for the starting of a back-up pump in the event that flow in the loop was lost. It might also alternate the operation of the pumps on a time-clock basis.

A back pressure regulating valve in the loop would provide constant inlet pressure at the solenoid valves. The tank level control portion of the control system would open and close the appropriate solenoid valves to keep the fuel levels in the individual tanks between the desired limits. It would be good practice to provide a back-up solenoid valve at each tank. This valve would shut off fuel flow into the tank if high level in the day tank or leakage into the rupture basin was detected.

Sometimes it is desirable to allow for the operation of multiple emergency generators without the installation of day tanks. One strategy that has been applied is to pump the fuel-oil to an oversized pipe header above the generators, the larger the pipe size used for the header, the longer the period the generators can operate without power to the transfer set. In effect, the header becomes the day tank. The pressure switch and vent ensure that the pressure in the header does not rise above the safe working pressure of the engine's fuel handling system.

6. FIRE EXTINGUISHING SYSTEM

The fuel-oil tank and oil burning equipment room or enclosure must be equipped with an automatic sprinkler system or provided with an equivalent fire suppression system in accordance with the New York City Construction Codes, portable fire extinguishers with a minimum weight of 30 pounds as required by the NYC Fire Code and NFPA 10. The fuel-oil tank and equipment room shall be equipped with smoke and heat detection and an automatic fire suppression system with an alarm that annunciates in a supervised location.

6.1 LIGHTING

The fuel-oil tank and equipment room must have adequate **lighting** in accordance with the New York City Construction Codes.

A drain pipe shall be installed at the base of shafts enclosing the supply and overflow piping. The pipe must lead to a dedicated sump or minimum 55 gallon container with a leak detection alarm. Tank overflow must be collected in an "**overflow catch basin" or tank.** The system should be shut down when that basin nears capacity. These indicators must be connected to a local audible alarm in the tank room and to a remote alarm located at a supervising station. The wiring must comply with the New York City Electrical Code. Any electrical wiring and equipment used in connection with oil-burning equipment shall be installed and maintained in accordance with Fire Code Section 605 and the NYC Electrical Code.

"Overflow Catch Basin" or tank with attached leak detection alarm

6.2 FUSIBLE LINK

A fusible link operated lever gate valve in the supply pipe shall also be provided in accordance with the New York Construction Codes. This fusible link works as a fail safe mechanism. In case of fire it will melt and shut-off supply.

6.3 FIRE EXTINGUISHERS

The P-98 Certificate of Fitness holder must be familiar with the different types of fire extinguishers available at the work site. The P-98 Certificate of Fitness holder must know how to operate the extinguishers in a safe and efficient manner. The P-98 Certificate of Fitness holder must also know the difference between the various types of extinguishers and when they may be used. A description of classes of fires and the appropriate extinguishers is below.

Class A fires are caused by ordinary combustible materials (such as wood, paper, and cloth), for which the quenching-cooling effect of quantities of water or solutions containing large percentages of water is most effective in reducing the temperature of the burning material below its ignition temperature.

Class B fires are caused by flammable petroleum products or other flammable liquids, greases, etc., for which the blanketing-smothering effect of oxygen-excluding media such as CO_2, dry chemical or foam is most effective.

Class C fires involve electrical equipment. The electrical non-conductivity of the extinguishing media is of first importance. These fires must be extinguished with non-conductive media such as CO_2 or dry chemical.

Class D fires are caused by ignitable metals, such as magnesium, titanium, and metallic sodium, or metals that are combustible under certain conditions, such as calcium, zinc, and aluminum. Generally, water should not be used to extinguish these fires.

A multi-purpose dry chemical fire extinguisher may be used to extinguish Class A, B, or C fires. Examples of Water type, C02 and Dry Chemical extinguishers are shown below.

Class B and Class ABC fire extinguishers are appropriate for use in case of fire with fuel-oil storage.

Examples of typical fire extinguishers are shown in figure 1. Fire extinguisher symbols are shown in figure 2.

