

FIRE PREVENTION

COURSE OUTLINE

- **While HAZWOPER deals with materials that are inherently dangerous, imagine how much more threatening some of these substances can be if they catch fire!**
- **A few of the dangers that chemical fires present include:**
 - High temperatures.
 - Smoke.
 - Toxic fumes.
- **Chemical fires can move quickly, and have devastating results.**
 - They require special firefighting techniques.
 - They are often difficult to control.
- **When chemical fires release corrosive or toxic gases, the safety and health of the surrounding community can also be affected.**
 - Some emergencies may even require people to evacuate.
 - All of these hazards make combating chemical fires especially dangerous.
- **Of course, the best way to "fight" a fire is to prevent it from occurring in the first place.**
 - But to do this, you need to know what causes things to burn.
- **Fire requires three components. Removing any one of them will extinguish a fire:**
 - Heat.
 - Fuel.
 - Oxygen.
- **For a fire to start, it needs some type of heat to ignite it. Sources of ignition include:**
 - Open flames.
 - Sparks from cutting and welding.
 - Electrical short circuits.
 - Unshielded hot surfaces.
 - Friction between materials (which can generate heat and static electricity).

- **In addition, chemical reactions can sometimes produce enough heat to cause materials to burst into flames.**
 - Some chemicals, like nitroglycerine, are shock-sensitive and explode when they are shaken.
 - Others, like lithium, react with water and other substances.
 - You must make sure that unstable materials are handled carefully, and that incompatible substances never mix.
- **There are also substances, such as linseed oil, which produce heat as they dry.**
 - This can cause them to spontaneously combust.
 - For this reason, rags and spill pillows soaked with these chemicals must be disposed of in metal containers approved for combustible materials.
- **Once a fire starts, it produces more heat, which causes it to spread further.**
 - This chain reaction will continue as long as there is enough fuel and oxygen.
- **Fuel can include:**
 - Solids like paper and certain metals.
 - Liquids.
 - Gases.
 - Even dust.
- **When liquids are heated, they boil, and when solids are heated they melt or "decompose."**
 - Either way, they give off vapors.
- **It's important to realize that it's the heated vapors coming off a flammable or combustible material, mixed with oxygen in the air, that produce flames.**
 - This means that when you light a fire in your fireplace it is not the log itself that is burning. It's the vapors coming off of the log that burn.
- **The temperature at which a material gives off vapors that will burn is known as its "flashpoint."**
 - Some materials, like asbestos, have extremely high flashpoints and require a tremendous amount of heat to cause them to burn.
 - Other substances have very low flashpoints and ignite easily.

- **A good example of a substance with a low flashpoint is gasoline, which can be ignited at temperatures as low as -45 degrees Fahrenheit (-42.8 degrees Celsius).**
 - Substances like gasoline that have flashpoints below 100 degrees Fahrenheit (37.8 degrees Celsius) are considered "flammable."
 - This means that these substances are always giving off vapors that can burn.
- **Materials with flashpoints between 100 and 200 degrees Fahrenheit (37.8 and 93 degrees Celsius) are considered to be "combustible."**
 - Combustibles, such as kerosene, are much easier to control because they have to be heated up before they produce ignitable vapors.
- **The third ingredient that fire needs is oxygen.**
 - The more oxygen there is, the greater the amount of fuel that will burn.
 - This is why fanning a fire causes it to grow.
- **Because fire needs a constant supply of heat, fuel and oxygen, removing any one of these components will extinguish a fire.**
- **While water is used to put out most fires, it will not work on many chemical fires.**
 - In fact, burning chemicals may actually float on top of water, spreading the fire even further.
 - Since trying to put out a fire with the wrong substance may actually make things worse, it is important to correctly identify what is burning and use the right type of material to extinguish it.
- **To help determine what firefighting materials to use, fires are categorized into four classes:**
 - Class "A".
 - Class "B".
 - Class "C".
 - Class "D".
- **Class "A" fires involve everyday combustibles, such as paper and wood.**
 - These fires can be put out with water.
 - This cools the burning materials, extinguishing the flames by removing the heat.

