Fire Watch

Worker Manual

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LIUNA
INNOVATION
AT WORK

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3. Identify the minimum requirements of a Fire Watch Team Program.
4. List the three alarm systems a fire watch would use.

SECTION ONE

FIRE WATCH PROGRAM

The following scenarios summarize two major fire losses that resulted from a lack of planning, failure to provide a fire watch and lack of emergency response training:

- On February 9, 1942 a fire broke out on the Normandy at a pier in New York City. This ship, the largest in the world at the time, was being retrofitted as a troop carrier to be used during World War II. A welding spark set some life preservers on fire. The failure to immediately detect the fire allowed it to grow. Subsequently, the Normandy was totally destroyed and laid on the harbor bottom for the rest of the war.

- On May 31, 1981, the S.S. Monticello Victory exploded when a welding torch ignited flammable gases. The destruction was complete and due to a devastating effect of the explosion a typical fire control program was ineffective.

Although these two incidents are separated in time by almost 40 years, both share the common factors which led to the disasters: lack of pre-planning, failure to employ a fire watch and failure to provide incipient fire extinguishing capacity. A host of similar incidents occurred during the intervening years, indicating that there were few or no lessons learned concerning hot work planning and fire control management.

FIRE WATCH

A Fire Watch is traditionally established when welding or cutting operations will take place. However, it may also be used when the nature of the ignitable materials is such that surveillance is required. OSHA Standards (29 CFR 1926.352(e) require that when ordinary precautions are not sufficient that a Fire Watch be established. As defined by the Department of Energy (DOE), a Fire Watch is an “individual charged with the responsibility to ensure the safety of all immediate personnel and facilities where open flame operations or procedures are occurring.”

When the possibility of fire is increased due to work operations, for example a work or storage area containing water-reactive materials and work operations that may introduce the ignition ingredient, the employer shall establish a Fire Prevention policy. This policy shall include training, pro-active performance requirements and assigned response activities.

HOT WORK PERMITS

Where welding, cutting, open flames and heat-producing operations may take place a hot work permit program must be implemented. The program shall describe, in great detail:

- The work to be performed
- The potential impact the hot work may have on other work,
- Personnel and materials in the area

The hot work permit shall contain, as a minimum, the following information:

- Data regarding fire prevention measures
- Response protocol
- Reporting procedures

Figure 1-3 shows an example of a hot work permit. Hot work permits aren't issued automatically. Prior to the start of hot work, there is an risk assessment process. The risk assessment must evaluate the nature of the work, the potential for ignition, and consequences of an unwanted incident. The issuing authority shall conduct a review, probably examine the work area, and determine that it is proper to issue the permit. Where a Certified Fire Watch is included as a requirement in the permit, the issuing authority shall determine that adequate staffing, proper training and sufficient equipment shall be used.

FIRE WATCH TEAM

The duties and responsibilities of the Fire Watch Team shall be sufficiently described whereby each member of the team will be fully trained to complete their task in a competent manner. This shall include coordination with all personnel involved in the work covered by the Hot Permit. Where work is to be performed that requires a permit, the workers must understand that the work does not start until the Fire Watch Team is in place and all other requirements are met.

The Fire Watch Team members shall be certified to operate as part of the team. Certification is conferred after training has been completed. The training program shall consist of generic and site-specific data. As a minimum the program shall contain:

- Duties and responsibilities
- Fire hazard recognition
- Reporting procedures
- Emergency procedures
- Site-specific requirements

A possible illustration is where welding or cutting will take place in a potentially gassy area. Where the plan requires constant air monitoring equipment and operating ventilation equipment the work will not commence until monitor readings are conducted and ventilation equipment has been turned on. Potentially gassy areas are waste water treatment plants, tunnels, etc.

Alarm systems which a local fire watch would expect to be available are manual pull stations, two-way radios, and/or telephones. Communications through these systems are generally directed to the facility Communications Center or Operations Center. Manual stations provide the Command Center the location of the fire automatically. The two voice communications systems require that the Fire Watch, or the instructed individual, verbally report the exact location of the fire.

