STUDY MATERIAL FOR THE
CERTIFICATE OF FITNESS EXAM
FOR

F-40

CENTRAL STATION SIGNALING SYSTEMS

INSIDE THIS BOOKLET YOU WILL FIND THE FOLLOWING:

NOTICE OF EXAMINATION (NOE)

REVISED 01/09/01

NOTICE OF EXAMINATION

Title: **Examination for Certificate of Fitness for Central Station Signaling Systems (F-40)**

Date of Test: Written tests are conducted Monday through Friday (except legal holidays) 9:00 AM to 2:30 PM; or comply with alternative certification procedures.

QUALIFICATION REQUIREMENTS

1. Applicants must be at least 18 years of age.
2. Applicants must have a reasonable understanding of the English language.
3. Applicants must present a letter of recommendation from his/her employer. The letter must be on official letterhead and must state the applicant's full name, character, physical condition, experience, and address of premises where applicant will be employed.
4. Applicants must present two (2) forms of satisfactory identification i.e., driver's license and passport picture ID.

APPLICATION INFORMATION

Application Fees: $25.00 for originals and $5.00 for renewals. The fee may be paid in cash, money order, or personal check payable to the New York City Fire Department. The $25.00 fee is payable prior to issuance of the Certificate of Fitness Test. Application forms are available at the Public Certification Unit, 1st floor, 9 MetroTech Center, Brooklyn, NY 11201.

TEST INFORMATION

Test: The test will be of the written, multiple choice type. A passing score of at least 70% is required in order to secure a Certificate of Fitness. Individuals with three years of relevant experience as explained in the Memorandum of Understanding, and having completed the Central Station Operator's Course sponsored by the Security Industry Association may have the written test waived. This procedure is the **Alternative Issuance Policy.** Call (718) 999-2482 for additional information and forms.

This study material will help you prepare for the examination for the Certificate of Fitness for Central Station Signaling. The study material includes information taken from the Fire Prevention Code and the Fire Prevention Directives of the Bureau of Fire Prevention, NYFD. The study material does not contain all of the information you need to know to perform your job. It is your responsibility to learn anything else that is needed to work with central station alarm signaling systems. It is also your responsibility to become familiar with all applicable rules and regulations of the City of New York, even if they are not covered in this material.

All questions on the Certificate of Fitness examination are multiple choice, with four alternative answers to each question. Only one answer is correct for each question. If you do not answer a question or mark more than one alternative your answer will be scored as incorrect. A score of 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

1. The capital of the United States is:

    (A) New York City.
    (B) Providence.
    (C) Albany.
    (D) Washington D.C.

The correct answer is "**D**". You would mark "**D**" on your answer sheet.

2. An interior fire alarm system is **NOT** required in a:

    (A) hotel.
    (B) private dwelling.
    (C) public school building.
    (D) high rise office building.

The correct answer is "**B**". You would mark "**B**" on your answer sheet.

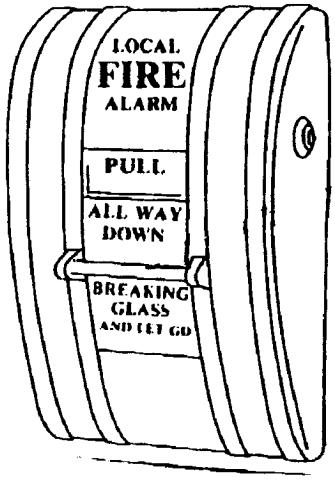
FIRE ALARM SYSTEMS

Fire alarm systems are required in many locations as part of a fire protection system. For example, alarm systems are required in hotels, motels, shelters, hospitals, office buildings and marinas. If a fire emergency occurs the alarm system warns the occupants of the building. Loud sirens, gongs or bells are used to signal when there is a fire. Some fire alarm systems also use flashing lights. The sirens, gongs, bells and flashing lights are commonly called the signaling devices. A signal indicating that there is a fire may also be sent to a monitoring station. For example, a signal may be sent directly to the Fire Department.

DESCRIPTION OF FIRE ALARM SYSTEMS

Manually activated fire alarms. Some fire alarms are activated automatically. Special sensors detect heat or smoke and sound an alarm. Other fire alarms must be activated manually. A person who notices a fire emergency must activate the alarm by hand. Fire alarms that are manually activated use fire alarm boxes. Fire alarm boxes are usually located near the natural exits from a building. There must be at least one manual fire alarm station on each floor of a building. There are two types of fire alarm boxes. They are called single action and double action stations.

