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categorize the system. However, each layer may be classified individually where a more stable layer lies under a less stable layer.

Module 12: Fire Protection and Prevention

Module Description

This module has been designed to deliver firsthand information about fires and fire protection measures. After completing this module, you will be able to identify different types of fires and define the safety measures that can be taken to avoid a disastrous situation. We will also discuss the different types of fire extinguishers in use and discover how careful planning and precautionary measures can be taken to save lives and property.

This module is intended for a general audience. For more information, please contact your local fire department and consult your fire safety and security maintenance supervisor.

Module Learning Objectives

At the conclusion of this module, students will be able to:

- Identify different types of fires and fire extinguishers
- Discuss fire related-injuries and their immediate remedies
- Discuss fire protection systems and evacuation during a fire
- Create evacuation plans and prepare for emergencies

Lesson 1: Fire Safety Essentials

Lesson Focus

At the end of this lesson, students will be able to:

- Explain how fires burn
- Describe types of fire prevention and protection
- Understand how to use fire extinguishers, as well as their different types
- Describe fire safety alarms
- Describe proper rescue and evacuation plans
- Describe the injuries associated with fire and their proper first aid
- Identify different types of burns

Fires

The event of something burning (often destructive) is called a fire. Fires occur when the following elements are present:

- Oxygen (e.g., air, compressed oxygen)
- Burning medium (e.g., wood, combustible materials, paper, gasoline)
- Heat source (e.g., flames, sparking elements, heaters)

The following are the different types of fires:

Class A: Ordinary Combustible

Class A fires involve ordinary combustible materials, such as paper, trash, some plastics, wood, and cloth. A rule of thumb is if it leaves an ash behind, it is a class A fire.

Class B: Combustible/Flammable Liquids

Class B fires involve flammable gases or liquids, such as propane, oil, and gasoline, as well as paint thinner, hydraulic fluids, flammable cleaning solvents, and other hydrocarbon fuels.

Class C: Electrical Fires

Class C fires involve energized electrical equipment such as power outlets, circuit breakers, defective wiring, and overloaded circuits.

Class D: Flammable/Combustible Metal Fires

Class D fires involve combustible metals such as magnesium, aluminum powder, and alkali metals. Many automobiles have magnesium parts, making many auto fires Class D fires. Auto fires should never be countered with water, which will react violently with any magnesium that might be present. In the picture (D) below, the reaction was caused by spraying water onto a magnesium part on the steering column.

Class K: Oils or Fats

Class K fires involve vegetable or animal cooking oils or fats. These types of fire are common commercial kitchens that use deep fat fryers.

Fire Prevention and Protection

Employers are responsible for preventing fires in the workplace and protecting workers from fire-related hazards. To do this effectively, employers must

- Create and implement a fire protection plan
- Train employees on fire prevention and safety
- Promote strong fire prevention practices and methods
- Perform regular inspections to identify and address fire hazards

Fire Protection Plan

OSHA standards require employers to develop a fire protection plan to be followed throughout all phases of construction and demolition work. This plan focuses on preventing fires and protecting all employees from fire hazards. Employers must immediately provide necessary firefighting equipment as specified by OSHA.

A fire protection plan includes the following details:

- Names of employees responsible for controlling fire hazards from fuel sources
- Names of employees responsible for fire prevention equipment or equipment to control fires
- Safeguarding controls and maintenance of safeguards to prevent accidental fires caused by heat causing machinery, equipment, and materials
- Handling and storage of combustible or flammable materials
- A temporary or permanent water supply, of sufficient volume, duration, and pressure to operate the firefighting equipment must be made available as soon as combustible materials accumulate
- Names of specific fire sources and locations and available equipment for fighting fires

A fire can start because of:

- Malfunctioning electrical equipment
- Cigarettes and tobacco related products
- Overheated wiring and equipment
- Welding arcs
- Heating equipment

Fire Prevention and Safety Training

Fire safety becomes everyone's job at a worksite. Employers should train workers about fire hazards in the workplace and about what to do in a fire emergency. This plan should outline the assignments of key personnel in the event of a fire and provide an evacuation plan for workers on the site. In the construction industry, a "fire plan" should be set up prior to beginning any demolition job.