The Certified Fire Watch team shall also be trained in the use of the extinguishing equipment available for small fire containment. Typically, this consists of portable fire extinguishers and small hose systems. The use of extinguishers is on a limited exposure

HOT WORK PERMIT **Hot Work Permit Number** _____

SECTION A - BACKGROUND INFORMATION (To be completed by supervisor in charge)

A. MAINTENANCE REQUEST NO:	B. STARTING DATE & TIME: DATE: TIME:	C. EXPIRATION DATE & TIME DATE: TIME:
D. EXACT LOCATION:	E. EQUIPMENT:	

F. EXACT LOCATION OF WORK TO BE CONDUCTED: _____

G. EMPLOYEE(S) ASSIGNED TO JOB:	BADGE NO.	H. SUPERVISOR(S)

SECTION B - TYPES OF PERMITS REQUIRE - (Checked by supervisor in charge)

- ☐ ASBESTOS (Copy to be attached)
- ☐ RADIATION (Copy to be attached)
- ☐ CHEMICAL/HAZARDOUS MATERIAL
- ☐ CONFINED SPACE ENTRY
- ☐ OPEN FLAME/WELDING

SECTION C - GENERAL PRECAUTIONS

ITEM	YES	NO
1. Equipment cleaned and purged		
2. Nuclear safety checks completed		
3. Look & Tag Procedures required and followed		
4. Water in space has been collected and sampled		
5. Complete isolation of process lines has been completed		
6. All mechanical equipment to the space have been tagged disconnected and/or blocked		
7. Electrical isolation complete for Lock & Tag Procedure		
8. All lines within space have been cleaned and purged		

Equipment is safe and ready for work (FACILITY OWNER'S SIGNATURE)

BADGE NO.	DATE	TIME

SECTION D - PERSONAL PROTECTIVE EQUIPMENT REQUIRED

EQUIPMENT	YES	NO	SPECIFY
Face Shield			
Hearing Protection			
Eye Protection			
Acid Splash Suit			
Gloves			
Respiratory Protection (consult with IH rep.)			
Flame Retardant Clothing			
Disposable Hood, Coveralls, and shoe Covers worn over company - issued clothing			

OTHER PROTECTION REQUIREMENTS

SUPERVISOR - IN - CHARGE SIGNATURE	BADGE NO.	DATE

SECTION E - CHEMICAL/HAZARDOUS MATERIAL PERMIT

TYPE OF MATERIAL	NAME OF MATERIAL(S)

PRECAUTION TAKEN	YES	NO	DNA
1. Equipment and/or lines have been drained, flushed, purged, or neutralized			
2. Valves have been closed and locked (when feasi ble) and danger tagged			
3. Area isolated			
4. Safety shower is operable close to worksite			
5. Special clothing or other protective equipment required			
6. Special precautions:			

FACILITY OWNER'S SIGNATURE	BADGE NO.	DATE

SECTION F - CONFINED SPACE ENTRY PERMIT - (Valid Max. 12 hours)

ATMOSPHERIC GAS TESTING RESULTS

OXYGEN CONTENT		COMBUSTIBLE GAS		TOXICITY	
TIME	READINGS	TIME	READINGS	TIME	READINGS

PRECAUTIONS TAKEN/NEEDED	YES	NO	DNA
1. Forced ventilation required			
2. Work requires staging or ladder			
3. Ground fault interrupting protection required			
4. Adequate/proper illumination required			
5. Standby notified what action to take			
6. Safety lines and harness required			
7. Nonsparking tools required			
8. Periodic gas testing required			

STANDBY WORKER COMMUNICATION:

SPECIAL INSTRUCTIONS:

STANDBY WORKER COMMUNICATION:

AUTHORIZING SIGNATURE:	BADGE NO.:
PERMIT ISSUED DATE:	TIME:

SECTION G - OPEN FLAME/WELDING PERMIT

PRECAUTIONS VERIFIED (within 36 feet of work)	YES	NO	DNA
1. Combustibles, magnesium and uranium have been removed, covered, or shielded.			
2. Flammable liquids have been removed or isolated.			
3. Wall and floor openings are covered or protected.			
4. A flame retardant tarp has been suspended under neath work.			
5. A combustible gas check has been made.			
6. (Work on walls/ceilings) All combustibles have been removed from opposite sides.			
7. A Fire Watch will be required and will remain posted during breaks and for 30 minutes after work is completed.			
8. Fire Watch is supplied with an extinguisher and know-how to activate the nearest fire alarm.			
9. Fire & Safety inspector shall be present during the burning operation.			
10. Fire & Safety inspector shall be present to moni tor when the system is initially opened.			