Figure 1

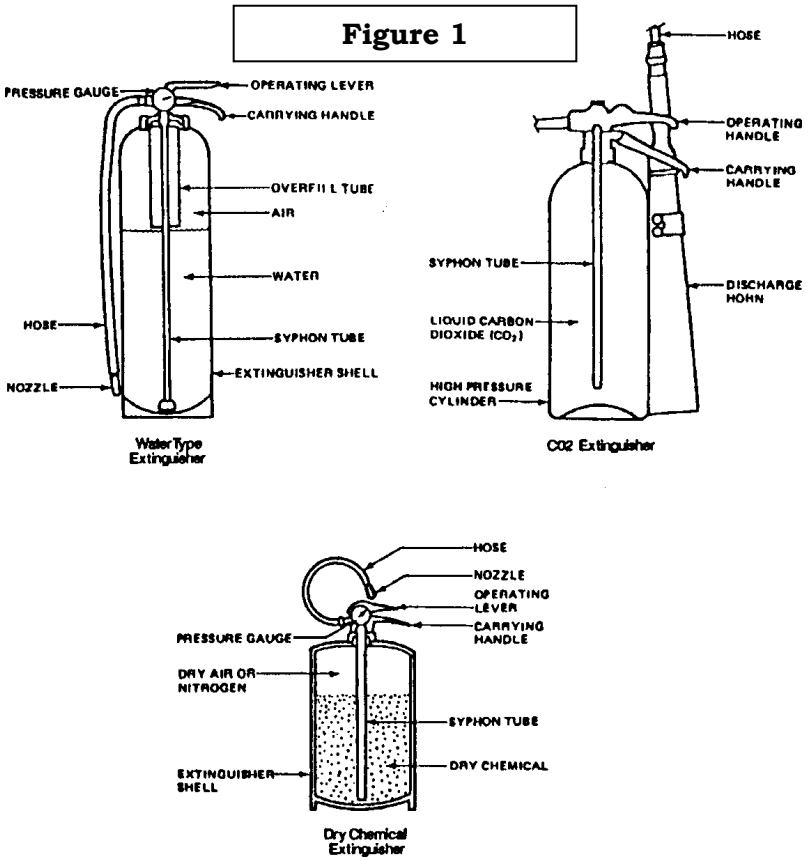
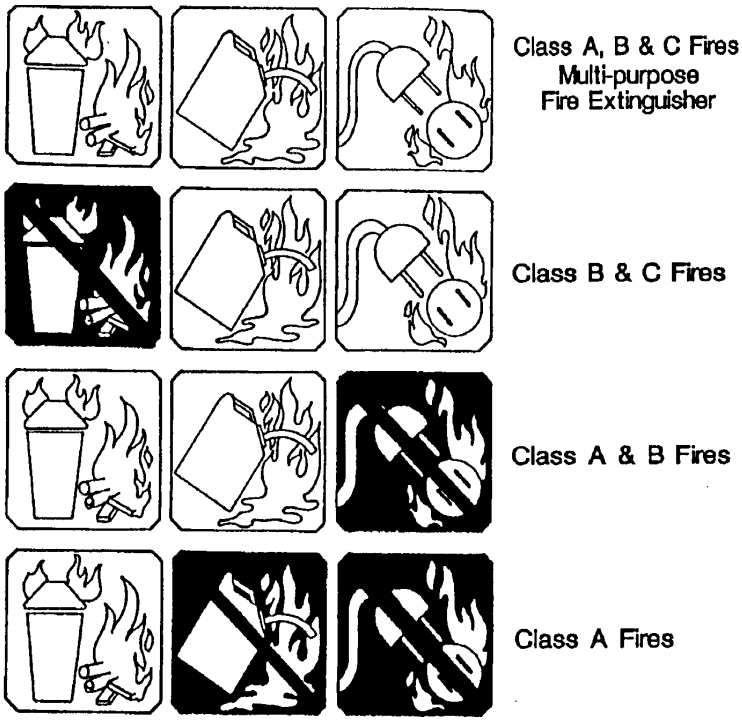


Figure 2



Fire Extinguisher Identification Symbols

6.3.1 Typical Fire Extinguishers

Usually operation instructions are clearly painted on the side of the fire extinguisher. They clearly describe how to use the extinguisher in case of an emergency. The P-98 Certificate of Fitness holder should become familiar with the instructions for the extinguisher at his/her work site.

Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguisher may be used on.

