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Blue Tuna's Safety Training Presentations

Fire Extinguishers

29 CFR 1910.157



Speaker's Notes:

- A fire extinguisher is an absolute necessity in any home, office, manufacturing facility, construction site, and even vehicles. There is a good chance that the extinguisher will sit on the wall for years collecting dust; however, it could also end up saving your property and your life.
- In this training session we will see what causes a fire, what fire extinguishers do, learn how to use an extinguisher, and learn about different fire suppressant materials.

Goals

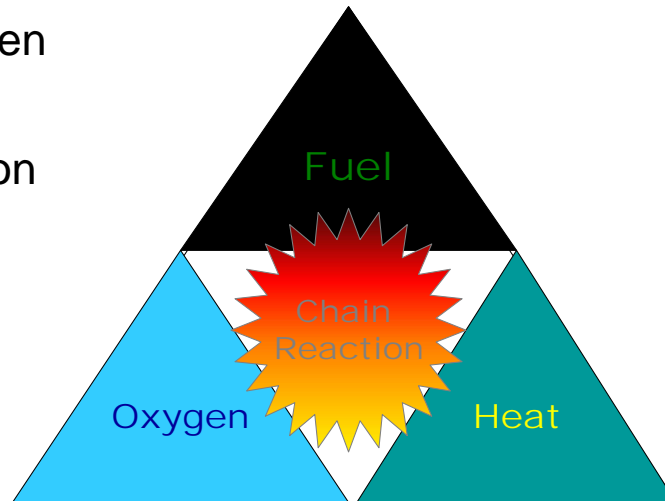
- Fire triangle and fire classes
- Types and use of extinguishers
- Quiz

Speaker's Notes:

- We will start by discussing the fire triangle and the different types or classes of fire.
- Next we will discuss many of the different types of fire extinguishers as well as their safe use and maintenance.
- Finally, we will wrap up the class with a quiz.

Fire Triangle

- Oxygen
- Fuel
- Ignition



Background for the Trainer:

- Discuss some possible sources of ignition in your workplace.

Speaker's Notes:

Fire is the result of a chemical combustion reaction. Fire, or the chemical combustion reaction, needs three things at all times in order for the reaction to continue—oxygen, fuel, and ignition.

- The oxygen in the air is sufficient to support fire.
- Some sort of fuel is required, such as wood, paper, gasoline, etc.
- However, wood and gasoline do not spontaneously catch fire just because they are surrounded by oxygen. For the chemical combustion reaction to take place, the fuel has to be heated to its ignition temperature by some outside source of ignition. Source of ignition might include: burning cigarette, overheating equipment, welding, static electricity, chemical reaction, etc. Once ignited, the heat of the flame keeps the fuel at the ignition temperature, so it will continue to burn as long as there is fuel and oxygen.

Class A

- Ordinary combustibles
 - Wood
 - Paper
 - Plastic
 - Garbage



Background for the Trainer:

- Discuss the types of ordinary combustibles that are in your workplace.

Speaker's Notes:

- Class A fires are fires that involve ordinary combustible materials such as:
 - Wood, pallets, lumber
 - Paper and cardboard
 - Plastic and foam
 - Garbage

Class B

- Flammable liquids

- Grease
- Gasoline
- Oil
- Solvents



Background for the Trainer:

- Discuss the types of flammable liquids that are in your workplace.

Speaker's Notes:

Class B fires are fires that involve flammable liquids such as:

- Grease that is often found in the kitchen
- Gasoline, kerosene, and other fuels
- Oil and other combustible liquids
- Common solvents such as paint thinners, mineral spirits, and common organic solvents that are found in a laboratory.

Class C

- Energized electrical equipment

- Appliances
- Switches
- Panel boxes
- Power tools



Background for the Trainer:

- Discuss the types of combustible metals that are in your workplace.

Speaker's Notes:

Class C fires involve energized electrical equipment such as:

- Appliance including stoves, washing machines, dryers, etc.
- Switches, outlets, power cords, extension cords
- Panel boxes and circuit breakers
- Power tools including drills, sanders, grinders, saws, etc.

