

# BASIC FIRE SAFETY

## INTRODUCTION

A medical center environment has the potential for fire hazards to fires due to the various types of equipment, tests, and procedures that are a part of hospital routine. In all clinical environments there are dependent, immobile people that could easily be hurt or killed if fire prevention is not practiced diligently, or hospital staff are not knowledgeable in responding to a fire. This text is designed to give basic information on fire safety that should prepare you to function well in any situation involving a fire.

The nature of working as temporary staff makes it difficult to keep informed of the specific procedures for fire at each hospital. In order to address this concern phone extensions for fire reporting are given under "emergency pages" on the hospital orientation sheets. It is recommended that you review the hospital's orientation sheet each time you work to keep the procedure fresh in your mind. If the hospital does not have an orientation sheet, please inquire on how to make emergency pages when you receive report at the hospital.

## FIRE CHEMISTRY AND BEHAVIOR

Fire is a chemical reaction that requires three things:

### 1) HEAT

There must be enough heat present to cause the fuel to give off vapors capable of ignition. The temperature at which vapors are given off is called the "flash point." There must also be enough heat present to ignite those vapors. The higher temperature at which vapors are ignited is called the "ignition temperature." Heat can be present in many forms such as combustion, decomposition, friction, chemical, and electrical heat.

### 2) FUEL

Fuel is present in many forms including gases, liquids, vapors, solids, dusts, plastics, and metals. There must be fuel present in the form of vapor given off from the object being heated. Vapors also must be present in just the right amount to burn or no fire results. If there is too much vapor, the fuel is too rich to burn. If there are too few vapors, the fuel is too lean to burn. The lower and the upper limits of fuel vapors are called the "flammable limits."

### 3) OXYGEN

At least seventeen percent oxygen is needed for fire to occur. Oxygen exists not only in air but other compounds. Oxygen can be pressurized or liquefied. For example, some metals have oxygen in their make up and once heated high enough, they ignite and burn by themselves.

Combustible metal fires are hard to extinguish. Adding water actually adds more fuel. When water is put on a fire resulting from combustible metal, the very high temperature involved causes oxygen and hydrogen in the water to separate into elements. The hydrogen fuels the fire more and the oxygen makes the fire burn more intensely.

Envision the three elements (heat, fuel, and oxygen) needed for fire as a triangle. Remove one side of the triangle and the fire goes out. Remember though, that as long as two sides of the triangle are present, the potential for fire is great. For example, flammable liquid fires extinguished by dry chemical extinguishers often re-ignite. This is because in using the dry chemical extinguisher, the chemical reaction has been interrupted, and the supply of oxygen has been interfered. It is possible though, that enough heat is present to reignite any vapor in the fire area. Never let your guard down in a just extinguished fire.

### FIRE BEHAVIOR

Every fire goes through definite stages which makes fire behavior predictable. However, the time taken may vary with the amounts of available heat, fuel, and oxygen.

#### 1) INCIPIENT STAGE

The incipient stage is the small, tiny beginning sources of heat that make a material hot enough to give off vapors which are ignited and burned. The heat given off causes still more vapors to be produced. The source may have a temperature of 1,000 degrees Fahrenheit or more. An example is an electrical arc, a burning match, or a welding spark.

#### 2) FREE BURNING STAGE

Once the fuel is heated and more vapors are given off, the fire continues to intensify, causing still more heat and increasingly more vapors. The upward flow of heat brings in fresh air at the bottom, insuring more oxygen for combustion. This cycle continues and is limited only by the elements of the fire triangle. At this point, the fire is self-sustaining and is only controlled by the amount of fuel and oxygen available.

### 3) SMOLDERING STAGE

When a fire uses up the oxygen available, such as in a room, the fire "dampers down." But there is still plenty of fuel and heat available. At this stage, even the smoke becomes a fuel. The temperature could be several hundred degrees Fahrenheit inside the room. All that is missing is oxygen in amounts necessary to have combustion. If a door is opened or a window breaks, a fresh supply of oxygen may cause an intense flash of fire.

When the interior of a closed space reaches 800 degrees Fahrenheit, conditions exist for a "backdraft," "smoke explosion," or "flashover." Entire buildings have been known to "flashover." One moment there is very heavy smoke and heat and the next there is total involvement in fire.

### 4) SMOKE

Smoke is dangerous, both as a fuel source and a cause of death and injury to people. Smoke is heated air mixed with microscopic particles of fuel and the gaseous and vaporous products of combustion. The gases found in smoke include: carbon monoxide, carbon dioxide, water vapor, sulfur dioxide, nitrous oxide, and others. Some gases are odorless, others deaden the olfactory nerves so we cannot smell them in the smoke at all. Other gases, such as carbon monoxide, are absorbed by the red corpuscles in the blood 200 times faster than oxygen.

Smoke emitted while a building or object burns can be full of toxic gases which can be fatal, even with a short exposure. In fact, more deaths in fires are caused by smoke inhalation and suffocation than by burns.

