

MARJOR PROGRAM POINTS

"FIRE PREVENTION AND SAFETY IN INDUSTRIAL FACILITIES"

Part of the "GENERAL SAFETY SERIES"

Quality Safety and Health Products, for Today...and Tomorrow

Outline of Major Points Covered in the "Industrial Fire Prevention" Course

The following outline summarizes the major points of information presented in the course on "Industrial Fire Prevention". The outline can be used to survey the course before taking it on a computer, as well as to review the course when a computer is not available.

- **Throughout history, fire has been a devastating destroyer.**
 - In 1835, a fire in New York City destroyed 530 buildings.
 - 36 years later, a city-wide fire engulfed Boston, MA, annihilating 800 buildings.
 - In 1871, the great Chicago fire consumed 17,450 buildings.

- **The wooden structures of the 19th century allowed fires to spread quickly.**
 - Firefighters of the day could do nothing to stop them.

- **Today there a number of things that make our workplaces much safer:**
 - Fire-resistant materials.
 - Smoke detectors.
 - Sprinkler systems.

- **In spite of these advances, devastating industrial fires still occur all too often.**
 - When a blaze consumes chemicals, plastics and other modern day substances, it can create toxic infernos that spread quickly and kill instantly.

- **The best way to "fight" a fire is to prevent it.**
 - First you need to know what causes things to burn.

- **All fires involve three elements:**
 - Heat.
 - Fuel.
 - Oxygen.

- **Removing any of the three elements will stop a fire.**
- **Fires start with heat, which serves as a source of ignition. Heat can be generated by many things, including:**
 - Open flames.
 - Static electricity.
 - Cutting and welding operations.
 - Faulty electrical circuits.
 - Unshielded hot surfaces.
 - Friction.
 - Chemical reactions.
- **Once a fire is burning, it produces more heat, which helps it to grow even larger.**
 - As long as there is enough fuel and oxygen, a fire will continue to spread.
- **Fuel can include:**
 - Combustible solids like paper, wood and some metals.
 - Flammable liquids.
 - Ignitable gases.
- **The vapors coming off a flammable or combustible material, mixed with oxygen in the air, produce flames.**
 - Some materials are always giving off flammable vapors.
 - Other materials have to be heated to produce these vapors.
- **For example, you have to apply heat to get a log to burn.**
 - The heat from the flames causes the wood to decompose, creating ash and flammable vapors.
 - These vapors mixed with oxygen in the air to produce more flames.
- **Since all fires are composed of heat, fuel and oxygen the chain reaction will continue until one of three things happens:**
 - The oxygen runs out.
 - The heat is removed.
 - The fuel is used up.

- **The temperature at which a material gives off flammable vapors is known as its "flashpoint."**
 - Some materials have extremely high flashpoints, and require a tremendous amount of heat to burn.
 - Other substances have low flashpoints, which makes them easy to ignite.

- **A good example of a substance with a low flashpoint is gasoline, which can be ignited at -45⁰ Fahrenheit (-42.8⁰ Celsius) or above.**

- **Gasoline and other substances that have flashpoints below 100⁰ Fahrenheit (37.8⁰ Celsius) are considered "flammable."**
 - These materials are especially dangerous, because they are almost always giving off vapors that can burn.

- **Materials that have flashpoints between 1000 and 2000 Fahrenheit (37.80 and 93.30 Celsius) are considered to be "combustible."**
 - Because combustibles, such as kerosene, have to be heated up before they produce ignitable vapors they are easier to control and safer than flammables.

- **In addition to heat and fuel fire needs plenty of oxygen.**
 - The more oxygen there is, the greater the amount of fuel that will burn.
 - That is why "fanning" a fire causes it to get hotter.

- **As a fire grows, it begins to draw in oxygen from the surrounding area, causing even more fuel to burn.**
 - As a result, a fire can quickly grow out of control... engulfing everything in its path.

- **To extinguish a fire this pattern must be broken.**
 - Fires are usually put out by applying substances that either remove the heat, or the oxygen.

- **What fuels a fire determines what type of extinguishing agents can be used.**
 - This is critical, because applying the wrong material will make things worse.

- **For instance, water:**
 - Will extinguish smouldering paper and wood.
 - Can cause burning liquids to spread.
 - Conducts electricity, so it can not be used on electrical fires or where it would come into contact with live wires or electrical equipment.

