July, August, September, 2004 Newsletter
By Vincent Dunn, Deputy Chief, FDNY, (Ret)

Locating a Fire in a Commercial Building

Locating the fire is the first responsibility of the incident commander. Knowing the location and the size of a fire inside a building lays the foundation for all firefighting operations. Before you can determine resources needed, determine the life hazard and determine where and how to vent the smoke, you must know the location and size of the fire. At most fires the location is

obvious and easily determined. You see the smoke and flame. At other fires it is not. Fire may be concealed. I worked in a residence area for the first 7 year of my career. Locating a fire was not a big problem in a multistory residence. However when promoted to lieutenant and assigned to a commercial factory district in lower Manhattan locating a fire became one of the most challenging phases of the fire operation. The following are tips on how to locate a fire in a commercial structure.

From an Alarm Panel.

The first officer to arrive at a fire should enter the lobby of the building, proceed to the security desk and contact the person in charge. The floor of the alarm and type of alarm (manual, water flow, smoke alarm) should be determined from the person in charge. If the building has an alarm panel, check the floor shown on the panel and compare it with the floor received from this person in charge. Sometimes, they do not match up. For example, a person on an upper floor may report to the person in charge of the lobby desk by telephone that there is an odor of smoke or that smoke can be seen rising from the floor below - outside a window. This person reporting the fire may simply report the fire and say he is on the 15th floor. The blaze could actually be on the 14th or 13th floor. This discrepancy will be discovered by checking an alarm panel and comparing it with the location reported by the person in charge at the lobby desk. Also, an alarm panel may reveal alarms for smoke on several floors.

In this instance, the chief or company officer should assume the lowest floor to be the floor of origin and begin the search from this point.

Using an Elevator

Experience has shown that using an elevator during a fire is extremely dangerous. Use caution. A malfunctioning elevator can bring you up to a burning floor, or bring you above the fire floor and trap you in an elevator shaft that becomes a smoke and heat chimney. If the elevators in the building are equipped with a Phase I recapture system it should be used to call all elevators down to the lobby. Check them for trapped people. If the elevator has a Phase II firefighter's emergency control system, this elevator should be used to reach a location two or three floors below the reported location of the blaze. Walk up the stairs to the floor where you

want to begin your search. Do not take an elevator to a fire floor. When entering an elevator, you may feel droplets of water from a sprinkler system raining down the shaft when you pass into the car, or there may be an odor of smoke in the elevator. These are signs of a fire above.

When using an elevator on a Phase II firefighter's service, realize this elevator can malfunction. Flame, heat, or water can cause an elevator to move in unexpected and dangerous ways and render the firefighter service useless. Firefighters using an elevator during a fire should:

I. Be equipped with masks to protect against smoke.

2. Have a portable radio to call help.

3. Carry forcible entry tools for escape.

4. Know the location of stairs in relation to the elevator.

5. Stop the elevator during the ascent to insure the controls are operating properly.

Elevators should not be used to locate a cellar fire. Descend an enclosed stair instead.