- **Class "B" fires involve flammable liquids and gases, such as propane, toluene and similar chemicals.**
 - Class B fires are usually fought with chemical foams.
 - These form a thick blanket over the burning materials, cutting off the supply of oxygen and smothering the fire.
- **Class "C" fires are electrical.**
 - Because there is a risk of electrocution, the chemical agents used to fight these fires do not conduct electricity.
- **Class "D" fires involve combustible metals, such as:**
 - Potassium.
 - Sodium.
 - Magnesium.
- **This class of fire can be the hardest to deal with, because combustible metals react with a variety of substances, including water.**
 - Class D fires are usually fought by carefully applying dry sand or chemical powders.
 - These materials cover the burning metal and eventually smother the fire.
- **Knowing about the different classes of fires will not only help you to extinguish them, it can also make it easier for you to prevent them.**
- **Since fire hazards can usually be identified ahead of time, most fires can be avoided by inspecting work areas for unsafe conditions... and by being safety conscious. Look for possible ignition sources such as:**
 - Heaters.
 - Lights.
 - Exposed wires.
- **Make sure materials that will burn are stored well away from these locations.**
- **Identify substances that are flammable or combustible by referring to:**
 - Safety Data Sheets (SDS).
 - Shipping papers.
 - Container labels.
- **Be aware of all of the hazards associated with a burning substance, such as:**
 - The possibility of explosion.
 - The release of toxic fumes.

- **It's important to have this information ahead of time, so that you can be prepared in case of an emergency.**
 - You need to be extra careful if you are dealing with flammable or combustible materials, since it doesn't take much to ignite these substances.
- **Keep all flammable and combustible materials in approved storage containers.**
 - These containers must be equipped with pressure relief valves that allow a substance to "breathe."
 - If a flammable or combustible material is sealed in an airtight container, pressure can build up... causing the substance to heat up and burst into flames.
- **Containers should also be outfitted with "flash arresters."**
 - These wire mesh devices prevent flames and sparks from "flashing" back into the containers and igniting flammable vapors.
- **Inspect containers for leaks and other damage.**
 - If there is a leak, place the container in an over-pack drum, or transfer it's contents into a salvage tank.
- **If you have to move flammable or combustible substances from one container to another, be careful.**
 - Use absorbent material to catch any spills, and make sure that you are well away from ignition sources.
- **Keep in mind that the tools and equipment that we use can also cause substances to ignite.**
 - Hand tools like metal shovels can produce sparks when they scrape against the ground.
 - If you are working around flammable materials, play it safe and use spark-proof tools.
- **Forklifts and other machinery might also produce sparks.**
 - Before you use equipment like this around flammable or combustible materials, make sure it is outfitted with spark-suppressing devices and is approved for the situation.
- **You need to be careful where you use electronic devices like cell phones and laptop computers, as well.**
 - Unless their components are shielded, they too can produce sparks that might ignite flammable vapors.

- **When transferring flammable materials, even the containers themselves can be dangerous.**
 - Since containers are often exposed to a lot of friction when they are transported, static electrical charges can form within them.
 - When someone goes to fill a statically charged container with a flammable substance from another container, a spark may leap between the containers, causing an explosion and fire.
 - Before pouring flammable substances into any container, make sure that it is properly grounded.
- **When dealing with a spill situation, you may have to take other safety measures to keep a fire from starting.**
 - If you're not sure what a substance is, assume that it is extremely flammable.
- **Lock out and tag power sources to prevent electrical energy from igniting the spilled material.**
 - Then have an authorized person use a direct reading device to test the air around the spill for flammable and combustible gases.
- **Use spill pillows or dikes to contain the spill, so that it does not spread and come into contact with ignition sources.**
 - Chemical foam can sometimes be used to form a "blanket" over a spill.
 - This will help to prevent a fire by keeping oxygen away from the fuel.
- **Be careful during cleanup.**
 - Don't allow any ignitable material to build up on your tools or clothing, since they could become fire hazards too.
- **Keep fire-fighting equipment easily accessible, so that if a fire does start, it can be extinguished without delay.**
- **Remember, fire moves quickly and can have devastating results.**
 - So you have to be prepared to react at the first sign of smoke.
- **To learn what to do in the event of a fire, consult your site's:**
 - Emergency response plan.
 - Safety Data Sheets (SDSs).
 - Emergency response guides.