Some “common sense” rules in fire prevention planning include:

- All potential sources of ignition should be evaluated and the necessary corrective measures taken.
- Electrical wiring and equipment for providing light, heat, or power should be installed by a competent person and inspected regularly.
- Equipment powered by an internal combustion engine should be located so that the exhausts discharge well away from combustible materials and away from workers.

- When the exhausts are piped outside the building, a clearance of at least six inches should be maintained between such piping and combustible material.
- All internal combustion equipment should be shut down prior to refueling. Fuel for this equipment should be stored in a safe location.
- Sufficient firefighting equipment should be located near any flammable or combustible liquid storage area.
- Only approved containers and portable tanks should be used for the storage and handling of flammable and combustible liquids.

The following references provide additional information to aid in recognizing and evaluating hazards and possible solutions in the workplace.

- Carbon Monoxide Explosion Hazards in Electric Arc Furnace Steelmaking Operations. OSHA Safety and Health Information Bulletin (SHIB), (December 4, 2015).
- Combustible Dust in Industry: Preventing and Mitigating the Effects of Fire and Explosions. OSHA Safety and Health Information Bulletin (SHIB), (July 31, 2005). Highlights hazards associated with combustible dusts; work practices and guidelines that reduce the potential for a combustible dust explosion, or that reduce the danger to employees if such an explosion occurs; and training to protect employees from these hazards.
- Star ME-1 Dry Fire Sprinklers. OSHA Safety and Health Information Bulletin, (January 7, 2004).
- Total Flooding Carbon Dioxide (CO2) Fire Extinguishing System. OSHA Technical Information Bulletin, (December 22, 2001).
- Fire Hazard of Polyurethane and Other Organic Foam Insulation Aboard Ships and in Construction. OSHA Hazard Information Bulletin, (May 10, 1989).
- OSHA Technical Manual (OTM). OSHA Directive TED 01-00-015 [TED 1-0.15A], (January 20, 1999). Includes information on fire safety.
- Fire and Explosions. Electronic Library of Construction Occupational Safety & Health (elcosh). Provides a list of construction-related fire safety resources.
- For additional information on hazards and possible solutions, see OSHA's Safety and Health Topics Pages on:
  - Demolition
  - Construction Industry

Fire Extinguishers

A fire extinguisher is a device used for putting out fires. There are four different types of fire extinguishers, which are classified according to the types of fire they extinguish. Each of the four types—classes A, B, C, and D—is rated for extinguishing a different kind of fire. Older fire extinguishers used geometric shapes to identify their type, but more current extinguishers use a labeling system that incorporates both words and pictures to distinguish the type of fire they are best suited for.

The following are the types of fire extinguishers and the method or ingredients they employ:

- **Class A**: Pressurized water cans, clean agent/halogen, and wet chemical for specific applications
- **Class B**: Carbon dioxide, dry chemical, wet chemical, clean agent/halogen
- **Class C**: Dry chemical, carbon dioxide, clean agent/halogen
- **Class D**: Dry powder
- **Multi-class extinguishers**: carbon dioxide/dry chemical

Extinguishers must be placed in an easily accessible location and should be in good operating condition. Extinguishers should be placed adjacent to a normal path of travel to make them as visible and readily available as possible. At a minimum, fire extinguishers must be placed at all points of egress on construction projects and in close proximity to any combustible/flammable materials stored on the site. The proper class must be marked on the extinguisher so that it can be used according to the class of fire.

Class A Extinguishers

Class A extinguishers are water-based or wet chemical solutions that are used on paper, cloth, wood, trash, and other common combustible fires. These extinguishers utilize a cooling and soaking stream that is effective on Class A fires. The numerical rating for this class of fire extinguisher refers to the amount of water the fire extinguisher holds and to the amount of fire it will extinguish.