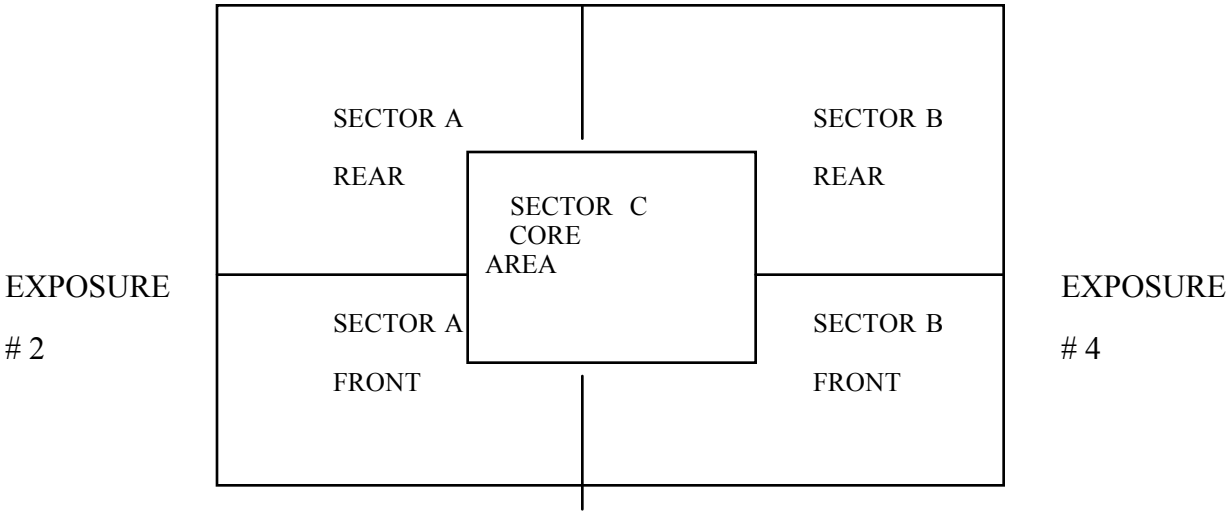
Communicating the Location

The fire chief should know the location of the fire, its relation to the floor layout and exposure 1. When a fire is located inside a building, its origin must be communicated to the chief outside at the command post, usually at exposure 1. To communicate the location of a fire there must be a fireground designation system and a fire building interior designation system known by both chiefs and company officers at the scene of the fire. A fireground communication system used by many fire departments is the exposure 1, 2, 3, 4 plan. For example, exposure numbers designates the areas around the outside of the building on fire. Looking down at the burning building from a bird's-eye view, exposure #I is the front of the building where the command post is located. Proceeding clockwise, exposure #2 is the left side of the burning building, exposure #3 is the rear of the burning building and exposure #4 is the right side of the building. This fireground designation system allows chiefs and company officers to communicate the location where flames are spreading to an adjoining building and the side of the burning building where a hoseline or ladder must be placed. In addition to a fireground designation system, a building interior designation system is required to pinpoint the location of

a fire inside a building. A building interior designation system is especially important in large-area residence or commercial buildings in order to communicate the fire spread from one area to another on a floor. One building interior designation systems used by fire departments is as follows: From a bird's-eye view from exposure # I the floor area inside of the building is subdivided into five sectors. Sector A-front; sector A-rear; sector B-front; sector B-rear; and the center core sector C.

Fireground and Fire building designation systems

EXPOSURE # 3



EXPOSURE #1

A fire building interior designation system like this, or another one, is absolutely necessary in order to pinpoint and communicate the location of a fire or fire spread between company officers inside and chiefs outside at the command post.

Size-up Information

When a fire is discovered during a search, its location inside the building must be relayed back to the chief at the command post. In addition to the location, other important information about the fire must accompany this radio report:

1. The floor number of the fire.
2. The sector of the floor, if a large area building.
3. The material burning (pot on stove, mattress, electric outlet, etc.).
4. Can the fire be controlled with resources (hose line) at the scene?
5. Is the fire spreading? Are additional resources required?
6. Which stairway to use for hoseline stretch, and which stair to use for evacuating people from above, if it is a high-rise building?

Odor of Smoke

What begins as a slight odor of smoke in a building can instantly turn into a toxic black cloud of smoke that fills up a room, so firefighters searching any type of fire must be equipped with masks. But most of the time we are called to find the location of a fire, which is hidden and is creating a very slight odor of smoke inside a building. These fires are small and require patience and detective work to find a smoldering spark or heat source. A search for a so-called odor-of smoke requires mask-equipped firefighters to use their sense of smell in order to locate this small fire. For example, when search begins, we proceed toward the direction where the odor of smoke becomes strongest. Sometimes, this leads nowhere. Odors of smoke disappear and shift with air movement. At most of these fires heading toward the strongest smell of smoke leads directly to the fire origin. Experienced firefighters have also learned to analyze smoke by its particular odor and then guess its location. Food burning on a stove and a mattress fire and burning paint and wood are well-known smells. When the odor of smoke is paper, check the wastebaskets beneath the desks. An acrid-type smoke will lead us to fluorescent light bulb fixtures and a possible burned out electrical ballast. A flickering or burned-out bulb might confirm this. This saves time searching. Electric wire insulation burning type smoke will lead us to check above a dropped ceiling, in a space where wiring exists. A sweet smell of burning garbage would lead us to the kitchen refuse bin, or the freight elevator lobby