COMBUSTIBLE GAS TESTING RESULTS

EQUIPMENT/AREA CHECKED:

SPECIAL INSTRUCTIONS/PRECAUTIONS

FIRE & SAFETY INSPECTOR SIGNATURE:	BADGE NO.	DATE

PERMIT ISSUED DATE:	TIME

Figure 1-3
Hot Work Permit

basis - the fire watch team is traditionally trained to fight small fires. Training must also include information to help the fire watch determine when a fire is beyond his/her abilities to extinguish.

When special equipment is needed on a job, the fire watch team must be trained in the operation, maintenance and calibration of the equipment. For example, a fire watch may use a combustible gas indicator (CGI) to measure the lower explosive limit (LEL) of the air where hot work is going on. Once the CGI detects a 10% LEL, the fire watch would require the hot work to cease.

At the conclusion of work the fire watch conducts a survey of the work area to determine that the area is free of combustion hazards. This survey shall be conducted approximately thirty minutes after hot work has ceased. Smoldering embers may become a major fire even hours after workers have left the site. Although surveillance is constant during the work period, this final inspection is a critical fire prevention requirement.

An illustration of the importance of this surveillance would be late night fires on construction sites; such as Atlanta High Rise which started burning at 11:00 p.m. and resulted in a multi-million dollar loss. Fire watch surveillance duty can be compared to campfire safety. To put out a campfire, the camper distributes the embers of the fire and douses the hot material with water or covers it with dirt prior to leaving the camp site.

FIRE PREVENTION PRECAUTIONS

There are several work habits that can be done as part of the job to help prevent fires from starting. These precautions include the following:

- Keep work area swept clean and clear of combustibles.
- Have a hose system available for wetting down a work area when combustible floors are present.
- Cover openings or cracks in the floors and walls to prevent sparks from traveling into lower or adjacent work areas.
- When welding or cutting on metal, take precautions to avoid conduction transfer of heat to ignitible materials.
- Fully charged fire extinguishers and/or small hose systems shall be available in the work area at all times.
- Vapor barriers shall be installed to prevent the possibility of combustible gases from entering the work area.

FIRE PREVENTION REGULATIONS

OSHA Standard 29 CFR 1926.352 outlines fire prevention regulations.

- When practical, objects to be welded, cut or heated shall be moved to a designated safe location. If not possible, all movable fire hazards in the vicinity of the work shall be taken to a safe place or otherwise protected.

- When object of work and all fire hazards cannot be removed, positive means shall be taken to confine heat, sparks and slag, and protect the immovable fire hazards from them.

- No welding, cutting or heating shall be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a hazard.

- Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.

- When "normal" fire prevention precautions are not deemed sufficient, additional personnel shall be assigned to guard against fire while work is performed, and for a sufficient period of time following completion, to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the provided fire equipment is to be used.

- In enclosed or confined spaces, the gas supply to the touch shall be positively shut off at some point outside the space when the torch is not to be used or if left unattended for some period of time. Torch and hose shall be removed from the space at change of shift and for overnight storage.

Six percent of fire incidents that occur during construction and renovation operations are caused by welding and cutting sparks. These fires account for 10% of all the dollar losses that take place in the United States each year. A properly prepared Fire Prevention and Fire Watch Team Program, coupled with training and diligent application of the program, can eliminate almost all of these losses.