The symbol with the shaded background and the slash indicates when the extinguisher must not be used. The P-98 Certificate of Fitness holder must understand these symbols. All fire extinguishers should be kept in good working order at all times.

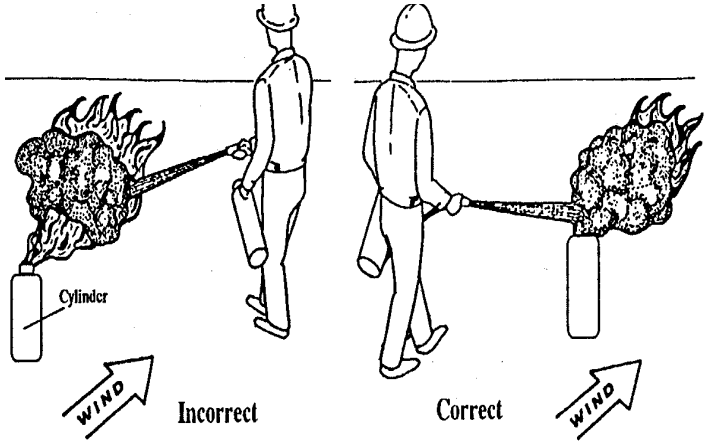
6.3.2 Fire Extinguishing Practices

In all occupancies other than Group R-3 occupancies, stationary fuel-oil-burning equipment, including boilers, emergency generators, furnaces, hot water heaters and space heaters, shall be provided with a dry chemical type portable fire extinguisher with at least a 20-B:C rating, or a carbon dioxide type portable fire extinguisher with at least a 2-B:C rating. Such portable fire extinguisher shall be located not more than 30 feet from the fuel-oil fired equipment, except that such travel distance may be increased to a

maximum of 50 feet if a dry chemical portable fire extinguisher with at least a 40-B:C rating, or a carbon dioxide portable fire extinguisher with at least a 4-B:C rating, is provided.

Fire extinguishers must be used in accordance with the instructions painted on the side of the extinguisher (see example on previous page).

Special care must be taken when extinguishing a fire. The easiest way to reduce the spread of the fire is to shut off the Emergency Shut Off valve until the flame is stopped. If a fire remains, the remnants must be approached from an upwind direction. This will prevent the P-98 Certificate of Fitness holder from being burned by the flames. Never approach a fire from a downwind direction. The correct way to approach a fire is shown on the right.



Absorbent materials must be provided to control leaks and slipping hazards. If a serious leak occurs 911 should be contacted immediately.

6.3.3 Portable Fire Extinguisher Inspections

MONTHLY

The portable fire extinguishers are required to be checked monthly. The owner of the business is responsible to select a person to do a monthly inspection. This monthly inspection is called a "quick check".

The **QUICK CHECK** should check if:
(1) the fire extinguisher is fully charged;
(2) it is in its designated place;
(3) it has not been actuated or tampered with;
(4) there is no obvious or physical damage or condition to prevent its operation.

The information of the monthly inspection record must include the date of the inspection, the name/initials of the person who did the inspection. This monthly quick check record must be kept on the back of the PFE tag or by an approved electronic method that provides a permanent record.

ANNUALLY

At least annually all Portable Fire Extinguishers must be checked by a W-96 Certificate of Fitness holder from FDNY approved company. After each annual inspection W-96 COF holder will replace the PFE tag. The information of the annual inspection record must be indicated on the new PFE tag.

6.3.4 Portable Fire Extinguisher Tags

Installed portable fire extinguishers must have an FDNY standard PFE tag affixed. This tag will have important information about the extinguisher. By November 15, 2019, all portable fire extinguishers must have the new PFE tags. The FDNY will only recognize new PFE tags and will be issuing violations to business that have PFE installed without a proper tag.

The color of the fire extinguishers may be changed by the FDNY every few years. The FDNY recommends two ways to verify the tag's legitimacy:

1. Hologram:

A real hologram strip shown on the tag is 3 inches long by ¼ inch wide. Counterfeit tags will NOT have a high quality silver hologram. The hologram on a counterfeit tag will NOT change color as it is moved against the light.

2. QR code

IF you scan the QR code, it should direct you to the updated FDNY approved fire extinguisher company list. You can use the company list to verify if the company printed on the list is currently approved by the FDNY.