where, nightly, bags of garbage are temporarily stored. A smell of burning rope could indicate a smoldering mop or dust rag inside a maintenance closet is the source of smoke. A coffeepot left on a heated burner of a coffee-making machine can cause a smoke detector in a ceiling above to activate an alarm. Check to see whether the coffee maker is shut off. The odor of burning paint would suggest a look into a graphic design office for spray- and paint-stained rags. In the absence of a large fire, the slight smell of burning wood smoke might require a plant box filled with wood chips to be examined for a discarded cigarette or overheated wood chip from a decorative spotlight used to highlight the foliage.

A discarded-lighted cigarette outside the store on the sidewalk created a rare and unusual cause of an odor of hydrocarbon oil smoke inside a ground floor store. Wind blew the cigarette into a small crack next to the building. This space between the building foundation and the sidewalk was caulked with an asphalt expansion joint. The smoldering asphalt smoke drifted into the store. Another rare origin of smoldering inside a high-rise building was due to grease burning on elevator hoist rails and cables. The elevator parts were recently greased and overheated due to heavy elevator use one morning. An oil odor of smoke drifted throughout the elevator lobby on several floors. The above causes of an odor-of smoke are unusual and require time, patience and detective-like work to discover. One important tool in the fire service, which has had great success in locating a hidden fire behind a wall or in an electric light fixture, is the thermal imaging camera. This tool detects heat sources, behind walls and ceilings, and in smoke. It reduces property damage by pinpointing a source of heat hidden behind or inside an object and eliminating necessity of breaking open walls, ceilings and doors.

Water Flow Alarm

Water flowing through pipes of a sprinkler system causes the transmission of a water flow alarm. A water flow alarm can be triggered by a fire, causing a sprinkler head to discharge water, or a leaking sprinkler system due to frozen pipe expanding and breaking, or a worker accidentally damaging a pipe in the system. A water flow alarm can also be triggered when there is a water pressure surge in the sprinkler system. A so-called pressure surge is a temporary increase in water pressure inside a water main that supplies a sprinkler system. The

momentary increase in water pressure causes an alarm valve to temporarily open and shut. This temporary opening and closing of the alarm (clapper valve) causes a water flow alarm to be transmitted to the alarm company, which relays the information to the fire department. The problem presented to the incident commander responding to a water-flow alarm is determining whether this alarm is being caused by a sprinkler discharging on a fire, by a broken sprinkler system or by a pressure surge. A search of the building is required when there is an alarm of water flow. If the exact cause of the water flow alarm is not determined and the fire department leaves the scene, a disaster may occur. For example if the cause of the water flow is a fire and it is not discovered, the fire may grow. If the cause of the water flow alarm is a broken pipe and it is not discovered, there will be flood damage to the property. A thorough search of a building must be conducted to locate the cause of a water flow alarm:

First - Check the alarm panel to pinpoint, if possible, the exact floor of the water flow alarm and search this area. In many buildings the exact location or floor is not indicated on the alarm panel; it just shows a water flow alarm somewhere in the building.

Second - By radio or telephone, contact the alarm company and ask it to reset the alarm, and then see whether the system stays reset or another water flow alarm triggered. If the alarm comes on again, this would indicate water is continuing to flow in the system and the cause was not a pressure surge. There may be either a fire or a leak. Or it could also indicate a defective alarm.

Third - Search the building. Start in the cellar; examine the sprinkler water pumps. If there are no water pumps, check the water main feed gauge. See if there is water flowing into the sprinkler system from the water main: Feel the pipe for vibration, listen to the pipes for flowing water by putting your ear to the pipe.

Fourth - Send a firefighter to the roof to check for a gravity tank supply; check this for water flow to the sprinkler system. Water flow can sometimes be heard indicating water from the tank is supplying water to the sprinkler.