SECTION ONE - ASSIGNMENT SHEET

1. Define the term “fire watch” according to the Department of Energy (DOE).

2. Identify the information described in a hot work permit.

3. Identify the minimum requirements of a Fire Watch Team Program.

SECTION ONE - ASSIGNMENT SHEET (continued)

4. List the three alarm systems a fire watch would use.

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SECTION TWO

FIRE

TRAINING OBJECTIVES

After completing Section Two, trainees will be able to:

1. Identify the three components of the fire triangle.
2. Identify the four components of the fire tetrahedron.
3. List the ways to extinguish a fire.
4. List and define the four classifications of fire.

SECTION TWO

FIRE

Man has learned from experience that some materials will burn while others will not, that some materials burn more readily than others, that burning takes place when air is present and that heat must be applied to start the process. A self-evident fact reveals that when materials burn, they lose their original shape, substance, and usefulness. It is important to understand the properties of fire; how it is created, how it reacts to certain conditions, and how it can be controlled.

Fire is a chemical reaction known as combustion. It is frequently defined as the rapid oxidation of combustible material, accompanied by a release of energy in the form of heat and light. Fire burns because three elements are present: heat, fuel, and oxygen. When these elements are brought together in the proper proportions, fire will be created.

MECHANICS OF A FIRE

Every fire requires the presence of oxygen and fuel to which heat is introduced. These three elements of a fire are frequently illustrated as a fire triangle. The heat need not have a long-lasting time duration; an instant spark could have sufficient heat to ignite combustible materials. Even a spark from grinding metal may serve as an ignition source, needing only to reach out for the fuel and oxygen in order to complete the fire triangle. Removal of any one leg of the fire triangle will prevent a fire from occurring initially, or extinguish an existing fire.

The Fire Triangle

The fire triangle is used to explain and describe the combustion and extinguishment theory (Figure 2-1). Each side of the triangle represents an element needed for a fire to occur. Oxygen, heat and fuel must be in the proper proportions to create fire. If any one of the three elements are removed, a fire can't exist.

Naturally, when welding or cutting will take place it is difficult to control the heat part of the fire triangle. Sparks or molten metal particles may travel as far as 35 feet from the point of work. Substantially, the control must involve the movement or protection of any flammable or combustible materials in

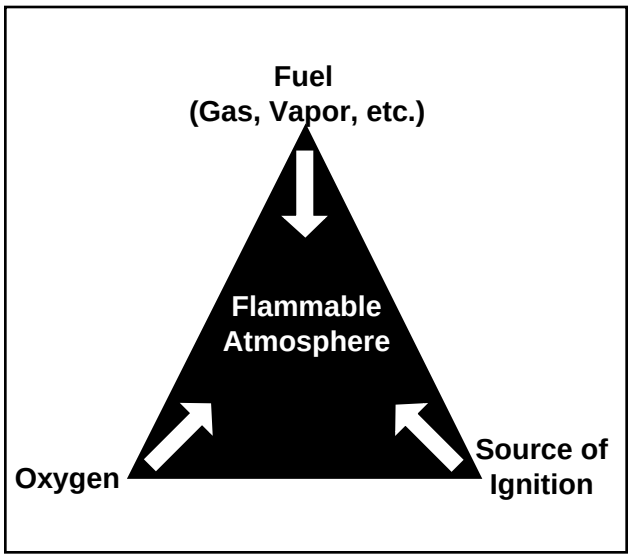

Figure 2-1
Fire Triangle

the vicinity of the work to be performed. The fuel must be removed - either physically taken out of the area or covered when removal is not possible. Some workers are of the opinion that walking under cascading welding sparks is harmless. However, you may have seen the pin holes in cotton clothing caused by welding sparks, and these same sparks will readily ignite materials with lower flash points.

Fire Tetrahedron

In recent years many new chemicals and materials have been produced which will burn and react in a manner which cannot be explained completely by the use of the fire triangle.

One question that defies explanation under the fire triangle is:

Why will calcium and aluminum burn in a nitrogen atmosphere in the absence of oxygen?

The most generally accepted theory is the "fire tetrahedron." Those who developed this theory made a transition from the fire triangle to a four sided pyramid (Figure 2-2). One of the four sides serves as the base and represents the chemical chain reaction. The three standing sides represent heat, fuel and oxygen. The removal of one or more of the four sides will make the tetrahedron incomplete and result in extinguishment of the fire. This theory has not done away with the fire triangle, but simply added a fourth component or condition.