Class B Extinguishers

Class B extinguishers are pressurized with non-flammable carbon dioxide gas, dry chemical, wet chemical, or clean agent/halogen. Carbon dioxide reduces, or smothers, the oxygen content to a point where combustion cannot continue. Carbon dioxide is a clean, non-contaminating, odorless gas and can safely be applied to clothing, equipment, and valuable documents without causing extreme damage.

Class B extinguishers are used on fires involving flammable liquids including grease, gasoline, oil, paint thinner, hydraulic fluids, flammable cleaning solvents, and other hydrocarbon fuels. Carbon dioxide is extremely cold when disbursed from the extinguisher.

The numerical rating for this class of fire extinguisher denotes the area in square feet of a flammable liquid fire that a person can expect to extinguish.

Class C Extinguishers

Class C fire extinguishers are used on fires involving energized electrical equipment. Such fires must be extinguished using a non-conductive extinguishing agent such as carbon dioxide or a dry chemical or a clean agent/halogen. Carbon dioxide is most effective in extinguishing electrical fires, as it does not leave a residue that can harm sensitive electronics.

This class of fire extinguishers does not have a numerical rating. Class C extinguishers have only a letter rating because there is no readily measurable quantity for Class C fires. The presence of the letter "C" indicates that the extinguishing agent is non-conductive.

Class D Extinguishers

Class D extinguishers are designed for use on flammable metals and are often specific to the metal in question. Metals such as magnesium, potassium, titanium, and sodium burn at high temperatures and give off sufficient oxygen to support combustion. These metals react violently with water or other chemicals and must be handled with great care. The most common extinguishers for Class D fires use a dry powder designed specifically for this purpose. A common method of extinguishing small flammable metals fires is to cover the fire in dry sand.

No picture designator is used on Class D extinguishers and this type of extinguisher generally has no rating.

Multi-Class Fire Extinguishers

Many fire extinguishers can be used on more than one class of fire and are called multipurpose extinguishers. Multi-class fire extinguishers are labeled with more than one class designator, such as A-B, B-C, or A-B-C. Multi-class fire extinguishers typically contain dry chemicals and an extinguishing agent that uses a compressed, non-flammable gas as a propellant.

Fire Safety Alarms

Smoke Alarms

In case of a building fire, the first step is to warn the occupants and to evacuate the building as soon as possible. Early fire warnings can be given by means of active smoke and fire alarms installed in strategic locations throughout a building.

The two primary types of smoke alarms in use are ionization and photoelectric alarms. Ionization smoke detectors activate more quickly in fast, flaming fires that consume combustible materials rapidly and spread quickly.

The photoelectric type of smoke detector will respond more immediately to slow, smoldering fires. These types of detectors provide early detection of smoke. When installed correctly, they provide accurate and dependable smoke detection.

A combination of both types of detectors provides the greatest protection against both fast moving fires and smoldering fires.

Fire Sprinklers

Fire sprinklers are designed to provide 24-hour protection by detecting and controlling fires before they become a threat to lives or property. They react quickly and independently of one another so that only those detectors in the affected area activate. Most fires are controlled by one or two sprinklers disbursing a minimal amount of water, which reduces the fire and water damage significantly.

Rescue and Evacuation

Comprehensive evacuation plans are designed to assist employers in meeting or exceeding workplace safety standards. These plans must be a cooperative effort between the employers and the employees. Copies should be posted near all exits, stairways, fire extinguishing equipment, and at any other location suitable for maximum exposure. These plans must contain pre-assessed escape and exit routes, designated assembly points, emergency call points, and the locations of fire extinguishing equipment.

Injuries and First Aid

The majority of fire-related deaths (as much as 80 percent) are caused by smoke inhalation. Burns and other injuries that result from direct contact with flames are actually second to smoke inhalation as a cause of death. Between 1992 and 2003, the construction industry saw a total of 361 fire or explosion deaths involving 313 incidents, or an average of 30 per year.