- **To identify the different types of burning materials, and indicate what substances can be used to extinguish them, fires are separated into four classes.**
 - Class A.
 - Class B.
 - Class C.
 - Class D.

- **Class "A" fires involve everyday combustibles, such as paper and wood.**
 - These are often put out with water, which cools the burning materials.

- **Class "B" fires are fueled by flammable gases and liquids, such as oil, propane and toluene.**
 - These materials can be extinguished by applying chemical foams that blanket the area and cut off the fire's oxygen supply.

- **Class "C" fires are electrical.**
 - These are also fought by smothering the fire.
 - But to prevent electrocution, Class C extinguishing agents are "nonconductive."

- **Class "D" fires are fueled by combustible metals such as potassium, sodium and magnesium.**
 - These fires are fought by covering them with dry sand or specially formulated chemical powders.
 - This cuts off the oxygen supply and eventually smothers the fire.

- **Class D fires are extremely dangerous, but not very common.**
 - If you have not been specifically trained to extinguish Class D fires, don't attempt to put one out.

- **To slow the growth of a fire, the first line of defense is usually an automated fire suppression system.**
 - Most facilities use sprinkler systems to quench Class A fires with a deluge of water.
 - Contrary to popular belief, sprinklers are not activated when a fire alarm goes off.
 - It is the heat from a fire that releases the valve on most sprinkler heads.
- **In areas where flammable liquids and gases are stored automatic fire suppression equipment would usually apply Class B foam or dry chemicals to smother fires.**
- **Class C materials are used where high voltage electrical hazards exist.**
- **Most automated fire suppression systems are not designed to put fires out.**
 - They beat down the flames and help keep them from spreading.
 - This allows people to evacuate and gives fire departments a fighting chance to save a building.
- **People who have been trained to fight fires are the second line of defense at most facilities.**
 - Typically these workers are only authorized to extinguish small fires.
 - Some facilities have in-house brigades capable of handling much larger blazes.
- **Training is critical, because there are a lot of misconceptions about how to fight a fire.**
 - Although you have probably seen it in the movies, never use a ordinary coat or blanket to smother a fire.
 - Textiles like these will often ignite, making the situation worse.
- **Don't try to beat down flames with a shovel, either.**
 - This will only fan a blaze, causing it to flare up.
 - Instead, smother the fire by throwing dirt or sand on it.

- **Of course, using a fire extinguisher is often the best way to put out a small blaze.**
- **There are many types of extinguishers. They discharge a range of materials, including:**
 - Water.
 - Carbon dioxide.
 - Dry chemicals.
- **Before using an extinguisher, make sure that it is compatible with the class of fire you are fighting.**
 - If the extinguisher's label doesn't indicate that it is rated for that class of fire, don't use it.
- **You often see fire extinguishers that are marked "A, B and C" on their label.**
 - This means that they can be used to extinguish all of these types of fires.
- **To put a fire out with an extinguisher use the "PASS" system.:**
 - Pull the pin.
 - Aim the nozzle.
 - Squeeze the trigger.
 - Sweep from side to side.
- **Once an extinguisher is empty, place it on its side in a out-of-the-way area.**
 - This will prevent anyone else from trying to use it again.
- **Most extinguishers empty in less than 15 seconds.**
 - If you can't put a fire out in that length of time you should evacuate the area immediately.
- **Now that you know why fires start, what causes them to spread, and how to extinguish them, you should be able to recognize potential fire hazards.**
 - Your company's "Fire Prevention Plan" will help you, by listing sources of ignition and major fire hazards in your facility.
 - An important part of the plan deals with how to properly store and handle hazardous materials.