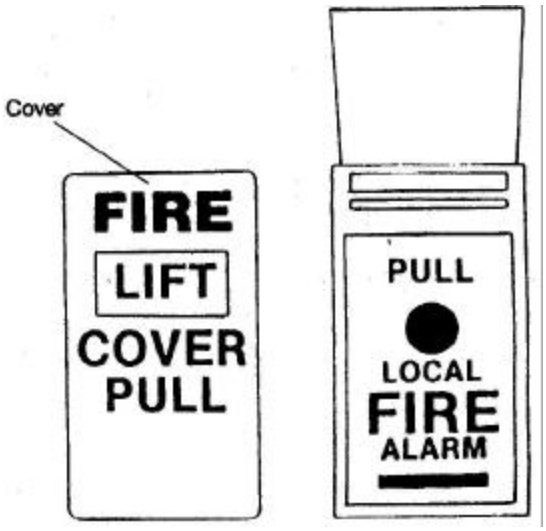
Single action stations. Single action stations require only one step to activate the alarm. For example, the alarm might be activated by pulling down on a lever. This kind of alarm station is often found indoors, e.g., in office buildings. The cover on this alarm station serves as a lever. When the cover is pulled down, it allows a switch inside to close. This sends the alarm signal. Another kind of single action breakglass station requires someone to break a small pane of glass with a small metal mallet.



SINGLE ACTION STATION

Double action stations. Double action stations require two steps in order to activate the alarm. The user must first break a glass, open a door or lift a cover. The user can then gain access to a switch or lever which must then be operated to initiate an alarm. A double action station is shown below. To activate the fire alarm station on the left the cover must be lifted before the lever is pulled. This kind of double action station is often found indoors.

The double action station shown on the following page is often found out of doors. The station is specially enclosed to protect the alarm from bad weather. A guard must be lifted before the handle is pulled to sound the alarm.



DOUBLE ACTION STATIONS

The alarm stations used to activate the fire alarm system are called initiating devices. Once activated, the fire alarm system can not be shut off at the fire alarm box. The alarm must be shut off at a main control panel using a special key. This key must be located near the control panel at all times. The alarm may be turned off only by a Certificate of Fitness holder or by a Fire Department representative.

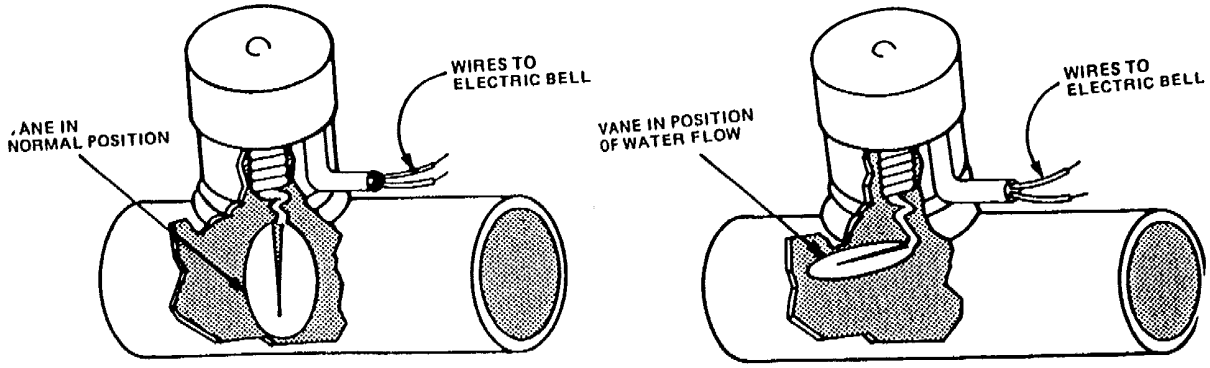
A silencing switch may be installed in the fire alarm system. Under special circumstances the silencing switch may be used to turn off part of the system . For example, The silencing switch may be used to turn off the sirens and bells after the building has been evacuated. However, the silencing switch does not prevent a signal from being transmitted to a monitoring station.

Automatically activated fire alarms

Automatic fire alarm systems sound a signal when a fire detection device indicates that there is a fire. Special sensors detect heat, smoke or the flow of water. These sensors are the initiating devices in automatic fire alarm systems. A few of the more common initiating devices are described below.