Note: Water is a dangerous medium for class C fires because of the risk of electrical shock.

Class D

- Combustible metals
 - Magnesium
 - Titanium
 - Potassium and sodium
 - Pyrophoric materials

Background for the Trainer:

- Discuss the types of combustible metals that are in your workplace.

Speaker's Notes:

Class D fires are fires that involve combustible metals such as:

- Magnesium metals, chips, grinding dusts, etc. that can be found in some metal shops.
- Titanium metals, chips, grinding dusts, etc. that can be found in many aerospace sheet metal companies.
- Potassium and sodium, which in their pure elemental forms are soft, ductile, malleable metals that can be easily cut with a knife or drawn into a wire. These metals are reactive toward air and water and are usually stored in a substance such as mineral oil. Extinguishing a potassium fire with water could result in an explosive reaction.
- Pyrophoric materials are highly reactive substances that are useful in the synthesis of organic chemicals, but special training is required to store and handle these materials safely. Examples include alkyllithiums, alkylmagnesiums, diphosphine, etc. A Class D fire extinguisher must be on-hand when handling these materials. An improper extinguisher could result in a larger fire—a carbon dioxide extinguisher used on an alkylmagnesium fire would actually cause the fire to burn more intensely.

Class K

- Kitchen fires
 - Added in 1998
 - Grandfathered if installed before 1998



Speaker's Notes:

Class K fires are kitchen fires.

- This class was added to the NFPA 10 Standard for Portable Fire Extinguishers in 1998.
- Kitchen extinguishers installed before June 30, 1998 are “grandfathered” into the standard.

Goals

- Fire triangle and fire classes
- Types and use of extinguishers
- Quiz

Speaker's Notes:

- Are there any questions regarding the fire triangle and the different types or classes of fire.
- Now we will discuss the different types of fire extinguishers as well as how to safely use and maintain fire extinguishers.

Extinguishing the Fire

- Remove heat
- Remove oxygen
- Remove the fuel



Speaker's Notes:

Fire extinguishers are designed to remove at least one of the three elements so that a fire will die out.

- The best way to remove heat from a fire is to dump water on the fire. This cools the fuel to below the ignition point, which interrupts the combustion cycle.
- To remove oxygen, you can smother the fire so it is not exposed to air. One way to smother a small fire is to cover it with a heavy blanket. Another way is to dump nonflammable material such as sand, baking soda, or inert gases on it.
- Removing fuel is the most difficult approach to extinguishing the fire because fuels are everywhere. In most cases, the fuel will only be removed once the fire has burned it up.

Water Extinguishers

- Rated only for Class A fires
- Spread a grease fire
- Cause an electrical shock on a Class C fire
- Increase a metal fire



Background for the Trainer:

- If you have water extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located in your workplace.

Speaker's Notes:

Water extinguishers contain water and a compressed gas. They spray a stream of water on the fire.

- Water extinguishers are rated only for Class A fires, such as wood, paper, plastic, garbage, etc.
- Water extinguishers must not be used on a Class B fire that involves burning flammable or combustible liquids. Oils, gasoline, solvents, grease, etc. all float on water so they will continue burning and actually spread out as they float on the water. A hot grease fire hit by a spray of cold water will result in the splattering of burning grease.
- Spraying a normal water extinguisher on a Class C fire that consists of energized electrical equipment could result in an electrical shock.
- The extremely hot temperature of a Class D metal fire will break down the water molecules (H_2O) into H_2 and O_2 molecules that will actually feed the fire and increase the intensity of the fire.

Dry Chemical Extinguishers

- Are best all-around choice
- Help prevent re-ignition
- Make a mess
- Class BC contains sodium bicarbonate
- Class ABC contains ammonium phosphate



Background for the Trainer:

- If you have dry chemical extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located.