If your PFE tags cannot be verified via these two methods, contact your supervisor. If you suspect your PFE is a counterfeit, contact FDNY immediately by e-mail: Tags.Decal@fdny.nyc.gov

PFE tag (This tag is released for 2021-2023)

6.4 ALARMS

A well designed control system will provide sufficient information to the operating personnel to make intelligent decisions regarding the operation and maintenance of the fuel-oil handling system. The control system should alert the operator if the "lag" pump is needed. Lag pump is the back-up pump. If the lead pump does not function properly, the lag pump should be brought on line either manually or automatically as required.

Usually a ***memory circuit*** is required so that this alarm does not clear itself when the "lag" pumps start. For example, if the "lag" pump is started because the pump set flow was interrupted, this flow would be re-established once the lag pump was operating. The

memory circuit would keep the alarm light on until it was manually cleared so that the C of F holders were made aware that a problem had occurred.

Depending on the type of design of the fuel-oil piping and storage put in place, the P-98 Certificate of Fitness holder must have a knowledge or prior training of the system under his supervision, because in normal operation the pump may run continuously, or automatically start and stop. Some pumps are manually operated while others have intermittent operation. This does not eliminate the requirement of shutdown interlocks and automatic back up pump operation for safety purposes. Since each system is unique, the control strategy will be different from one job to another.

WORKING INDICATOR WITH AUDIBLE ALARM

6.4.1 Indicators and Alarms

The fire alarm command station must monitor all fire detection and alarm systems in the buildings. Working indicators and alarms must be provided for fuel-oil tanks and rooms containing fuel-oil burning equipment, including a level sensor for height and capacity of fuel-oil, high and low levels, and leak detection. The float switch must be provided within the containment area and must be arranged so as to sound an alarm and stop the transfer pump in case of failure of the tank or the control in the tank. The P-98 Certificate of Fitness holder must take notice of the alarm or bells and take appropriate action. For example, if an day tank alarm goes off – in addition to corrective action it must be logged in the logbook.

6.5 HOW TO CONTACT THE FDNY

The Fire Department must be contacted directly by phone in case of an emergency, dialing **911**. It is suggested to have the Fire Department Borough Communication Office phone numbers posted near the telephones most likely to be used in case of an emergency. These phone numbers are:

Bronx (718) 430-0200

Brooklyn (718) 965-8300

Manhattan (212) 570-4300

Queens (718) 476-6200

Staten Island (718) 494-4296

6.6 RECORD KEEPING

A bound logbook must be kept on the premises by the P-98 Certificate of Fitness holder to document the operation of the oil burning equipment system. The logbook should record the hours of operation of the equipment as well as the routine maintenance and repairs performed**.** All daily inspections and weekly tests performed must be documented by the P-98 Certificate of Fitness holder in the log book.

7. LITHIUM-ION BATTERY SAFETY

Lithium-ion safety

Lithium-ion batteries are rechargeable batteries found in electric bikes, scooters, cars, laptops, tablets, phones, and many other common household devices.

Lithium-ion battery fires have caused deaths, serious injuries, and devastating damage to property around the city. It's important to follow rules for safe storage, charging, and disposal for these types of batteries.

If you own a lithium-ion powered device or plan to buy one, the FDNY has important safety tips that you should follow. These tips apply to all devices powered by lithium-ion batteries, including phones, tablets, laptops, e-cigarettes, toys, high-tech luggage, and even robotic vacuum cleaners.

Immediately stop using or charging battery and call 911 if you notice:

- **Fire or Smoke**
- **Overheating**
- **Change in color or shape**
- **Odd noises**
- **Leaking**
- **Strange smell**

ALWAYS:

- purchase and use devices certified by a Nationally Recognized Testing Laboratory (NRTL).
- follow the manufacturer's instructions for:
  - charging and storage.
  - correct battery, cord, and power adapter
- keep exit path clear at all times.
- plug directly into a wall electrical outlet for charging.
- keep batteries and devices at room temperature.
- store and/or charge batteries away from anything flammable.
- keep away from heat sources.
- bring batteries to a **NYC Battery Recycling Center.** Visit nyc.gov/batteries for more information.