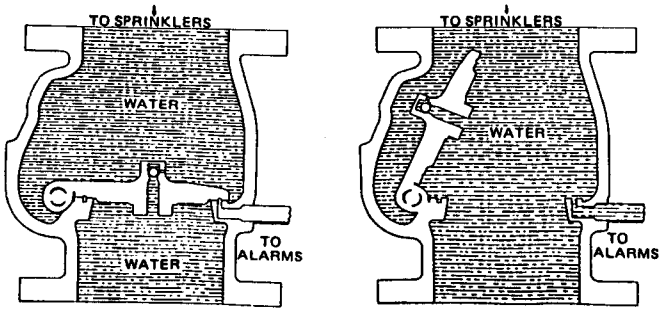
Waterflow alarms are designed to signal when water flows through the fire protection system. For example, a waterflow indicator signals when water flows through the piping in a sprinkler system. Waterflow in the sprinkler system may be detected using one of two methods. These methods use vane type waterflow indicators or special check valves.

Vane type indicators are installed inside the piping of the fire protection system. The vane indicators are usually installed close to the main control valve. When the water flows through the piping it moves the vane. The movement of the vane causes a signal to be transmitted to the alarms. When the signal is transmitted the alarm is sounded. A signal may also be transmitted to a monitoring station. An example of a vane type indicator is shown below. The figure on the left shows the vane position when water is not flowing through the piping. The figure on the right shows the position of the vane when water flows in the piping. When the vane moves it closes a switch and a signal is sent.



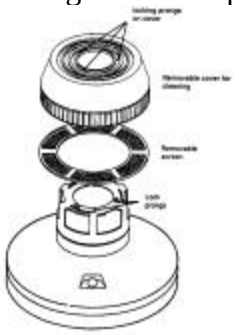
VANE TYPE WATERFLOW INDICATOR

The check valve is designed to detect when water flows into the protection system's piping. The valve is installed at the location where the water supply enters the fire protection system. A clapper mechanism is located inside the check valve. Under normal conditions the clapper is in the closed position. When in the closed position the clapper prevents water from flowing into the piping. The clapper mechanism opens when there is a demand for water in the fire protection system. For example, the clapper will open when a sprinkler head opens to discharge water. When the clapper opens it allows water into the system piping. It also allows water to flow into a chamber that leads to the waterflow gong. When the water flows into this chamber it causes the gong to sound. An illustration of a check valve is shown below.



CHECK VALVE WITH A CONNECTION TO THE WATERFLOW GONG

Smoke detectors sound an alarm when smoke is detected in the building. Smoke detectors have been shown to be very effective in reducing fire damage. An example of a smoke detector is shown below.



SMOKE DETECTOR

Automatic fire and smoke detectors are devices that respond to heat, visible smoke, flame or invisible combustion by-products. Many kinds of fire detectors are available.

Attic areas and other unattended areas should have automatic detectors. In occupied areas, an automatic detector increases the speed with which an alarm will be transmitted. No single initiating device is 100% effective. Therefore, a survey of a building will disclose the devices or combination of devices needed to protect life and property.

The proper placement of detectors is essential for effective operation. Detector effectiveness depends on the kind of detector and the nature of the area being protected. Combustion by-products rise to their equivalent temperature level in a room and room air-flow moves them about. It is possible that smoke might never reach the warmer high-point of a ceiling since beams and pipes might prevent smoke from settling in certain spots. In addition, air currents can dilute smoke density. These effects must be considered in the design of a complete system.

The proper selection of detectors is essential because each stage of a fire is different. Each kind of detector reacts to different fire characteristics to initiate an alarm.

IONIZATION DETECTORS. These are detectors that sense solid or liquid (aerosol) particles, or gases released by thermal decomposition of a fuel. Ionization detectors can sense fires at the first stage of development. Ionization detectors are not appropriate for environments where dust and spray particles are present.

PHOTO-ELECTRIC DETECTORS. These detectors rely on carbon smoke particles to reflect a beam of light from an internal source into a receiving light sensor. The increase in the amount of light striking the sensor initiates the alarm. Photo-electric detectors are most effective where smoldering fires or large carbon-smoke particles occur. Such fires may come from mattresses, burning plastics or parts of a building where dense, cool smoke will settle.
Both ionization and photo-electric smoke detectors are classified as early warning fire detectors. They detect fires in solid fuels at a stage when hazard to life or property is minimal to moderate.
In addition, these detectors can sense smoke in the air flow-flow ducts and plenums. Most frequently, these detectors are used to turn the air-handling system off to minimize fire hazard.