- **They will show you what fire-fighting materials can be used to put out a fire involving specific substances, as well as what evacuation procedures to follow.**
- **This information is especially important if the chemicals that are burning are corrosive or toxic.**
 - Fires involving these types of substances produce fumes that can threaten the health of people many miles downwind.
 - In these situations you will need to contact the local fire department, so people in the surrounding area can be evacuated if necessary.
- **While not all fires can be prevented, there are a number of ways to keep them from spreading.**
- **The first line of defense is usually a sprinkler system or other automatic fire-suppression equipment.**
 - In chemical storage areas, these are often set up to drop large amounts of foam to smother a fire.
 - Before this deluge is released, an alarm will sound, warning you to get out of the way.
- **If you are trained and authorized to do so, you may choose to fight a fire yourself.**
 - But remember, always sound the alarm first.
 - Even a small fire can grow out of control in seconds, especially when flammable chemicals are involved.
- **Small fires can sometimes be put out by using a fire extinguisher.**
 - But first, check to make sure that the extinguisher is appropriate for the class of fire that you are dealing with.
- **It's a good idea to practice using fire extinguishers, so that you know exactly how to work them in an emergency.**
- **When operating an extinguisher, use the P.A.S.S. method:**
 - Pull the pin.
 - Aim the nozzle at the base of the fire.
 - Squeeze the trigger.
 - Sweep the spray from side to side, until the fire is extinguished.

- **Once the extinguisher is empty, lay it on its side and out of the way of evacuation routes.**
 - This will prevent anyone from mistaking it for a full extinguisher.
- **Most extinguishers empty in less than 15 seconds.**
 - If you can't put the fire out in this amount of time, evacuate immediately.
- **To make sure that everyone is accounted for in an evacuation, all employees should go to a predetermined meeting place.**
 - Take a "head count", and if anyone is missing inform rescue personnel.
- **When evacuating a building, check doors to make sure that they are not hot before you open them.**
 - Be careful... hot doors often have flames behind them.
 - Feel the door with the back of your hand (it's more sensitive to heat than your palms).
 - If any part of the door is hot, find another escape route.
 - If the door is cool to the touch you can go through, but be sure to close it behind you.
- **If there is time, close all the windows in the area too.**
 - This will help to contain the fire by limiting the available oxygen.
- **Once a fire starts there may be only a few seconds before smoke builds up and makes it hard to see.**
 - So know your evacuation route blindfolded.
- **Remember, smoke can also kill, especially if the burning substances are releasing toxic fumes.**
 - Since smoke rises and tends to accumulate at the ceiling, get close to the floor to avoid inhaling it.
- **If possible, use a wet cloth to cover your face.**
 - This will help to filter out some of the smoke, making it easier for you to breathe.
 - Take short breaths, so that you don't inhale any more smoke than you have to.
 - Get to fresh air as quickly as possible... 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."**
 - Get on the ground, keep your legs and arms close to your body and roll back and forth, or over and over, until the flames are smothered.
 - If possible, keep your face covered with your hands while you roll. This will prevent you from breathing in the flames and burning your mouth, throat and lungs.

*** * *SUMMARY* * ***

- **Fires of any type can cause a lot of damage... but chemical fires can be especially dangerous.**
 - To prevent these fires you need to eliminate potential fire hazards.
- **Learn to recognize materials that are flammable and combustible, and keep them away from ignition sources.**
- **Consult your facility's emergency response plan, Material Safety Data Sheets and other resources to determine what to do in the event of an emergency.**
- **When you see a fire, sound the alarm immediately.**
- **If you are authorized, you may fight a small fire yourself... but make sure that you use the right kind of fire extinguisher.**
- **Don't hesitate to evacuate. If a fire is too much for you to handle, get out!**
- **Fire can break out anywhere, at any time. But if you are alert, and know how to react in these situations, you can be sure that you won't get "burned!"**