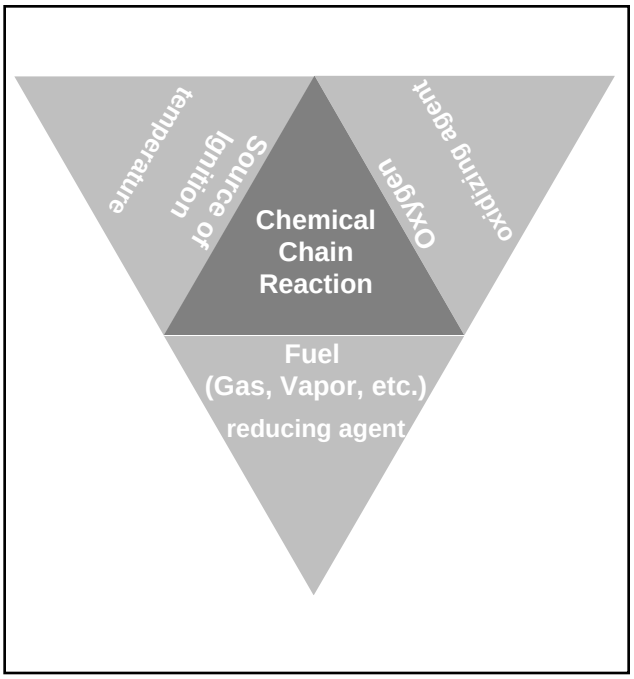

Figure 2-2
Fire Tetrahedron

Fuel (Reducing Agent)

The fuel side of the tetrahedron is the same as for the fire triangle and is defined as "a material that can be oxidized." The term "reducing agent" has reference to the fact that fuel reduces an oxidizing agent.

Oxygen (Oxidizing Agent)

The term "oxidizing agent" is used in the place of the oxygen or air leg of the triangle. This term helps in explaining how some materials, such as sodium nitrate or potassium chlorate (which release their own oxygen under certain conditions) can burn in an atmosphere free of any outside source of oxygen. Sulphuric acid can be ignited in carbon dioxide without oxygen being involved.

This is also true of other materials. Examples of oxidizing agents are:

Hydrogen Peroxide	Nitrate
Fluoride	Nitric Acid
Chlorine	Zirconium
Bromine	Chromates
Manganese Dioxide	Lead Dioxide

Heat (Temperature)

The heat leg of the triangle has been replaced with the term "temperature." Science refers to heat as a type of energy, and temperature as a quantity of heat energy. (Heat is energy in disorder and temperature is the measure of the degree of that disorder.)

Chemical - Chain Reaction

To begin with, to have fire there must be fuel, oxygen, and heat. The fuel must be heated to give off gases and vapors, and enough heat must be present to ignite these vapors. In the burning of either solid or liquid fuels, the vapors which are distilled off and carried into the flame, contain atoms and molecules which have not been consumed in the initial burning process. These liberated particles my have an electrical charge which either attracts other particles or repels them. Lesser burning takes place very near the fuel due to the lack of oxygen molecules to react with the hydrocarbon particles.

The area between vapor or gases and the visible flame is called the "flame interface." Immediately above the area, oxygen molecules exist in sufficient number to produce energy reactions which create light in the form of flames. This area is fed by the oxygen drawn into the fire as rising heated vapors or gases. This process continues throughout the flame. The molecular structure of the material is broken down, and the released atoms combine with other radicals and elements which are drawn into the process, to form new compounds which are again broken down by the heat. The final by-products then escape the flame in the form of smoke or steam. Since carbon is one the elements which is more difficult to ignite, most of the visible smoke consists of unburned carbon particles.

IGNITABLE MATERIALS

Ignitable materials may be either solid, gas, or liquid. However, even liquid fires are actually the vapors from the liquid that are burning. Solid materials generally require direct contact with a heat source. However, gases will travel and reach out to the ignition source. The explosion on the S.S. Monticello Victory occurred when flammable gases in a distant part of the ship traveled to the area of welding and ignited. Related incidents are not uncommon; for example, scenarios where a business or homeowner had an open container of gasoline which was ignited by an open flame source such as water heater, furnace pilot light, etc.