## FIRE CLASSIFICATIONS

For educational and fire fighting purposes, fires are classified into four categories:

### 1) CLASS A

Class A fires are ordinary combustibles fires; these fires are fueled by wood, cloth, paper, rubber, and some plastics.

### 2) CLASS B

Class B fires are flammable/combustible liquids, gases, and greases. Paint, gasoline, and natural gas are examples. Never try to put out one of these fires with water, as water spreads and increases the fire. In most hospitals, routine checks are done to assure that flammable materials are not stored side by side on shelf areas.

### 3) CLASS C

Class C fires are energized electrical equipment fires. Hospitals generally conduct electrical safety checks on the equipment used there. However if you notice malfunctions such as smoke, sparks, flames, excessive vibrating, the item is too hot or cold to the touch, or stopping and starting erratically, report it to the proper hospital safety personnel.

### 4) CLASS D

Class D fires involve exotic metals. There are certain combustible metals, such as sodium, magnesium titanium, zirconium, and potassium, which create fire hazards. It is rare to encounter this kind of fire in the hospital or at home.

## REPORTING A FIRE

Upon the discovery of a fire, keep calm, and report it immediately, no matter how small or insignificant it may seem. Never underestimate the potential danger of an incipient fire! If two or more persons are present, one should pull the nearest fire alarm box, and the other should dial the emergency extension and tell the operator the exact location of the fire. Alert others in the area, and if possible help remove all persons that may be in danger. Techniques for evacuating disabled persons are found in the following section. Turn off any running oxygen units.

## EVACUATION OF DISABLED PERSONS

During any type of disaster, such as a fire or earthquake, you may have to help evacuate disabled persons. The following techniques are useful for doing this safely and efficiently. While only lifts from wheelchairs are explained, it is important to remember that the same guidelines can be followed in assisting individuals with other physical disabilities. In each case, a cooperative effort will be necessary to achieve safe stairwell evacuation. If individuals are of slight stature, they can be carried in the arms or evacuated with a Pack Strap Carry. Remember to use the stairwell, and not the elevator.

### a) PACK STRAP CARRY

The helper kneels at the front of the wheelchair and places the person's arms up and over the helper's shoulders and across their chest. The helper leans forward before raising slowly, to a standing position.

b) IN CHAIR EVACUATION

This type of evacuation will work with non-motorized wheelchairs. Unlock the brake, gently lean the chair backwards and move it to the edge of the first step.

One helper steadies the chair by holding the rods to which the footrests are attached. DO NOT lift the chair from the bottom position.

The helper in the top position controls the descent of the chair by bending their legs slowly and taking most of the weight.

c) OFFICE CHAIR EVACUATION

This type of evacuation can be used with a motorized wheelchair or fragile person. Transfer the disabled individual into a sturdy office chair.

One helper gently leans the chair backwards while the other helper faces the chair and holds onto the front chair legs.

The helpers control the descent by bending legs slowly and keeping their backs erect.

**IMPORTANT: NEVER LEAVE EMPTY WHEELCHAIRS IN THE STAIRWELLS!**

d) TWO PERSON CARRY FORE AND AFT

This technique is useful for removing people in motorized wheelchairs, for persons with limited walking ability, and for use where there is a narrow stairwell.

One helper reaches under the person's arms and grasps the individual's right wrist with their left hand and left wrist with their right hand.

If the disabled person is able to separate their legs, the other helper stands between their legs and lifts just above the knees.

If the disabled person cannot separate their legs, the helper stands alongside and carries both legs from that position.

The helpers control the descent by bending legs slowly and keeping their backs erect.

e) TWO PERSON CARRY SIDE-BY-SIDE

This type of carry will work with a wide stairwell. The helpers position themselves next to the wheelchair and grasp each other's arms, upper arm, or shoulder.

The disabled individual places their arms around the helpers' necks.

The helpers then lean forward and place their free arm under the individual's legs, firmly grasping each other's wrists.

The helpers then descent the steps of the stairwell at the same time.

#### **EXTINGUISHING A FIRE**

Once the fire has been reported, if it is possible to do so safely, return to the fire and attempt to extinguish it. Bring the appropriate extinguisher to the fire. Building code requirements call for the placement of portable fire equipment in specific locations per floor. The most commonly used fire extinguisher in commercial buildings is the ABC all purpose dry powder. To use a fire extinguisher, use the "PASS" method:

- P - Pull the pin.
- A - Aim at the base of the fire.
- S - Squeeze the trigger handle.
- S - Sweep from side to side.

#### **OTHER FIRE SAFETY TIPS**

If evacuation is necessary, USE THE STAIRWELL FOR EXIT. Do not use elevators. Elevators may stop on the fire floor exposing occupants to dangerous smoke or flames. Do not run, use the stairwell handrails, keeping to the right side of the stairwell. Allow other people to enter the stairwell but do not hold up travel. Assist those who are slower moving or disabled. If you exit onto the sidewalk, stay clear of exits and move a considerable distance from the building. Avoid causing interference with firefighters' and exposing yourself to the danger of falling glass. Do not return to the building for any reason unless you have been told it is safe to do so. If circumstances force you to go up the stairway, go up to the roof.