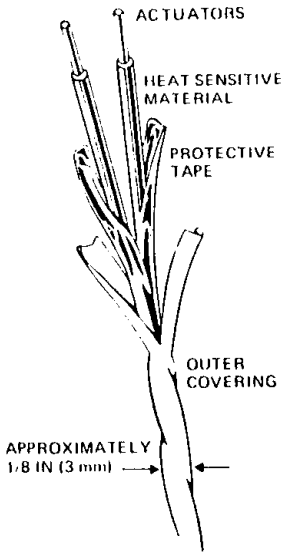
DUCT DETECTORS. Building air-handling systems can draw dangerous combustion by-products from one area and move them throughout a facility. This spreads fire and endanger s all occupants. These detectors are mounted on the outside of ducts. High-velocity sampling tubes direct a measured amount of the air into the sensing chambers.

Duct detectors by themselves are not sufficient protection for a building. They will not sense the presence of fire when the air-handling system is off and the duct air is diluted. Duct detectors should be used along with detectors in the protected space.

AIR SAMPLING-TYPE DETECTEORS. A sampling-type detector consists of piping or tubing distribution from the detector unit to the areas to be protected. An air pump draws air from the protected area(s) back to the detector through the air sampling ports and piping or tubing. At the detector, the air is analyzed for fire by-products.

RATE-OF-RISE HEAT DETECTORS. Rate-of- rise heat detectors activate the alarm when the room temperature increases at a certain rate. This kind of detector is more sensitive than the fixed temperature detector. The rate-of-rise heat detector does <u>not</u> have to be replaced after it has activated the fire alarm.

Regardless of what kind of detector is installed, heat detectors require special attention. All heat detectors must be carefully installed according to the manufacturer's instructions. A sample of a line-type heat detector is shown below.



LINE TYPE HEAT DETECTOR

SUPERVISORY DEVICES

Supervisory devices are commonly installed as part of some protection systems. The supervisory devices monitor important parts of the system. An alarm such as a bell will be sounded when there is a problem or trouble with part of the system. For example, a signal will be sounded when a control valve is damaged or when it is in the wrong position. This kind of signal is commonly called a trouble signal or trouble bell. The trouble signal is always transmitted to the main control panel. When a trouble bell starts to ring the Certificate of Fitness holder should check the system. Then the part of the system that caused the trouble should be repaired. The trouble signal may be transmitted to a monitoring station also.

Some control panels indicate the exact location of the trouble. Other panels only display a general trouble signal. For example, a lighted panel might indicate only that there is a problem somewhere in the fire protection system. Each supervised device must then be inspected to determine which part is causing the trouble signal. When a trouble signal is detected the Certificate of Fitness holder must make sure that the problem is corrected. Some parts of the fire protection system that are commonly supervised are:

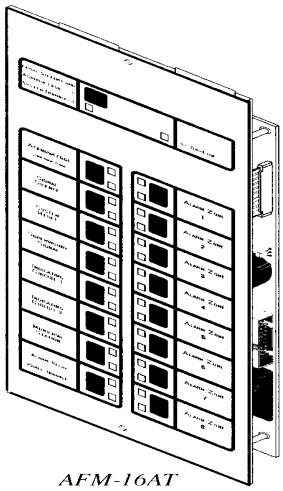
(a) Water control valves
(b) Water temperature in gravity and pressure tanks
(c) The water level in the gravity and pressure tanks
(d) The pressure level in the tanks
(e) The power supply for the fire pump

TRANSMISSION OF ALARM SIGNALS

There are three methods used to notify the occupants of a building in case of a fire. The first method is the general alarm method. This method activates all signaling devices throughout the building when a fire is discovered. The second method is the selective method. The selective method activates the signaling devices only in areas close to the fire. The third method is the pre-signal system. The pre-signal method sends a signal to a control panel or a manned station. When the signal is detected the cause of the alarm must be investigated. When a fire is discovered the general fire alarm is manually activated by inserting a key into the manual fire alarm station.

After the fire alarm system has been activated it must be reset manually. The alarm must be reset by a Certificate of Fitness holder. The alarm system must be reset at the control panel. The fire alarm must remain in operating condition at all times unless the building is vacated for more than one week.

Annunciator panels are sometimes installed in large buildings. The annunciator panel is used to monitor the fire alarm devices in a designated fire zone. There may be several fire zones in a building. Each fire zone is marked clearly on the panel. When a fire occurs an indicator light flashes on the panel. The indicator light identifies the location of fire. For example the light on the panel might indicate that a fire has occurred in Fire Zone 2. This information allows the Fire Department to quickly locate the fire. An example of a typical annunciator panel is shown below.