EXTINGUISHMENT

Under the theory of the fire triangle there are three ways to put out a fire:

1) Remove fuel
2) Eliminate the oxygen
3) Reduce the temperature

With the introduction of the tetrahedron concept, “STOP the chain reaction” should be added. With the introduction of vaporizing liquid and dry chemical extinguishing agents, it was noticed that certain phenomena occurred that were not explained by the fire triangle methods of extinguishment. These agents were observed to extinguish fire more rapidly than would the same quantity of other smothering agents. Certain activity in the unexplained secondary reaction was taking place.

Investigation disclosed that in heating these agents (sodium bicarbonate and potassium bicarbonate or the vaporizing liquids) a reaction takes place which is very similar to that which is explained under chemical chain reaction. The atoms released by the extinguishing agents would combine with the molecules already involved in the chain reaction, because molecules already involved in the chain reaction form molecules which would not unite with the oxygen of the air, thereby breaking the chemical chain reaction.

Classification of Fires

Class A fires occur in ordinary combustible materials such as wood, cloth, paper, rubber and most plastics. The most commonly used extinguishing agent is water, which cools and quenches. Fire in class A materials can also be extinguished by dry chemical used on ABC fires, which break up the chemical chain reaction.

Class B fires are fires involving flammable liquids, oil, greases, tars, paints and flammable gases. Dry chemical, foam, vaporizing liquids, and carbon dioxide can be used on this type of fire. Water fog can be used as an extinguishing agent depending on the circumstances of the fire.

Class C fires involve energized electrical equipment. Dry chemical or carbon dioxide are used to put out the fire. It is important to know that extinguishing agents for a class C fire must not conduct electricity. For example, using water to put out an electrical can kill or injure the person fighting the fire because it conducts electricity.

Class D fires are fires in combustible metals, such as magnesium, titanium and potassium. Metal X is used on these types of fires. If normal extinguishing agents are used on class D fires a chemical chain reaction will occur. ONLY specialized extinguishing agents should be used.

SECTION TWO - ASSIGNMENT SHEET

1. Identify the three components of the fire triangle.

2. Identify the four components of the fire tetrahedron.

3. List the ways to extinguish a fire.

4. List and define the four classifications of fire.

SECTION THREE

PORTABLE FIRE EXTINGUISHERS

TRAINING OBJECTIVES

After completing Section Three, trainees will be able to:

1. Identify the four classes of portable fire extinguishers.
2. Identify the two kinds of liquid extinguishers.
3. Identify the two kinds of gas extinguishers.
4. Identify the three kinds of solid extinguishers.
5. List the three different dry chemical extinguishers.
6. Describe the information found on a fire extinguisher label.

SECTION THREE

PORTABLE FIRE EXTINGUISHERS

Portable fire extinguishers are intended as a first line of defense to cope with fires of limited size. Just as there are different classes of fires, there are corresponding classes of portable fire extinguishers.

Class A

Class A extinguishers uses a number rating to show the amount of fire that can be extinguished using 1-1/4 gallons of water as the standard. For example:

Class A is the amount of fire extinguished with 1-1/4.

Class 2A extinguisher is the amount of fire extinguished with 2-1/2 gallons. (2 x 1-1/4 = 2 1/2)

Class B

Class B uses a number rating to show the square foot surface area it will cover. A 16B extinguisher will be able to extinguish a 4 x 4 foot area of burning liquid. (4 x 4 = 16)

Class C

The agent in a class C extinguisher does not conduct electricity.

Class D

The material in this extinguisher can be used on certain types of metal fires.

Besides being divided into four classes, portable fire extinguishers can also be categorized by the state of the agent inside the cylinder. The three types of extinguishers are liquid, gas and solid.