Water leaking on the roof from an overflowing gravity tank can be the cause of a water flow alarm if there are no leaks and no water sounds, check over the sides of building from the roof

and check the shafts for signs of smoke coming out a window of a lower floor. Also, look for water discharging from a water scupper or side wall drain.

Fifth - The firefighters after checking the roof, walks down the stairs, checking each door for sounds of a sprinkler discharge or smell of smoke. During or after freezing weather, sprinkler piping on outside truck-loading platforms, unheated stairs and halls should be examined for frozen and leaking pipes.

Sixth - A person from the sprinkler alarm company should be requested to respond. That person should check the alarm for possible defects and proper working parts.

Locating a cause of a water flow alarm is difficult and time consuming. It must be done thoroughly. It takes time patience and experience.

HVAC System.

Some large office buildings have heating, ventilation/air conditioning (HVAC) systems that provide cool air in the summer and warm air in the winter to several floors. There is a mechanical machine room where the air for the entire building is cooled or heated shafts and ducts leading from the mechanical machine room supply air to all parts of the building. A return air shaft takes used air back to the mechanical machine room where the air is cleaned mixed with outside fresh air and recycled throughout the floor ducts again.

Searching for the location of a fire is more difficult in a building with an HVAC system. When searching for the origin of a small fire which creates a slight odor of smoke on one of the office floors shut the HVAC system off. This will reduce air movement and allow the buildup of smoke, making it easier to find the fire. If after searching with the HVAC system off, the source of fire is not discovered, order the system started again. If the odor of smoke returns, and the other floors served by the HVAC system reveal no fire, the HVAC system could be origin of the fire. Now check the mechanical equipment room. A fan or motor, which moves the air, could be overheated and smoldering. The HVAC air filter could be burning or paper and dust on the filter could be the source of fire, sending the smoke throughout the air ducts. If the odor of smoke returns when the HVAC system is turned on and the search in the mechanical equipment room does not reveal its source, check the fresh-air intake grating on the outside of

the building. Some odors of smoke reported inside office buildings having a HVAC central air system are caused by smoke from fires outside the building that is sucked into a fresh-air intake. A rubbish fire, a food vendor's cooking smoke and truck exhaust near a fresh-air intake can distribute smoke throughout several floors of an office building. When a serious fire occurs near a fresh-air intake of an exposed building, order the building manager of the building to shut down the fresh air intake opening.

Lessons learned

Searching for the location of a fire is a dangerous assignment. Flashover, explosions and collapse when searching for the location of a fire and suddenly finding it have killed firefighters. But past experience has also shown us that disaster also can occur when the location of a fire is not discovered. The location of a fire is sometimes concealed from searching firefighters by unusual or illegal alterations to a building. In New York City Twelve FDNY firefighters were killed in a floor collapse on Oct. 17, 1966, when the exact location of a cellar fire was not determined. On Aug. 2, 1978, six FDNY firefighters were killed by a truss roof collapse because the severity and location of the fire were not clearly defined. "Those who can not remember the past are doomed to repeat it.", said George Santayana.

Questions for, Locating a Fire, newsletter:

1. Locating a fire is the responsibility of the

A. First arriving ladder officer
B. First arriving engine officer
C. Incident commander
D. The second arriving chief

Answer_____

2. When an alarm panel indicates several floors have smoke detectors activated you should start the search at which floor where a detector is activated:

A. The lowest floor
B. The highest floor
C. The middle floor

D. The lobby floor

Answer_____

3. Firefighter operating an elevator during a fire should be equipped with what equipment?

A. Mask
B. Force entry tools
C. Portable radio
D. All of the above

Answer_____

4. When a fire occurs near a HVAC fresh air intake and smoke is sucked into the building the incident commander should:

A. Tell the person in charge
B. Vent the building
C. Order fresh air intake shut down
D. Evacuate building

Answer_____

4. To locate a cause of a water flow in a sprinkler system the incident commander should:

A. Check alarm panel to pinpoint floor of sprinkler discharge and search area
B. Contact alarm company and ask to reset alarm and see if it stays reset or water flows again
C. Search building for sound and sight of water discharge from sprinkler
D. All of the above

Answer_____

Answers: 1.C; 2.A; 3.D; 4.D; 5. D