

Fixed Fire Extinguishing Systems

Time: 2 hours

Materials: Industrial Emergency Services
Training Incipient Level
Second Edition IFSTA Manual

Overhead Projector
Handouts
Model of Sprinkler System
At ACCFD Training Center

Transparancies of local fixed extinguishing systems
Written Test

Method of Instruction: Lecture and Illustration

References: IFSTA Industrial Emergency Services Training
IFSTA Essentials

Objectives and Job Requirements

Requisite knowledge: Students should have completed approved course in Basic Fire Behavior. Students should be familiar with water supply hose layouts as listed in their departments standard operating guidelines.

Course Objectives

Given an example of an existing system student will be able to recognize system type and list one life safety hazard associated with that system.

Given an example of an existing system student shall be able to identify major components of that system.

Introduction

Fixed Fire Extinguishing Systems

Explain: Importance of these types of systems and how their types and location can clue firefighters to specific site hazards such as: Automatic Deluge System may be associated with fuel storage, ammunition storage, large electrical transformers. Total Flooding CO2 may be associated with confined space in combination with hazardous atmospheres

Foam Systems: Most likely to involve flammable liquids, sometimes in large quantities.

(5 minutes)

Automatic Sprinkler Systems

Any experiences with fires in sprinklered industrial complexes?

What was outcome:

(Question)

What is an automatic sprinkler system?

System of arranged piping and discharge heads that supplies water from a fixed source for purpose of fire protection.

NFPA Standard 13 Standard for Installation of Sprinkler System

Basic Components Water Source

Main control valve

Alarm check valve

Main Drain

Fire Department connection

Water flow alarm, riser, crossmain, branch lines, heads. Inspector test valve

(Show visual)

Types of Sprinkler Heads

Upright, Pendant, Wallmount, Recessed, Fuselink, Bulb, Chemical Pelvet, Quick Response.

Show where to find temp range

Selection is based on maximum temperature expected at level of sprinkler head under normal conditions and the anticipated rate of heat release produced by a fire in the immediate area.

(Show Heads)

Control Valves

*Manually Operated

*Must be indicating type

O.S. & Y. P.I.V. Butter Fly

(Show picture of valves – 10 minutes)

Wet Pipe: Used where freezing is not an issue, simplest type

Dry Pipe: Used where freezing temperatures can damage system. Uses air or nitrogen between heads and dry pipe valve under pressure when a head fuses, air is released and dry pipe valve opens admitting water to the system.

Preaction System: Used when it is important to prevent water damage. System uses closed heads, fire detection devices and deluge valve. Operates when devices detect fire or smoke opens deluge valve sends water to heads, when heads open water is supplied, alarm will sound once water is in system.

(10 minutes)

Ask where this type of system may be located

(?)

Deluge System: Normally used to protect extern hazardous occupancies. Fuel storage, hazardous operations, uses dection devices to operate and usually has open heads

Ask where this type of system may be in local response area

(?)

Sprinkler Systems General Info

- F.D.C Usually 2-2 ½ female
- Minimum supply, must maintain required flow at highest head in system with 15 psi residual
- Minimum flow requirements are established by hazard to be protected, building construction occupancy and fuel loading
- Departmental SOPs pertaining to sprinkler systems 2nd engine to supply 2-2 ½ lines 150 psi volume
- Only turn off system when directed by command place firefighter at control valve with radio in event of rekindle

Questions ?

(5 minutes)

Carbon Dioxide Extinguishing Systems

Two types of CO₂ systems

Total flooding and local application must conform to NFPA Standard 12

(Show visual of system)

Total flooding system will fill an enclosed space displacing O₂ and smothers fire

*Must produce minimum concentration of 34% CO₂ in protected area

*Must have preactuation alarm to warn of impending discharge

(?)

Ask about hazards to personnel associated with this system

*Most dangerous aspect is O₂ displacement area will be considered a confined space hazard and all personnel will don SCBA while working in area. Area must be tested and O₂ level must be a 19.5 – 21% before allowing personnel into area.

*Be sure fire is out before ventilating area to prevent rekindle

Local Application Systems:

Discharges agent directly on hazard and usually shuts down any source of fuel, does not require a preactuation alarm

Types of Actuation:

*Automatic: Triggered by detectors

*Normal manual: Triggered by someone operating a manual station

*Emergency Manual: Bypasses other two functions manually dumps system

(Show types)

(10 minutes)

Dry Chemical Extinguishing Systems

***Used where rapid knockdown is required and rekindle is unlikely and contamination is not an issue**

(?)

Ask if anyone is aware of this type of system in their area

Locations may include:

- *Flammable chemical storage**
- *Ammunition storage**
- *Dip tank operation**
- *Cooking areas**
- *Paint supply**

Two main types of dry chemical system must conform to NFPA Standard 17

***Total Flooding & Local Application**

System Description

All dry chemical systems have same basic components

***Storage tanks for agent and expellant tanks can range from 30# to 4000#. May contain expellant gas and agent in same tank.**

Gas will either nitrogen or CO2

***Piping for distribution:**

Piping will be designed to match specific chemical and flow characteristics

***Nozzles: Designed to match specific hazard to be protected**

(10 minutes)

Total Flooding Systems

*Introduces a dense concentration of agent into a closed area

Local Application Systems

- Most common. Agent is discharged directly onto hazard

System Actuation

*Automatic activation usually a fused link which releases a mechanical or electrical valve to release agent