Speaker's Notes:

- Dry chemical extinguishers are your best all-around choice for the average industrial, manufacturing, office, or warehouse environment.
- They have an advantage of carbon dioxide (CO_2) extinguishers in that they leave a blanket of nonflammable powder on the extinguished material, which reduces the likelihood of re-ignition.
- The disadvantage is that the powder makes a terrible mess that must be cleaned up.
- Class BC-rated dry chemical extinguishers contain sodium bicarbonate (normal baking soda) or potassium bicarbonate (nearly identical to baking soda) as the extinguishing media and an inert compressed gas as the propellant.
- Class ABC-rated dry chemical extinguishers are the most common. They contain ammonium phosphate as the extinguishing agent and an inert compressed gas as the propellant.

Carbon Dioxide (CO₂) Extinguishers

- Are Class BC-rated
- Are not effective on Class A fires
- Should not be used on Class D—metal fires
- Do not leave any residue
- Are a good choice for computers or electronics
- Must be used 3 to 8 feet from the fire



Background for the Trainer:

- If you have carbon dioxide (CO₂) extinguishers in your workplace, bring one into the class to show employees. Also tell the employees where they are located

Speaker's Notes:

Carbon dioxide extinguishers contain CO₂ as a compressed liquid. As the CO₂ escapes the extinguisher, it expands into a gas. As it expands, it cools the surrounding air, often forming ice around the extinguisher hose. CO₂, which is heavier than air, extinguishes the fire by essentially displacing the oxygen near the fire, which smothers the fire and cools down the ignition source.

- Carbon dioxide extinguishers are primarily effective on Class B—flammable liquid fires, and Class C—electrical fires.
- Carbon dioxide is not very effective on Class A—normal combustible material—fires because the material will usually re-ignite.
- Also, carbon dioxide should never be used on a Class D—metal—fire because it reacts with the burning metal and increases the fire.
- The advantage of a CO₂ extinguisher is that it does not leave behind any residue.
- Because it does not leave behind residue, CO₂ is a good choice for fires that involve computer systems or delicate electronics.
- A disadvantage of CO₂ extinguishers is that the gas disperses quickly, so they are only effective when used close to the fire at a distance of about 3 to 8 feet away.

Metal/Sand Extinguishers

- Class D rated
- Powdered copper
- Sodium chloride
- Forms an airtight crust over the fire

Background for the Trainer:

- If you have metal/sand extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located in your workplace.

Speaker's Notes:

- Metal/sand extinguishers are for flammable metal fires—Class D only. You should have approved Class D extinguishers if you are working with any type of flammable metal.
- Powdered copper is preferred for fires that involve lithium and lithium alloys. It will cling to a vertical surface, making it the preferred agent for three-dimensional and flowing fires.
- Sodium chloride works well for metal fires involving magnesium, sodium, potassium, sodium potassium alloys, uranium, and powdered aluminum.
- Metal/sand extinguishers work when the extreme heat from the fire causes the extinguishing agent to cake and form a crust that excludes air and dissipates heat.

Halon Extinguishers

- Gas interrupts fire's chemical reaction
- Are Class BC-rated
- Protect valuable electrical equipment
- Have a range of 4 to 6 feet
- Halon production is now banned



Background for the Trainer:

- If you have halon extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located in your workplace.

Speaker's Notes:

- Halon extinguishers contain a gas that interrupts the chemical reaction that takes place when fuels burn.
- Halon extinguishers are only effective on Class B—flammable liquids—and Class C—electrical—fires.
- Halon extinguishers have been used to protect valuable electrical equipment, since they leave no residue to clean up.
- Because the gas quickly dissipates, they have a limited range of only 4 to 6 feet.
- Halon 1211 production was banned by international agreement starting in 1994. So Halon extinguishers cannot be replaced. Also, maintaining a Halon extinguisher is expensive, because service companies must use a closed recovery system that prevents the escape of Halon during maintenance.

Halotron I Extinguishers

- Replaces Halon 1211
- Discharges as a liquid
- Leaves no residue
- Is nonconducting
- Is ideal for computers and electronics
- Is Class BC-rated



Background for the Trainer:

- If you have Halotron I extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located.