Smoke Inhalation

Smoke inhalation is the number one cause of fire-related deaths. Smoke from a fire may contain poisonous gases or may be hot enough to burn a victim's throat and lungs, resulting in serious breathing problems. Symptoms of heavy smoke inhalation include breathing trouble, coughing, drowsiness, an upset stomach, vomiting, unconsciousness, and death.

It is important to evacuate from a smoky room as quickly as possible. If available, use a piece of wet cloth to cover your mouth and nostrils as you crawl as close to ground level as possible to safety. Once you're in fresh air, rest while taking deep breaths, and do not enter the smoky area until the fire is completely extinguished, all smoke has been removed, and fire officials have cleared the area.

Chest x-rays and blood tests are sometimes required to determine the extent of the damage caused by smoke inhalation. Providing a victim with oxygen through a nose tube or mask is the most important treatment. In severe cases, such as carbon monoxide poisoning, a victim may require oxygen administered in a compression chamber. Follow-up care is important for anyone recovering from smoke inhalation.

Burns

Although smoke inhalation is the primary cause of fire-related deaths, burns actually cause more nonfatal injuries.

For all burns beyond mild first-degree burns, seek medical attention immediately. Improper treatment can exacerbate damage. Minor first-degree burns can be treated by flushing the area with cold running water. Apply a clean, water-cooled cloth over the area to relieve pain. Do not apply ointment. Seek medical attention if the pain persists or if the burn appears worse.

Until emergency help arrives to treat a major burn, do the following:

- **Protect the burned person from further harm.** If you can do so safely, make sure the person you're helping is not in contact with the source of the burn. For electrical burns, make sure the power source is off before you approach the burned person.
- **Make certain that the burned person is breathing.** If needed, begin rescue breathing if you know how.
- **Remove jewelry, belts and other restrictive items,** especially from around burned areas and the neck. Burned areas swell rapidly.
- **Cover the area of the burn.** Use a cool, moist bandage or a clean cloth.
- **Don't immerse large severe burns in water.** Doing so could cause a serious loss of body heat (hypothermia).
- **Elevate the burned area.** Raise the wound above heart level, if possible.
- **Watch for signs of shock.** Signs and symptoms include fainting, pale complexion or breathing in a notably shallow fashion.

For minor burns:

- **Cool the burn.** Hold the burned area under cool (not cold) running water or apply a cool, wet compress until the pain eases.
- **Remove rings or other tight items from the burned area.** Try to do this quickly and gently, before the area swells.
- **Don't break blisters.** Fluid-filled blisters protect against infection. If a blister breaks, clean the area with water (mild soap is optional). Apply an antibiotic ointment. But if a rash appears, stop using the ointment.
- **Apply lotion.** Once a burn is completely cooled, apply a lotion, such as one that contains aloe vera or a moisturizer. This helps prevent drying and provides relief.
- **Bandage the burn.** Cover the burn with a sterile gauze bandage (not fluffy cotton). Wrap it loosely to avoid putting pressure on burned skin. Bandaging keeps air off the area, reduces pain and protects blistered skin.
- **If needed, take an over-the-counter pain reliever,** such as ibuprofen (Advil, Motrin IB, others), naproxen sodium (Aleve) or acetaminophen (Tylenol, others).

(https://www.mayoclinic.org/first-aid/first-aid-burns/basics/art-20056649)

Electrical Burns

Even if there is no visible evidence on the surface of the skin, electrical burns can cause deep tissue damage. Commence CPR/EAR if pulse and breathing are absent and immediately seek medical attention. Try to prevent the person from becoming chilled. Cover any burned areas with a sterile gauze bandage, if available, or a clean cloth. Do not use a towel or blanket, as these have loose fibers that might stick to the burns.