Annunciator Panel

SIGNALING SYSTEMS

Fire alarm systems are classified according to the kinds of functions they perform. The installation and use of some of the more common systems is described below.

Central Station Signaling Systems. Central station systems are operated by employees of a firm whose principal business is to furnish and maintain supervised signaling service. The central station serves several businesses or properties that subscribe to the service. The service providing fire protection often provides other services as well, e.g., burglar alarm service.

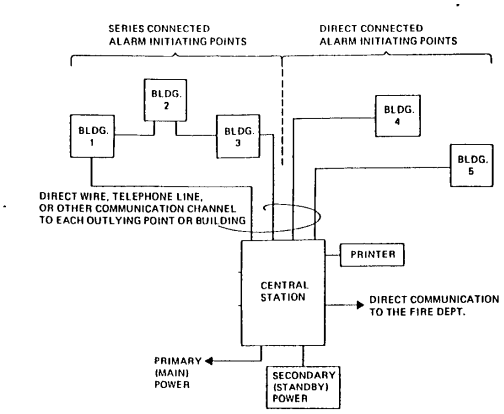
Proprietary Signaling Systems. This kind of system can serve several properties under one ownership. The property owner owns the alarm system. Alarm and trouble signals are transmitted to a central supervising station. The station is usually located on the same premises as the alarm system. The station must be attended 24 hours a day by a Certificate of Fitness holder. This type of signaling system is commonly used at large premises.

Local Protective Signaling Systems. The main purpose of this system is to provide an evacuation alarm for building occupants. Separate further action must be taken to send an alarm to the Fire Department.

Auxiliary Signaling Systems. Alarm signals are transmitted directly to the Fire Department. These alarms use the same transmission lines as fire alarm boxes on the streets. Trouble signals are transmitted to a specific location on the premises. For example, the supervisory trouble signals may be sent to a monitoring station on the premises.

Remote Signaling Service. Alarm and trouble signals are transmitted directly to the Fire Department. Private leased telephone lines are used to transmit the signals.

Both alarm and trouble signals are transmitted to the central station. Trained operators receive and interpret the signals and take necessary action. The central station operators transmit fire alarms to the local Fire Department company. Responses to supervisory signals are made as necessary. The layout of a central station signaling system is shown in the illustration below.



A Central Station Signaling System

The central station must be manned by at least two Certificate of Fitness holders at all times. The Certificate of Fitness holder is required to monitor the system signals and may not be given any other responsibility. The Certificate of Fitness holder must notify the Fire Department immediately when an alarm signal is detected. This must be accomplished by providing a class "3" Alarm Box and Terminal Number to the Fire Department Communication Office. The owner of the building must also be notified. The Certificate of Fitness holder should never assume that any alarm is "only" a false alarm.

Only Certificate of Fitness holders are authorized to receive and retransmit fire alarms at a Central Station. There are very important standard operating procedures for central station companies to transmit class "3" alarms to any FDNY Communication Office. The chart shown on the following page establishes the guidelines to be followed by FDNY Fire Alarm Dispatchers when requesting or receiving information.

FIRE DEPARTMENT - CITY OF NEW YORK

STANDARD OPERATING PROTOCOL FOR APPROVED CENTRAL STATION COMPANIES TO RETRANSMIT CLASS 3 FIRE ALARM SIGNALS TO FDNY BOROUGH COMMUNICATIONS OFFICES.

FDNY BOROUGH COMMUNICATIONS REQUEST THE FOLLOWING INFORMATION:

1. **ACTIVE FDNY CLASS 3 FIRE ALARM BOX AND TERMINAL ASSIGNMENT(S) IF THE CLASS 3 ASSIGNMENT IS *NOT* AVALIABLE, THEN THE FIRE ALARM SIGNAL IS DESIGNATED AS *"UNASSIGNED"*.**
2. **THE PREMISES ADDRESS(S): (INCLUDING MULTIPLE ADDRESSES AND AKA's).**
3. **THE NAME OF THE FDNY APPROVED CENTRAL STATION COMPANY.**
4. **THE TYPE OF FDNY CLASS 3 FIRE ALARM: CLASS E, CLASS J, MANUAL, VALVE (WATERFLOW), OR AUTOMATIC.**
5. **SPECIFIC, DETAILED LOCATION(S) THE FIRE ALARM COVERS: NORTH, SOUTH, EAST, WEST, FLOOR(S), SECTION(S), ZONE(S), ETC.**
6. **SPECIFIC PREMISES OCCUPANCY TYPE: WAREHOUSE, HOUSE OF WORSHIP, CABARET, NURSING HOME, ETC.**
7. **THE APPROVED CENTRAL STATION COMPANY DISPATCHER NUMBER.**
8. **IF THE CALL DOES NOT ORIGINATE FROM A DEDICATED PRIMARY - SECONDARY (NO-DIAL) TELEPHONE LINE, FDNY BOROUGH COMMUNICATIONS WILL REQUEST A CALL BACK TELEPHONE NUMBER.**