- **Many industrial fires occur because flammable materials are stored improperly or used incorrectly.**
 - Make sure that flammable substances are well away from sources of ignition.
 - Store them in containers approved for industrial use.
- **Gasoline and other flammable liquids should be stored in safety cans that are outfitted with "flash arresters."**
 - These wire mesh devices prevent flames and sparks from entering the mouth of a container and igniting the substances inside.
- **Special care should be taken with materials that can be highly unstable. These include substances that are:**
 - Spontaneously combustible.
 - Shock-sensitive.
 - Chemically-reactive.
- **Spontaneously combustible materials, such as varnishes that contain linseed oil, produce heat as they dry.**
 - Since rags soaked with these materials can burst into flame, they must be disposed of in sealed metal containers designed to handle ignitable waste.
- **Substances like nitroglycerin are "shock-sensitive."**
 - These types of materials can detonate and start a fire when they are shaken or dropped.
 - Shock-sensitive materials require special handling procedures, such as being stored at very low temperatures.
- **Some substances can start a fire by reacting with other materials.**
 - "Water-reactive" substances, like calcium carbonate, produce ignitable vapors when they get wet.
 - These materials need to be kept in airtight containers and stored in dry locations.
- **While open flames are obvious fire hazards, some ignition sources are more difficult to "spot"... unless you know what to look for.**
 - For instance, static electricity can build up in containers that are designed to hold flammable materials.

- **Plastic fuel containers that have been transported in trucks with plastic bed-liners are especially prone to static charges.**
 - The static is generated by friction, as the can rubs against the liner.
 - If a statically charged can is left on a truck the spark can discharge at the mouth of the can when it is filled, igniting flammable vapors.
- **To prevent this, containers should always be "grounded" before they are filled.**
 - This allows static electricity to harmlessly discharge.
 - Small containers can be placed directly on the ground.
 - Large containers should have "grounding wires" connected to them before they are filled.
- **Sparks from tools and equipment can ignite flammable materials, as well.**
 - Hand tools like shovels can create dangerous sparks when they scrape against hard surfaces.
 - You can protect yourself in these situations by using "spark-proof" tools made out of materials like polypropylene, that are treated with anti-static agents.
- **Forklifts and powered equipment that are used around flammable materials must be equipped with safety features that prevent their mechanical parts from creating sparks.**
- **Small electronic devices such as cell phones, can create sparks that could ignite flammable vapors as well.**
 - You should never use these devices in areas where vehicles are fueled, or where other flammable substances are handled.
- **To learn what equipment is safe to use in flammable environments you can:**
 - Check their nameplates.
 - Consult users' manuals.
 - Talk to your supervisor.

- **Fires can also be started by other sources of ignition, including:**
 - Welding and cutting operations.
 - Electrical equipment.
 - Careless smoking.
- **Being aware of your surroundings can help you to prevent these types of fires.**
- **Stray sparks from welding and cutting operations cause a number of industrial fires.**
- **The best way to prevent these fires is to follow safe work practices such as:**
 - Moving ignitable materials away from the area.
 - Placing fireproof blankets over materials that can't be repositioned.
 - Using guards to prevent sparks and hot metal fragments from scattering.
- **Even with these types of precautions a stray spark or a piece of hot metal can "escape."**
 - So posting a "fire watch" can be critical.
- **Since embers can smolder for some time before they actually ignite a fire, employees on "fire watch" must:**
 - Look for signs of fire while work is being performed.
 - Maintain their watch for at least a half an hour after the welding job is done.
- **Other major causes of industrial fires are faulty electrical equipment and overheating.**
- **Overloaded circuits cause a lot of electrical fires.**
 - Overloads occur when equipment draws too much power.
 - In time this can cause wiring to heat up and burn.
- **To avoid overloads, make sure that:**
 - Wiring is rated for the equipment you will be using.
 - Too many devices are not plugged into the same circuit.

- **Fires can also start when wood shavings, grease and other ignitable materials build up on a machine that gets hot.**
 - To avoid this, keep equipment clean, especially around electric parts such as motors, or areas where friction can cause a lot of heat.
 - If you notice equipment overheating, or see frayed or loose wiring, shut off the power and notify your supervisor.

- **Paying attention to your surroundings while you work, and being aware of potential fire hazards, can prevent many on-the-job fires.**
 - But it is also important not to let your guard down when you go on break.

- **When you are cooking don't leave toaster ovens and other appliances unattended.**

- **If you smoke, be aware of your environment.**
 - Don't light up around ignitable materials.
 - Be careful where you discard your cigarette butts.
 - Make sure cigarettes are completely out before you toss them.
 - Only dispose of butts in proper containers, such as specially designed receptacles or metal pails filled with sand.

- **No matter how many precautions you take, a fire can still occur.**
 - This is when fire alarms and smoke detectors save lives.