Speaker's Notes:

- Halotron I is an ozone-friendly replacement for Halon 1211. However, Halotron I production is slated to cease in the year 2015.
- Halotron I discharges as a liquid with high visibility.
- Halotron I does not leave any residue.
- Halotron I is nonconducting
- Halotron I is ideal for computer rooms, clean rooms, telecommunications equipment, and electronics.
- Halotron I is rated for both Class B and Class C fires.

FE-36™ Extinguishers

- Halon 1211 replacement
- Less toxic
- No ozone depletion
- Class BC-rated

Background for the Trainer:

- If you have FE-36™ extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located.

Speaker's Notes:

- FE-36 (Hydrofluorocarbon-236fa or HFC-236fa) is a DuPont-manufactured Halon 1211 replacement.
- FE-36 is less toxic than Halon 1211 and Halotron I, but still retains the same extinguishing properties.
- FE-36 has zero ozone-depleting potential and is not scheduled to be phased out of production.
- It is rated for Class B and Class C fires and is especially useful for fires that involve expensive computer and electronic equipment.

Water Mist Extinguishers

- Class AC-rated
- Safety from electrical shock
- Less scattering of burning materials
- Hospital environments and clean rooms



Background for the Trainer:

- If you have water mist extinguishers in your workplace, bring one into the class to show the employees. Also tell the employees where they are located.

Speaker's Notes:

- Water mist extinguishers are ideal for Class A fires where a potential Class C hazard exists.
- The misting nozzle provides safety from potential electrical shock.
- The misting nozzle also reduces the scattering of burning materials that can happen when using an ordinary water extinguisher.
- Water mist extinguishers are an excellent choice for hospital environments, books, documents, and clean-room facilities. A nonmagnetic version of the water mist extinguisher is the preferred choice for MRI (magnetic resonance imaging) and NMR (nuclear magnetic resonance spectrometer) facilities.

Fight-or-Flight Decision

- Alarm has been pulled
- Fire Dept. has been called
- Fire is small and contained
- You can avoid the smoke
- Exit is clear
- Extinguisher is nearby
- You have been trained to use the extinguisher



Speaker's Notes:

When a fire occurs, each person needs to make a fight-or-flight decision regarding whether or not they should evacuate or attempt to fight the fire with an extinguisher. Only attempt to use an extinguisher if you can say yes to every bullet point on this slide. If any of these conditions have not been met, do not fight the fire yourself—evacuate the area.

- The fire alarm has been pulled, which means other employees are notified of the fire and are evacuating the building or coming to your aid.
- The Fire Department has been called. Someone has dialed 9-1-1.
- The fire is small, contained, and not spreading beyond its starting point.
- The smoke is not bad and you can easily stay low and avoid the smoke while using the fire extinguisher.
- The nearest exit is clear so that you can easily evacuate if the fire suddenly increases in size. When fighting a fire with an extinguisher, your back should always be toward the exit so you know that you can always escape.
- An extinguisher is nearby and it is the correct extinguisher for the type of fire. You should not have to go very far to get the extinguisher.
- You have been trained and know how to properly use the extinguisher.

If you have any doubt about your personal safety or if you cannot extinguish the fire, leave immediately and close off the area (i.e., close doors and windows).

PASS

- Pull
- Aim
- Squeeze
- Sweep



Speaker's Notes:

Even though extinguishers come in a number of shapes and sizes, they all operate in a similar manner. To use an extinguisher, remember the acronym PASS.

- Pull the pin at the top of the extinguisher. The pin keeps the handle from being accidentally pressed when the extinguisher is not in use.
- Aim the nozzle toward the base of the fire. Stand 8 to 10 feet away from the fire.
- Squeeze the handle lever to discharge the extinguisher. When you release the handle lever, the discharge will stop. Keeping the lever squeezed will result in a continuous flow of extinguishing agent. Squeezing and releasing the lever will result in short bursts of extinguishing agent.
- Sweep the nozzle back and forth toward the base of the fire. After the fire appears to be out, watch it carefully, since it may re-ignite.