If you are inside a room and suspect fire or smoke outside, feel the door. If it is hot, do not open it. Place a blanket or article of clothing (wet, if possible) along the bottom of the door to keep out the smoke. If you should become trapped in a room, stay calm. Call the operator and state this fact. Have bright material ready in case you have to signal from a window. Do not break the window unless absolutely necessary.

If smoke is present, remember heat and smoke tend to rise. Stay low, you may need to crawl to exits on your hands and knees.

When retreating from a fire, if possible close as many doors as possible between you and the fire. Air movement fans the fire and causes it to spread.

Always consider every alarm "the real thing," unless you have been otherwise notified.

Do not use telephones. If you are on the phone, end the call quickly. Do not initiate calls except in emergencies. Keep the phone lines open.

#### **OXYGEN THERAPY AS A FIRE HAZARD**

Although oxygen is not a flammable gas, it does support combustion. Materials that are combustible will burn with such speed in an oxygen enriched atmosphere, that they may be considered to be explosive. In the past, ignition of fabrics such as bed linens, blankets, and clothing that have been enriched with oxygen has fatally injured many patients. It is important to remember that the separation of oxygen enriched atmospheres and ignition sources is necessary to insure the safety of all.

Observe carefully the proper procedures for handling compressed gas cylinders. The regulator used should assure that the oxygen will be delivered in the appropriate quantity and pressure. The regulator should be designed specially for oxygen use, since contamination of other gas regulators by flammable or combustible materials can, upon the introduction of oxygen, result in a violent explosion rupturing the regulator. This is caused by the combination of a hundred percent oxygen under high pressure with a combustible material, which leads to rapid oxidation or explosion. The same thing can happen with an oxygen regulator contaminated with petroleum lubricants. Never lubricate the regulator or cylinder fitting to make it work better. Also to ensure the orifice on the cylinder valve is not contaminated, "crack" the cylinder valve before attaching the regulator to blow out any foreign material or contaminants.

After a cylinder of oxygen is no longer needed, shut the oxygen off by the cylinder valve, followed by release of the pressure from the regulator. With the cylinder valve closed, the cylinder will not become a missile if the regulator is accidentally broken. Replace the dust cap on the cylinder, and mark the tank as empty. Remove the cylinder to the proper storage area and make sure it is secured by a chain, or holder.

When starting any oxygen therapy, or doing oxygen rounds, make sure a "no smoking" sign is posted where it can be easily seen. Make sure all adjacent electrical equipment is approved for use in oxygen rich atmospheres. Remove from the therapy area any highly combustible items such as lotions, oils, or excessive papers.



# FIRE SAFETY

Where is it most common for a fire to start?

- Patient bed or bedside
- Machinery room
- TV sets
- Trash cans
- Electrical panels
- Coffee makers

What 3 things need to be present for a fire to exist?

- Oxygen
- Heat
- Fuel

## R

**Rescue those in immediate danger**

- ♦ Protect yourself first.
- ♦ Don't open hot doors.
- ♦ Keep close to the ground.
- ♦ Use wet towel over face to filter the air



Removing one or more will extinguish the fire

## A

**Activate the alarm**

If you see or smell smoke, pull the handle on the nearest fire alarm station.

## C

**Contain the spread of the smoke and flames.**

- ♦ Close all doors & windows.
- ♦ Move patients beyond smoke barrier if feasible.
- ♦ Place wet towels or sheets against door cracks for a better seal.



## E

**Extinguish the fire  
Evacuate the area**

- ♦ Use a portable extinguisher if the fire is small to contain it. Remember to aim at the base of the fire and sweep the spray from side to side.
- ♦ If you can't extinguish the fire, evacuate to an area on the same floor beyond the fire doors, or to a lower floor if it's not safe.

## FIRE SAFETY QUIZ

Directions: Answer the following questions by filling in the blank.

1. What does the acronym R.A.C.E. stand for?

R \_\_\_\_\_  
A \_\_\_\_\_  
C \_\_\_\_\_  
E \_\_\_\_\_

2. What does the acronym P.A.S.S. stand for?

P \_\_\_\_\_  
A \_\_\_\_\_  
S \_\_\_\_\_  
S \_\_\_\_\_

3. What type of fire extinguisher would you use to extinguish an electrical fire?

- a. Water extinguisher
- b. Water in basin
- c. ABC dry Chemical

Directions: Answer the following questions by marking a "T" for true or an "F" for false in the space provided:

- \_\_\_\_ 4. Elevators are an acceptable means for evacuation during a fire.
- \_\_\_\_ 5. If evacuation of your unit is necessary, you should proceed to a safe area on the other side of the first set of smoke doors you come to.
- \_\_\_\_ 6. If the alarm is activated for an area beside, below, or above you, no actions need to be taken in your unit.
- \_\_\_\_ 7. If there is fire or smoke in your unit, you should open the window to let the smoke out.
- \_\_\_\_ 8. During a Code R.A.C.E., communication with your co-workers is important.

Signature \_\_\_\_\_ Date \_\_\_\_\_