- **To be effective, fire alarms and smoke detectors should be strategically positioned throughout the workplace.**
 - This should include the basement and other storage areas.
 - If you hear an alarm or detector go off, you should leave the area immediately.

- **So that everyone in your facility knows what to do in the event of a fire, your company should have an "Emergency Action Plan." The plan will describe:**
 - How to report fires.
 - The evacuation procedures for your facility.
- **Each employee should know of at least two escape routes.**
 - That way, if one path is blocked they will know another way out.
- **Always keep evacuation routes uncluttered.**
 - Make sure all exit doors can be opened from the inside (otherwise you could find yourself trapped).
- **Your facility's Emergency Action Plan will also:**
 - List a location for you to report to after evacuating.
 - Establish a way to make sure that all employees have been accounted for.
- **Emergency personnel should be notified immediately if anyone is missing.**
- **When you are evacuating your work area there are several basic guidelines to follow:**
 - Always remain calm.
 - Walk, don't run, and never push past other people.
 - Follow your predefined evacuation route (but be careful that you aren't heading into danger).
- **If it's not safe to proceed in the direction that you are going, find another escape route.**
 - But avoid taking "shortcuts."
- **Never use an elevator to escape from a burning building.**
 - You could get trapped inside if the power failed.
 - Use the stairs instead (but be cautious when you approach closed doors).

- **Make certain that doors are cool to the touch before you open them.**
 - Check doors with the back of your hand...its more sensitive to heat than your palms.
 - Never open a door that is hot (it probably has flames behind it).

- **If a door is cool, you can proceed on through, but be sure to close it behind you.**
 - If you have time, shut all the windows too.
 - This limits the amount of available oxygen and helps to contain the fire.

- **When a building is burning, smoke can quickly build up and make it impossible to see.**
 - So you need to know your evacuation route "blindfolded."
 - Since smoke rises, get close to the floor to avoid inhaling it.
 - Cover your face with a wet cloth, if possible.
 - Take short breaths.

- **Smoke can kill, especially if it contains toxic substances.**
 - So get to fresh air quickly.
 - Then seek medical attention.

- **If your clothing catches fire, don't run around. This will only fan the flames. Instead, remember this simple phrase:**
 - "...Stop."
 - "...Drop."
 - ..."and Roll."

- **This means:**
 - Drop to the ground.
 - Keep your legs and arms close to your body.
 - Cover your face with your hands.
 - Roll back and forth until the flames are smothered.

- **Whenever there is a fire, injuries can occur.**
 - In these situations, knowing first aid can save lives.

- **Serious burns should be treated cautiously:**
 - Do not apply cold water or ice.
 - Never remove clothing that has stuck to the skin.
 - Cover the wound with loose, dry, sterile dressings.
 - Get medical help as quickly as possible.
- **You can treat slight burns or scalds by:**
 - Submerging them in cold water.
 - Then applying a dry, sterile bandage.
- **Never cover a burn with grease or butter.**
 - They trap the heat and actually make the burn worse.
- **Smoke inhalation can cause violent coughing and prevent people from catching their breath.**
 - Get victims to fresh air quickly.
 - Have them lay down and breath slowly, drawing in deep lungfuls of air.
- **If someone isn't breathing at all:**
 - Call for medical help immediately.
 - Then perform artificial respiration.

* * ***SUMMARY*** * *

- **The best way to "fight" a fire is to prevent it in the first place.**
- **Treat flammable and combustible materials with caution.**
 - Before filling a container, make sure that it is approved for the substance and properly grounded.
- **Be careful when welding operations are taking place.**
 - Make sure that appropriate precautions have been taken.
- **Look for possible sources of ignition and report dangerous situations.**
 - If you see an electrical hazards, switch off the power immediately, then notify your supervisor.

- **Only smoke in designated areas.**
 - Make sure to thoroughly extinguish cigarettes and properly dispose of the butts.
- **Know your evacuation routes.**
 - Keep them uncluttered.
 - Make certain that all exit doors can open.
- **Be ready for an emergency.**
 - Participate in fire drills and take a first aid course.
- **If you discover a fire, sound the alarm and get out!**
- **Most fires can be prevented.**
 - But there is always a chance that one will occur.
- **By staying alert, and following your company's Fire Prevention Plan, you can make sure that you don't "get burned!"**