

FIRE PREVENTION AND SAFETY IN INDUSTRIAL ENVIRONMENTS

COURSE OUTLINE

- **To burn, a fire needs three ingredients...**
 - Fuel.
 - Oxidizer.
 - Heat.
- **The "fuel" is any material that will burn. Fuels can include...**
 - Combustible solids such as wood, paper, cardboard and some metals.
 - Flammable and combustible liquids such as gasoline, toluene and some solvents and cleaning solutions.
 - Ignitable gases such as propane and natural gas.
- **A fire must also involve an oxidizer.**
 - In most cases, atmospheric oxygen takes on this role.
 - But there are some situations where an oxidizer such as fluorine or chlorine, combined with heat and fuel, can lead to a fire too.
- **The more oxygen a fire has, the better it will burn.**
 - That's why fanning a fire makes it flare up.
- **The third element that a fire needs is heat.**
 - This is a "source of ignition" such as a burning match or an electric spark.
 - It "lights" the fire and keeps it burning.
- **Once a fire has started, it will continue as long as there is fuel and oxygen to feed it.**
 - But when you remove either of these ingredients, the fire goes out.
- **To put out most fires, you apply some type of "retardant".**
 - This could be water, baking soda or sand.
 - These can reduce its heat or deprive it of fuel or oxygen.
- **But not all fires are alike.**
 - Depending on the types of materials that are burning and where the fire is located, using the wrong fire retardant can make a bad situation even worse.

- **For example, water does a great job of putting out burning cardboard.**
 - But if you pour water on burning liquids, it will just spread the fire further.
 - And since water conducts electricity, you can't use it on a fire that is burning in or around electrical equipment, because somebody could be electrocuted.
- **To make it easier to distinguish between different types of fires and determine how they should be extinguished, they have been divided into classes.**
 - "Class A" fires involve everyday solid combustibles like paper and wood, which can be extinguished with water.
 - "Class B" fires involve flammable gases, liquids and some plastics, which are usually extinguished by applying chemical foams.
 - "Class C" fires involve electricity and can occur in any type of electrical equipment.
 - "Class D" fires involve combustible metals and are less common but can still occur in industrial environments because of the high levels of heat these metals can be exposed to.
- **When a fire starts, seconds count.**
 - The burning has to be slowed down as much as possible as soon as possible in order to protect lives and property.
- **The first line of defense in most buildings is a sprinkler system which is triggered automatically by the heat of a fire.**
 - Sprinkler systems can be designed to soak a fire with large quantities of water, foam or dry chemicals.
 - While these retardants may extinguish the fire, they also beat down flames and slow the burning process.
 - This lets people inside evacuate and fire department personnel get in safely to do their job.
- **Fire extinguishers provide another line of defense in a fire emergency.**
 - They discharge water, carbon dioxide or dry chemicals to fight specific classes of fires.

- **Before using an extinguisher in any situation you need to make sure that it is compatible with the class of fire you're fighting.**
 - If the label indicates that it's the wrong type of extinguisher for that fire, don't use it.
 - Fortunately, many fire extinguishers are marked "A, B and C" on their label.
 - This shows that they are multipurpose units and can safely be used for all three classes of fires.
- **When you use a fire extinguisher, remember to follow the "P.A.S.S." method...**
 - **P**ull the pin.
 - **A**im the nozzle.
 - **S**queeze the trigger.
 - **S**weep from side to side.
- **Most extinguishers will empty in less than 15 seconds.**
 - If you can't put a fire out in that timeframe, you should evacuate the area immediately.
 - Place the empty extinguisher on its side out of the way so no one will trip over it or try to use it again.
- **Many fires occur because flammable materials are handled or used incorrectly.**
 - Flammable substances should be kept well away from all sources of ignition and stored in containers approved for industrial use.
- **Gasoline and other flammable liquids should be stored in cans that are equipped with flash arresters.**
 - These prevent flames and sparks from getting inside and igniting the substances.
- **Care should be taken with 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 flames, they must be disposed of in sealed metal containers that are designed to handle ignitable waste.

- **“Shock sensitive” substances like organic peroxide can detonate and start a fire when they are shaken or dropped.**
 - So they require careful handling and storage procedures.
- **Some substances can undergo vigorous chemical reactions when they are exposed to certain other materials.**
 - Calcium carbide, for example, is a "water-reactive" substance that generates flammable vapors when it gets wet.
 - Materials like these must be stored in sealed containers and isolated so that they can't react with other substances.
- **Industrial environments are uniquely vulnerable to fire hazards because of the materials and machinery that are often involved in what they do.**
- **The best way to “fight” fires is to keep them from starting in the first place.**
 - You can help to prevent fires in your facility by learning how to recognize potential fire hazards and doing what's needed to reduce or eliminate them.
- **Clutter can be fires waiting to happen, including...**
 - Packing materials.
 - Piles of paper.
 - Boxes.
- **So you should “police” your work area regularly and dispose of all waste.**
- **The wood shavings and combustible dust that are generated by woodworking and metal processing are also common causes of industrial fires.**
- **Oil, grease, and other ignitable materials that build up on machine parts can get hot and lead to a fire as well.**
 - So remember to keep all equipment surfaces clean.
- **Careless smoking causes a number of “accidental” fires by providing a source of ignition for any fuel that's in the area. If you smoke...**
 - Be sure to follow your company's smoking policy.
 - Smoke only in designated areas.
 - Make sure cigarette butts are extinguished before discarding them.
 - Place butts in proper containers... not in the trash.