Lesson Summary

- Fires require the presence of oxygen, a medium to burn (such as wood, paper, or another combustible material), and a heat source.
- Fires fall into different classes based on their sources and proper control measures:
    - Class A fires involve ordinary combustible materials
    - Class B fires involve combustible or flammable liquids
    - Class C fires involve electricity
    - Class D fires involve flammable or combustible metals
    - Class K fires involve cooking oils and fats
- Employers are responsible for preventing fires in the workplace and protecting workers from fire-related hazards. To do this effectively, employers must
    - Create and implement a fire protection plan
    - Train employees on fire prevention and safety
    - Promote strong fire prevention practices and methods
    - Perform regular inspections to identify and address fire hazards
- There are four different types of fire extinguishers, which are classified according to the types of fire they extinguish. Each of the four types—classes A, B, C, and D—is rated for extinguishing a different kind of fire.
- The two primary types of smoke alarms in use are ionization and photoelectric alarms. Ionization smoke detectors activate more quickly in fast, flaming fires that consume combustible materials rapidly and spread quickly. The photoelectric type of smoke detector will respond more immediately to slow, smoldering fires. These types of detectors provide early detection of smoke. When installed correctly, they provide accurate and dependable smoke detection.
- Fire sprinklers are designed to provide 24-hour protection by detecting and controlling fires before they become a threat to lives or property. They react quickly and independently of one another so that only those detectors in the affected area activate.
- The majority of fire-related deaths (as much as 80 percent) are caused by smoke inhalation. Burns and other injuries that result from direct contact with flames are actually second to smoke inhalation as a cause of death. Between 1992 and 2003, the construction industry saw a total of 361 fire or explosion deaths involving 313 incidents, or an average of 30 per year.

Lesson 2: Fire Prevention and Safety Measures

Lesson Focus

At the end of this lesson, students will be able to:

- Identify ignition hazards
- Understand safety needs related to temporary buildings, open-yard storage, and indoor storage
- Conduct fire emergency planning
- Identify and explain types of portable firefighting equipment
- Identify and explain types of fixed firefighting equipment

Ignition Hazards

Electrical wiring and equipment should be installed by an experienced electrical professional in compliance with the requirements of applicable safety and building standards.

Smoking should be strictly prohibited in any area that could pose a potential fire hazard. Such areas should be clearly marked with "No Smoking" signs.

Pipe joints to tanks or vessels that carry flammable gases or liquids must be liquid and vapor tight. Above-ground piping must be secured to prevent disengagement at the fitting or at the piping system. This design is mandatory to ensure that any spill resulting from any disengagement could not unduly expose persons, buildings, or structures.

Combustible Dust

Combustible dusts are fine particles that present an explosion hazard when suspended in air in certain conditions. A dust explosion can be catastrophic and cause employee deaths, injuries, and destruction of entire buildings. In many combustible dust incidents, employers and employees were unaware that a hazard even existed. It is important to determine if your company has this hazard, and if you do, you must take action now to prevent tragic consequences.

In addition to the familiar fire triangle of oxygen, heat, and fuel (the dust), dispersion of dust particles in sufficient quantity and concentration can cause rapid combustion known as deflagration. If the event is confined by an enclosure such as a building, room, vessel, or process equipment, the resulting pressure rise may cause an explosion. These five factors (oxygen, heat, fuel, dispersion, and confinement) are known as the “Dust Explosion Pentagon”. If one element of the pentagon is missing, an explosion cannot occur.

An initial (primary) explosion in processing equipment or in an area where fugitive dust has accumulated may dislodge more accumulated dust into the air, or damage a containment system (such as a duct, vessel, or collector). As a result, if ignited, the

additional dust dispersed into the air may cause one or more secondary explosions. These can be far more destructive than a primary explosion due to the increased quantity and concentration of dispersed combustible dust. Many deaths in past incidents, as well as other damage, have been caused by secondary explosions.