LIQUID EXTINGUISHERS

There are two kinds of liquid extinguishers:

- Stored pressure water extinguisher
- Aqueous film forming foam (AFFF)

Stored Pressure Water Extinguisher

Characteristics of a stored pressure water extinguisher include the following:

- Size 2-1/2 gallon
- Used on Class A fires
- Water stream reaches 30 - 40 feet
- Discharge time is about 1 minute
- Propellant is compressed air
- Limitation: protect from freezing

Inspection

To conduct an inspection on a stored pressure water extinguisher, follow these steps:

1. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.

2. Operating instructions on name plate are legible and on front of extinguisher.

3. Check seal and tamper indicators.

4. Check condition of handle and operating lever for damage.

5. Check that hose and nozzle are in good condition and are securely tightened.

6. Determine fullness of extinguisher by weighing or hefting. Do not trust the pressure gauge or indicator for it could be faulty or inaccurate.

7. Check for a signature and date on the inspection tag.

Aqueous Film Forming Foam (AFFF) - Light Water

Characteristics of the AFFF fire extinguisher include the following:

- Size 2-1/2 gallon
- Used on Class A & B fires
- Stream reaches about 30 - 40 feet
- Discharge time about 1 minute
- Limitation: protect from freezing

Inspection

To conduct an inspection on an AFFF extinguisher, follow these steps:

1. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.

2. Operating instructions on name plate are legible and on front of extinguisher.

3. Check seal and tamper indicators.

4. Check condition of handle and operating lever for damage.

5. Check that hose and nozzle are in good condition and are securely tightened.

6. Determine fullness of extinguisher by weighing or hefting. Do not trust the pressure gauge or indicator for it could be faulty or inaccurate.

7. Check for a signature and date on the inspection tag.

GAS EXTINGUISHERS

There are two kinds of gas extinguishers:

- Carbon dioxide
- Stored pressure halon

Carbon Dioxide

Characteristics of a carbon dioxide ($CO_{2)}$ fire extinguisher include the following:

- Size 2 - 20 pounds.

- Used on Class B and C fires.

- Stream reach of about 3 - 8 feet.

- Discharge time about 15 - 30 seconds.

- CO_2 is stored at a high pressure of 800 - 900 psi at 70°F. At 120°F, storage pressure will be about 2,500 psi.

- Relief valve goes off about 2,700 psi.

- Full weight and empty weight stamped into head for purposes of weighing (10% low must be refilled).

There are some limitations when using carbon dioxide as an extinguishing agent, such as:

- Protect from freezing -40°F.
- Maximum storage temperature is 130°F.
- Can be an ignition source due to static electricity build up.
- CO_2 can cause frost bite.

Inspection

To conduct an inspection on a stored pressure halon fire extinguisher, follow these steps:

1. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.
2. Operating instructions on name plate are legible and on front of extinguisher.
3. Check seal and tamper indicators.
4. Check condition of handle and operating lever for damage.
5. Check hose for damage and tightness (dry, cracked or cut).
6. Check horn for condition (Horn must not be cracked or chipped because static electricity will escape from the horn).
7. Check pressure release valve for clogging or obstructions.
8. Determine fullness by weighing or hefting.

   Note: CO_2 must be weighed quarterly. A loss of more than 10% of the stamped rate weight is an indication that the extinguisher requires recharging.
9. Check for a signature and date on the inspection tag.

Stored Pressure Halon

Characteristics of a stored pressure halon extinguisher include the following:

- Sizes - various
- Smaller size used on Class B and C fires
- Larger sizes used on ABC fires
- Reach of 9 - 15 feet
- Discharge time 15 - 30 feet
- Stored in cylinders
- Halon interrupts chemical chain reaction to extinguish a fire
- Clean and non-corrosive
- Same UL listing as CO_2
- Pressurized with nitrogen
- Non-toxic in the quantities used for putting out fires
- Has built in warning of toxicity - an unbearable odor

Inspection

A stored pressure halon extinguisher is inspected in the same way as the stored pressure water extinguisher. The only difference is in the pressure and hydrostatic test periods.

Note: The removal of the agent from the extinguisher shall only be done using a halon closed recovery system.

1. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.