- **One in five workplace fires occur when welding, cutting or some other operation that can provide a source of ignition is being performed.**
 - These tasks are known as "hot work", and they are strictly controlled at your facility by a "permitting" system.
- **Hot work fire safety measures include...**
 - Preventing the throwing off of sparks or slag.
 - Removing or protecting flammables in the area.
 - Posting a "fire watcher" to make sure no secondary fires occur.
- **Electricity is involved in many industrial fires.**
 - Electrical fires can be caused by damaged or overloaded circuits and equipment, as well as not following safe work practices.
- **"Overloads" occur when too much power is being drawn through an electrical circuit, which can cause the wiring to heat up and catch fire.**
 - Before you plug in a power tool or piece of equipment, make sure the circuit can handle its power requirements.
 - This also applies to any extension cords you plan to use.
 - They should be rated for the amount of power the equipment they are connected to will be drawing.
- **Never install an extension cord as a "permanent" power-supply solution.**
 - They're for temporary use only.
 - Over time they can deteriorate and become a fire hazard.
- **You should also avoid using power strips or other "adapters" that can result in plugging too many devices into a single circuit.**
 - Check all power cords for damage such as cracked or frayed insulation.
 - If you find any cord problems, don't use that equipment.
- **We can all help reduce the risk of fires occurring in our workplace by taking precautions as well as eliminating hazards.**
 - But accidents can still happen.
 - So it's important to know how to respond if and when a fire does occur.
- **The groundwork for this has already been laid out in your building's "Emergency Action Plan".**
 - This details the steps that should be taken if an emergency occurs.
 - This includes mapping out evacuation routes and explaining how everyone in the building can evacuate safely.

- **You should take the time to familiarize yourself with the Plan and identify at least two evacuation routes from the areas where you work.**
 - That way if one route is blocked, you'll be able to evacuate quickly using the other one.
 - Remember to keep evacuation routes and emergency exits clear so everyone can get out safely.
- **During a fire, smoke can make it difficult to see where you're going.**
 - So you should practice how to navigate along your evacuation routes with your eyes closed as well.
 - It could save your life.
- **When a fire alarm rings, it's your signal to leave the building.**
 - Don't delay because you think it's "just a drill".
 - And don't stop to pick up your personal possessions.
 - Just go!
- **Remain calm and follow your evacuation route.**
 - Walk, don't run.
 - Never push past people in front of you.
 - Do not use an elevator (you could be trapped inside if the power fails).
 - Use the stairs instead.
- **Inhaling the smoke from a fire could kill you.**
 - But since smoke rises you can avoid breathing it by staying as close to the floor as possible.
 - Cover your face with a wet cloth if you can and take short breaths.
- **When you approach a closed door, make sure that it's cool before you open it.**
 - Check the temperature with the back of your hand (it's more sensitive to heat than your palm).
 - A door that's hot probably has flames behind it, so don't open it!
 - Use an alternate route instead.
- **If you work in a "multi-story" facility, you may be instructed to evacuate to a "safe area" inside the building.**
 - Otherwise, proceed to the ground floor and leave the building immediately.

- **Get to the assembly area that's specified in your company's Emergency Action Plan.**
 - Report yourself as “safe”.
 - Remain there until you’re told that it’s okay to leave.

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- **In order to burn, fires must have fuel, an oxidizer such as oxygen and heat. Removing any one of these ingredients will extinguish the fire.**
- **Not all fires are alike. Before you use any fire extinguisher, check the label to make sure it's designed for the class of fire you're fighting.**
- **Identify fire hazards in your work area and know where there is an extinguisher that can put them out.**
- **Eliminate potential sources of ignition from your facility, such as overloaded electrical circuits and damaged equipment.**
- **Smoke only in designated areas. Make sure to thoroughly extinguish cigarette butts and properly dispose of them.**
- **Be sure you know at least two evacuation routes from your work area.**
- **If a fire emergency does occur, remain calm and follow your company's evacuation plan.**
- **Now that you know how fires can start, how to prevent them and how to respond effectively if one does occur, you can help to make sure that you and your coworkers don’t “get burned” on the job.**