Dust Control Recommendations

- Implement a hazardous dust inspection, testing, housekeeping, and control program.
- Use proper dust collection systems and filters.
- Minimize the escape of dust from process equipment or ventilation systems.
- Use surfaces that minimize dust accumulation and facilitate cleaning.
- Provide access to all hidden areas to permit inspection.
- Inspect for dust residues in open and hidden areas at regular intervals.
- If ignition sources are present, use cleaning methods that do not generate dust clouds.
- Use only vacuum cleaners approved for dust collection.
- Locate relief valves away from dust deposits.

Ignition Control Recommendations

- Use appropriate electrical equipment and wiring methods
- Control static electricity, including bonding of equipment to ground.
- Control smoking, open flames, and sparks.
- Control mechanical sparks and friction.
- Use separator devices to remove foreign materials capable of igniting combustibles from process materials.
- Separate heated surfaces from dusts.
- Separate heating systems from dusts.
- Select and use industrial trucks properly.
- Use cartridge-activated tools properly.
- Use an equipment preventive maintenance program.

Injury and Damage Control Methods

- Separation of the hazard (isolate with distance)
- Segregation of the hazard (isolate with a barrier)
- Deflagration isolation/venting
- Pressure relief venting for equipment
- Direct vents away from work areas
- Specialized fire suppression systems
- Explosion protection systems
- Spark/ember detection for suppression activation
- Develop an emergency action plan
- Maintain emergency exit route

Temporary Buildings

Temporary buildings should not be constructed in any location where the means of exit could be adversely affected. If a temporary structure is constructed within a building, it should be made of non-combustible material.

Temporary combustible structures, covering a maximum area of 2,000 square feet, should be constructed at least 10 feet away from any other building and should never be used for storage and handling of flammable or combustible liquids, gases, explosives, or blasting agents or similar hazardous materials.

Open Yard Storage

The following guidelines should be followed whenever storing materials in an open yard:

- Combustible materials should be stored in a stable condition and should not be stacked or piled higher than 20 feet.
- Driveways between combustible storage spaces should be at least 15 feet wide and should be properly maintained for easy access.
- The storage site should be kept free from the accumulation of unnecessary combustible materials. Weeds and grass should be properly maintained and regular checks should be made to ensure cleanup of the storage areas.
- No combustible material should be stored outdoors within 10 feet of a building or structure.
- Portable fire extinguishing equipment, clearly labeled for the type of fire, should be provided at convenient and conspicuously accessible locations.
- The maximum travel distance to the nearest fire extinguishing unit should not exceed 100 feet.

Indoor Storage

The following guidelines should be followed whenever storing materials indoors:

- Storage should not obstruct exits, no matter how secure the fire evacuation plan may seem. Material should not be stored within 36 inches of a fire door opening.
- All materials should be stored, handled, and piled with due regard to their fire or ignition characteristics.
- Material should be stacked to minimize the spread of fire internally and to permit convenient access for firefighting.
- The distance from the top of the storage pile to the nearest sprinkler should be at least 18 inches.
- Lighting and heating units should be properly installed and regularly checked to prevent accidental ignition.
- A clearance of 24 inches should be maintained for the path of travel, unless a barricade is provided, in which case no clearance is needed.

Emergency Planning

In the event of a fire, a safe and speedy response depends on how well employees and employers are prepared for emergencies. The response requires proper planning and cooperation among workers, including the planning of escape routes, prevention of fires spreading, and safe evacuation procedures. These well-executed plans can ensure that every worker will safely evacuate in the event of a fire. Emergency plans should be reviewed at least annually and modified as required. All workers must be provided access to the fire safety plan.

Proper planning includes regularly scheduled safety inspections, and methods of informing fire and rescue personnel if and when fires are discovered.