Inspect Extinguishers

- Monthly inspection
- Extinguisher not blocked
- Pressure is acceptable
- Pin and seal are intact
- No dents or damage



Background for the Trainer:

- If your company has an inspection checklist, bring copies for all trainees.

Speaker's Notes:

- The fire extinguishers in your workplace should be inspected at least once a month—more often in more severe work environments.
- Make sure access to the extinguisher is not blocked by equipment, stock, or scrap. Coats, air hoses, electrical cords, etc. must not be hanging on the extinguisher and prevent access in an emergency.
- The pressure of the extinguisher must be at the recommended level. On extinguishers equipped with a gauge, the needle should be in the green zone, which means that the pressure is not too high or too low. Replace the extinguisher if the pressure is not at the recommended level.
- The pin and the tamper seal must be intact. The pin prevents the extinguisher from accidental discharge if the handle is bumped. The seal shows that the pin has not been removed and that the extinguisher is ready to use in an emergency. Replace the extinguisher if the pin or tamper seal are missing.
- Be sure that the extinguisher does not have any dents, rust, chemical damage, or any other signs of abuse or wear.

Care and Maintenance

- Keep extinguisher clean
- Replace if damaged
- Recharge immediately after use
- Have hydrostatic testing done
- Remove non-rechargeables after 12 years

Speaker's Notes:

- Keep extinguishers clean. Wipe off any corrosive chemicals, oil, grease, etc. that may have landed on the extinguisher.
- Replace the extinguisher if it is damaged, dented, leaking, the pin is missing or not sealed, the pressure is not correct, or if it has been discharged.
- When an extinguisher is discharged, replace it immediately with another extinguisher. Have the used extinguisher recharged. It is always good to have a few extra extinguishers in your workplace that can be used to immediately replace discharged extinguishers while they are waiting to be recharged.
- Fire extinguishers should undergo hydrostatic testing, or pressure testing, after a few years to ensure that the cylinder is safe to use. Consult the owner's manual, extinguisher label, or the manufacturer to see when your extinguishers need such testing.
- Non-rechargeable extinguishers must be removed from service 12 years from the date of manufacture.

Locations and Signs

- Readily accessible
- 75 feet—Class A
- 50 feet—Class B
- 50–75 feet—Class C
- 75 feet—Class D
- Highly visible sign



Background for the Trainer:

- Discuss the distance to extinguishers in your workplace.
- Describe how the location of fire extinguishers are marked.

Speaker's Notes:

- Extinguishers must be located where readily accessible. They must be easy to get without possibility of injury. They cannot be blocked by equipment or materials. They must be mounted in a way that they can easily be removed in an emergency.
- If the fire hazard is Class A, then extinguishers cannot be located more than 75 feet from any point in the workplace. The 75-foot distance includes walking down aisles, around equipment, or around materials that might be in the way. In other words, a person must not have to travel more than 75 feet from any point in the building in order to get a fire extinguisher.
- If the fire hazard is Class B, then the extinguishers cannot be located more than 50 feet from any point in the workplace.
- Class C fire extinguishers may be distributed in the same pattern that you have for the Class A or Class B hazard.
- If the fire hazard is Class D, then extinguishers must be located no farther than 75 feet from the hazard.
- The location of fire extinguishers must be identified with highly visible signs, such as red arrows, which say “fire extinguisher,” mounted 10 to 12 feet above the ground that point down toward the extinguisher. Other signs or markers include red paint on the wall.

Summary

- Fire triangle
- Fire hazard class
- Know your extinguishers
- Fight or flight
- PASS

Speaker's Notes:

- The fire triangle is a great way to help remember that a fire needs oxygen, fuel, and ignition temperature in order to have the chemical combustion reaction, or fire.
- The fire hazard classes are: A—normal combustibles, B—flammable liquids, C—electrical, D—flammable metals, K—Kitchen
- Learn about the different types of extinguishers that are located in your workplace and know what classes of fire they are designed to extinguish.
- Consider fight or flight before using an extinguisher on a fire: alarm pulled, fire department called, fire is small, not much smoke, and the exit is clear.
- To use an extinguisher, remember the acronym PASS.



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