This chart must be posted at all dispatching stations. Additionally, the Central Station must be equipped with two separate paths of communication with the Fire Department. Radios and telephones are the most widely used paths of communication. All communications must be automatically recorded. The transmission of all alarm signals must be recorded automatically at the central station, as well. These records must kept on file for at least one year. The records must be made available upon request to any representative of the Fire Department.

The central station must have **two** dedicated recorded telephone lines in addition to cellular phone service to the Borough Communication office. When a fire signal is received, the Fire Department should be notified immediately using the dedicated telephone. The Borough Communication Office phone numbers are listed on the following page. These numbers must be posted at all dispatch stations that retransmit fire alarm signals to the FDNY. Furthermore, these numbers **must** be programmed into the cellular phone. If the primary or secondary lines fail, the cellular telephone should be utilized to transmit the signal.

Manhattan	(212) 999-2222
Bronx	(718) 999-3333
Staten Island	(718) 999-6666
Brooklyn	(718) 999-4444
Queens	(718) 999-5555

If a signal is received indicating a flow of water in an automatic sprinkler system the Borough Communication Office must be notified immediately. The premises' owner or subscriber must also be notified by telephone or by the quickest means possible. Telephone notifications to subscribers must always be recorded.

If a combination alarm is received that is indicative of waterflow at the protected premises the signal should be treated as an alarm signal. The Borough Office should be notified immediately. A combination alarm occurs whenever two or more associated supervisory signals occur in close succession. For example, low water level supervisory signals received in close succession from two or more gravity tanks would be treated as a waterflow alarm.

Alarm signals from manual fire alarm boxes, automatic fire detectors, waterflow detectors are treated as fire alarms. Fire alarm signals must be transmitted to the Fire Department Borough Communication Offices immediately upon receipt of full signal at Central Station Facility. Full signals are deemed to be received at the time it is capable of being decoded.

Supervisory alarm signals should be communicated immediately to a designated person at the protected premises. The person need not be notified if the condition was restored immediately.

Borough Offices must be notified by telephone immediately when all mandatory systems are out of service for eight (8) hours or longer. The date, time and duration of disruption in service should be noted. Documentation of details must be made in the Central Station logbook.

Whenever a change in the type of fire alarm service being provided (e.g., from automatic to manual) the Bureau of Fire Prevention must be notified in writing within seven days. When any supervisory alarm service is terminated the Bureau of Fire Prevention must notified in writing within seven days.

TESTING OF THE CENTRAL STATION SIGNALING SYSTEM

All circuits extending from the central station must be tested at least once every twelve hours. Tests of all central station devices must also be tested at no more than twelve hour intervals. A record of all inspections must be kept in a log for a period of at least 60 days. The inspections must be recorded by the appropriate Certificate of Fitness holder. The following parts of the supervisory system must be tested quarterly.

a) transmitters
b) waterflow activated devices
c) automatic fire detection systems
d) valve supervisory devices

The following parts of the supervisory systems must be tested twice a year.

a) manual fire alarms
b) tank water level devices
c) tank water temperature devices
d) all other sprinkler supervisory devices
e) combination night and fire alarm boxes

A central station must have personnel available at all times who are competent to inspect, maintain, and repair central station equipment and transmitters. Repairs and/or restoration of service must be effected as soon as practicable in cases of malfunction.

The central station operating room should be kept locked at all times for security. Only authorized personnel should be allowed to enter.

The central station must have equipment to automatically receive and record all signals. The time of transmission and receipt of signals must also be recorded. These records must be maintained for a period of one year.

POWER SUPPLY

The main power supply for a Central Station may be provided by connection to a local utility on a dedicated branch circuit. The primary power supply should be supervised and its failure indicated by a distinctive trouble signal. The Central Station must have a reliable secondary (standby) power supply. Full load tests should be conducted per established standards with accurate records maintained. The secondary power supply should activate within 30 seconds of failure of the primary power supply and be available for the exclusive use of the operating room. Storage batteries or engine driven generators can provide secondary standby power.