General Requirements

The following are some general requirements for a fire protection plan:

- It is the employer's responsibility to develop a fire protection plan that can be implemented and enforced throughout a company or workforce.
- The employer is also responsible for providing any and all required firefighting equipment and for providing immediate access to such equipment at all times.
- Firefighting equipment must be conspicuously located and maintained in good operating condition at all times. Any defective equipment must be immediately replaced. Employees should either be instructed in the use of this equipment or instructed to not use the equipment.
- The employer should consult with a professional fire protection organization should assistance be needed in implementing an effective fire protection plan.

Water Supply

These are the requirements for maintaining a water supply:

- A temporary or permanent water supply that can provide a sufficient volume, duration, and pressure should be available for the proper operation of firefighting equipment.
- The water supply must be installed and tested as soon as possible.

Portable Firefighting Equipment

Fire Extinguishers and Small Hose Lines

The following are guidelines for fire extinguishers and small hose lines:

- If employees are expected to use fire extinguishers, they must be selected and placed based on the potential type and size of fire that can occur. The employer

should distribute portable fire extinguishers for use by employees on Class A fires so that the travel distance for employees to any extinguisher is 75 feet (22.9 m) or less.
- At least one fire extinguisher should be located adjacent to a stairway.
- Extinguishers and water drums which are subject to freezing should be protected from cold conditions.
- Carbon tetrachloride and other toxic vaporizing liquid fire extinguishers are prohibited.
- Portable fire extinguishers should be inspected periodically and maintained in accordance with safety standards.

Fire Hose and Connections

The following are guidelines for fire hoses and connections:

- Uniformly spaced standpipe systems or hose stations and 1 ½" or smaller hose connected to a sprinkler system installed for emergency use by employees are acceptable as long as they provide total coverage and the employees are trained at least annually in their use.
- If fire connections are not compatible with local firefighting equipment, the contractor should provide adapters, or the equivalent, to permit connections.

Fixed Firefighting Equipment

Sprinkler Protection

Automatic sprinkler protection should be installed, if possible, and should be placed in service as soon as possible. During demolition or alterations, existing automatic sprinkler installations should be retained in service as long as is reasonable.

Fire Alarm Devices

The following information applies to fire alarm devices:

- An alarm system, telephone system, siren, etc., should be established by the employer so that the employees on the site, as well as the local fire department, can be alerted during an emergency.
- The alarm code and reporting instructions should be posted at or near phones and employee entrances.
- Fire walls and exit stairways, which are required for completed buildings, should be given construction priority.
- Fire cutoffs must be retained in buildings undergoing alterations or demolition until operations necessitate their removal.

Lesson Summary

- Ignition hazards often include electrical wiring and equipment, individuals smoking, pipes or tanks that carry flammable material, and combustible dust.
- Temporary buildings should not be constructed in any location where the means of exit could be adversely affected. If a temporary structure is constructed within a building, it should be made of non-combustible material.
- Combustible materials should be stored in a stable condition and should not be stacked or piled higher than 20 feet.
- Proper planning includes regularly scheduled safety inspections, and methods of informing fire and rescue personnel if and when fires are discovered.
- A temporary or permanent water supply must be available and be able to provide a sufficient volume, duration, and pressure for the proper operation of firefighting equipment.
- Automatic sprinkler protection should be installed, if possible, and should be placed in service as soon as possible. During demolition or alterations, existing automatic sprinkler installations should be retained in service as long as is reasonable.

Module 13: Materials Handling, Use and Disposal

Module Description

This module introduces the hazards that are involved in the handling and storage of materials. Different methods of handling and storage are discussed, as well as the hazards they pose to workers and the methods by which these hazards can be reduced or eliminated from the workplace.

Module Learning Objectives

At the conclusion of this module, students will be able to:

- State the major causes of injury suffered from handling and storing materials
- Identify the various methods that can be used to prevent injuries during materials handling
- Discuss the safety measures necessary when operating mechanical handling devices
- Discuss the various safety and health principles that can be adopted in the workplace

Revision #1
Created 24 April 2024 20:34:21 by Dale Bergman
Updated 24 April 2024 20:35:22 by Dale Bergman