*Manual Operation

Usually a push button or pull station located in area of hazard but in a manner to allow safe actuation of system

Safety Precautions:

The chemicals used as agent are not toxic but can irritate eyes and respiratory tract be alert for confined space issues

(5 minutes)

Foam Extinguishing Systems

*Usually found at flammable or combustible liquid storage sites ask
difference between flammable and combustible liquid

Flashpoint below 100 degrees F = Flammable

Flashpoint above 100 degrees F = combustible

System Description

- Water supply
- Foam concentrate
- Piping System
- Foam maker
- Discharge devices

Types of Foaming Systems

Total Flooding

*Introduces high concentration of product into confined space

*Local Application

*Discharges foam concentrate on a specific location

System Actuation

*Automatic

Usually has series of detection devices

*Manual

(5 minutes)

Specific Foam Concentrates

(?)

Ask class about methods of fire extinguishing

- 1) Oxygen exclusion
- 2) Temperature reduction
- 3) Inhibit chemical reaction
- 4) Fuel removal

This will help understand properties of types of foam

Foam Characteristics

***High expansion foams**

Usually used in confine spaces, to somther fire and displace O2

***Some form a vapor mitigating barrier**

***Some produce a thick blank which suppresses vapor and cools product**

(10 minutes)

Types of Foam Concentrates

1) Regular protein foam

- Not usually found in todays systems
- Has good heat stability
- Does not flow well
- Breaks down fast

2) Fluoroprotein Foam

- Protein and synthetic based
- Good flow
- Good for subsurface injection
- Can be formulated to be alcohol resistant
- Good heat resistant and water retention

3) Film Forming Fluoroprotein Foam

Combines fast knockdown as a F F F and long lasting characteristics of fluoroprotein foam

- Multi purpose: can be used on polar solvent fuels at 6% and hydrocarbon fuels at 3%
- Pre mixable
- Subsurface injection
- Can be plunged into fuel

4) A F F F = Aqueous film forming foam

- Most common in use today
- Has ability to heal itself if blanket is breached
- Forms film ahead of blanket to suppress vapors

5) Alcohol – Resistant A F F F

- Use on polar solvents
- Can be subsurface injected on light hydrocarbons
- Cannot be plunged into polar solvent fuels

6) Vapro Mitigating Foam

- Designed to stop acidic or alkaline reactions
- Designed solely for vapor suppression not to be used for ignited spills

7) High Expansion Foam

- Low water content
- Generally used for confined or enclosed spaces
- Low run off
- Require a foam generator

8) Emulsifiers

Designed to be used on Class A & B fires, does not blanket fuel but combines with it to form an emulsion that will not be flammable

- Should not be used on spills that have a depth of 1" or more
- Does not work well with water soluble fuels
- Some are toxic to fish and aquatic life

Ask what types we have on our department.

(?)

(5 minutes)

Fixed Monitors

Stationary monitors that are pre piped and supplied by a facilities water source. Some may be equipped to deliver foam concentrate monitors can be adjusted to change direction manually or automatically

Basic Components

- Water Supply
- Piping
- Fixed monitor

System Actuation

*Manual: Requires turning on control valve

*Remote location: Operated by joystick or switches from a location away from hazard

Question where if any in our response area

(?) (5 minutes)

Wet Chemical Extinguishing System

These agents react with animal or vegetable oils to form a non-flammable soap best suited for commercial range hoods and duct work. After discharge be alert for slippery surfaces.

System Actuation

Automatic: Usually activated by a heat sensitive device such as fusible links

Maunal: Manual activation is most common with these systems usually done by pull station

(5 minutes)

Halon Extinguishing Systems

Halon 1301 and Halo 1211 are most commonly used in this system

*Halon 1211 is toxic and not permitted in occupied areas

*Both systems may produce toxic by products in fires and should have a preaction alarm

Local Application Systems:
Apply agent directly on hazard

(10 minutes)

Total Flooding: Discharge of agent in a confined area concentration of Halon is dependant on type of hazard protected example:

Propane requires 6.7%
Hydrogen requires 31%

Safety precautions:

Due to possible toxic atmospheres and lack of O2 only trained personnel with SCBA should enter affected area, entry should be denied until tested and deemed safe by trained personnel

Summary

Explain how firefighters should stay familiar with various types of extinguishing system in their response area and how a particular system may be an indicator to a specific hazard

Fixed systems when operated and maintained properly is one of the best means of initial fire attack in industrial complexes

(?)

Questions

1) List two types of sprinkler systems

2) List two types of manually operated water flow control valves

3) A pendant style sprinkler head can be installed in any location and perform properly

True

False

4) List two types of carbon dioxide extinguishing systems

5) One of the main safety concerns with a total flooding CO₂ system is

- _____
- (a) frostbite
 - (b) displaced O₂
 - (c) cost
 - (d) toxic residue

6) Where might you find a dry chemical extinguishing system

- (a) where rapid knock down is required
- (b) facilities with low water pressure
- (c) unattended locations
- (d) none of the above

7) What gases could be used as an expellant in a dry chemical system

- (a) propane
- (b) oxygen
- (c) hydrogen
- (d) carbon dioxide

8) Protein foams are the most common foams used today

True

False

- 9) Alcohol resistant A F F F Foams
- (a) can be used on polar solvents
 - (b) can not be used on polar solvents
 - (c) can not be subsurface injected
 - (d) should only be used on alcohol

10) Emulsifiers can be used on Class A and Class B Fires

True

False