NEVER:

- use aftermarket batteries or chargers.
- use damaged or altered batteries
- plug into a power strip or overload an outlet.
- overcharge or leave battery charging overnight.
- charge a battery or device under your pillow, on your bed, or near a couch.
- leave e-bikes or e-scooters unattended while charging.
- block your primary way in or out of a room/space with e-bikes, e-scooters, wheelchairs, etc.
- place batteries in Trash or Recycling bin. **It is ILLEGAL.** Visit nyc.gov/batteries for disposal locations and information.

In the event of a Fire, Leave and CLOSE the door. Call 911 once you are in a safe location.

Charging Lithium Ion

Lithium-ion batteries do not have to be fully charged; partial charge is the most suitable.

When **charging more than five (5)** personal mobility devices or their removable batteries, it must be in a **dedicated room with ventilation** and a self-closing door.

For a total battery capacity of 20 kilowatt-hours (kWh), a 2-foot separation between charging batteries is required. For a total battery capacity up to 50 kWh, a 3-foot separation is needed.

Chargers must only be used with a compatible battery pack. The original equipment manufacturer (OEM) charger interplays with the battery pack using the battery management system (BMS). The wrong battery/charger combination may not work safely. For example, the 100% cutoff to prevent overcharging, which damages batteries, may not work which can easily create hazardous conditions such as fires, explosions and/or injuries.

Always check with the manufacturer or retailer of the personal mobility device, an authorized repair shop or a testing laboratory such as Underwrites Laboratories (UL) to see if replacement is recommended or listed and safe for use with that device. Using unauthorized parts, including batteries and/or chargers, may cause damage, fire and possibly void your warranty.

Extinguishing Lithium-ion

Water may not prevent a battery from burning and spreading. Battery cells are known to explode and quickly spread to another battery. It can spread to another devices.

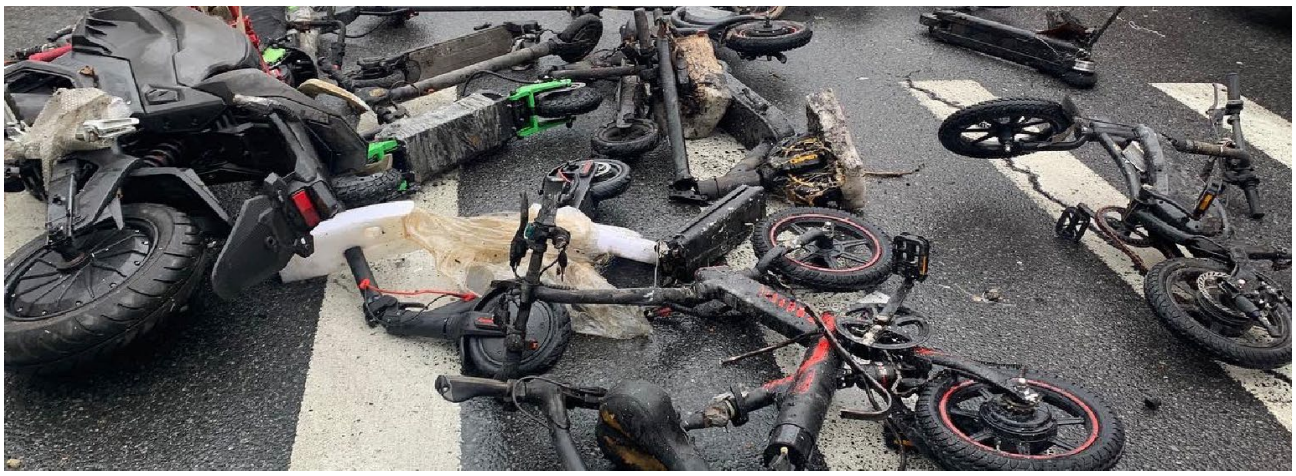
Fire Extinguishers
do not work
on lithium-ion batteries fires.

Unexpected Re-ignition.

Reignition is common. Lithium-Ion Batteries are known to unexpectedly re-ignite (without warning) minutes, hours and even days after all visible fire has been put out.

Lithium-ion batteries can enter an uncontrollable, self-heating state. This can result in the release of gas, cause fire and possible explosion.

These batteries may continue to generate heat even when there is no visible sign of fire. Once heat reaches a certain level fire may reignite on the battery and surrounding area.



APPENDIX