2. Operating instructions on name plate are legible and on front of extinguisher.

3. Check seal and tamper indicators.

4. Check condition of handle and operating lever for damage.

5. Check that hose and nozzle are in good condition and are securely tightened.

6. Determine fullness of extinguisher by weighing or hefting. Do not trust the pressure gauge or indicator for it could be faulty or inaccurate.

7. Check for a signature and date on the inspection tag.

SOLID EXTINGUISHERS

There are three kinds of solid extinguishers:

- Stored pressure dry chemical
- Cartridge type dry chemical
- Dry powder

Stored Pressure Dry Chemical

Characteristics of a dry chemical extinguisher include the following:

- Sizes 2-1/2 - 30 pounds
- Used on Class B and C fires - Also type ABC fires if applicable
- Reach of 5 - 20 feet
- Discharge time 10 - 15 seconds
- Will not freeze
- Extinguishes fire by disrupting chemical chain reaction
- Pressurized - usually with nitrogen
- Pressures vary from 175 - 350 psi
- Chemicals presently used are said to be non-toxic.
- Limitation: The valve assembly must be cleaned and the extinguisher refilled after each use.

Inspection

The stored pressure dry chemical extinguisher is inspected in the same way as the stored pressure water type extinguisher. Only pressure and hydrostatic test periods differ.

Note: This type of extinguisher does not have to be emptied on annual inspections.

1. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.

2. Operating instruction on name plate are legible and on front of extinguisher.

3. Check seal and tamper indicators.

4. Check condition of handle and operating lever for damage.

5. Check that hose and nozzle are in good condition and are securely tightened.

6, Determine fullness of extinguisher by weighing or hefting. Do not trust the pressure gauge or indicator for it could be faulty or inaccurate.

7. Check for a signature and date on the inspection tag.

Cartridge Type - Dry Chemical

Characteristics of a cartridge type dry chemical extinguisher include the following:

- Sizes 2-1/2 - 30 pounds
- Used on Class B and C fires, unless rated ABC
- Reach of 5 - 20 feet
- Discharge time 15 - 25 seconds
- Does not need protection from freezing
- Extinguishes fire by disrupting Chemical Chain Reaction
- Cartridges usually pressurized by CO_2 or nitrogen
- Pressure in cartridges is usually between 800 - 900 psi;
- CO_2 cartridges have left hand threads: nitrogen cartridges have right hand threads

Inspection

To conduct an inspection on a cartridge type dry chemical extinguisher, follow these steps:

1. Remove cartridge guard and remove cartridge. Check cartridge for corrosion, damaged threads and seal disc damage.

2. Remove ring pin, lift hose out of the way and check puncture lever to make sure it is operating freely. Replace ring pin and seal.

3. Check gasket in cartridge receiver to see that it is in good condition.

4. Screw cartridge in place tightly and replace cover.

5. Remove fill cap and check to see that dry chemical is within 2" of the fill cap opening.

6. Examine fill cap gasket to ensure good condition. (Ensure indicator pin is in undischarged position). Screw fill cap tightly in place and reseal.

7. Squeeze nozzle and shake hose to ensure that the nozzle is not obstructed. Check tightness of nozzle and hose.

8. Check extinguisher body for damage (dents, pit marks). If dents of 1/16" are found, the extinguisher must be hydrostatically tested.

9. Check for a signature and date on the inspection tag.

Precautions for Using Dry Chemical

1. Do **not** mix different chemicals. A chemical chain reaction can develop and cause dangerous pressure levels.
2. Do **not** exceed a storage temperature of 140°F. Additives may melt above this temperature.
3. Do **not** use dry chemicals where delicate electrical contacts are located.
4. Dry chemicals will **not** extinguish fires in materials that produce their own oxygen.

Types of Dry Chemical

There are three different dry chemical extinguishers:

- Regular dry chemical (sodium bicarbonate based)
- ABC multipurpose dry chemical (monoammonium phosphate)
- Purple K (potassium carbonate)

Regular Dry Chemical

Regular dry chemical has a base of sodium bicarbonate and is the most widely used dry chemical. The bluish-white color of the powder differentiates it from other types. It is a free-flowing powder, non-abrasive and will not produce a toxic effect when used as a fire fighting agent.

The common name for this extinguisher is Standard or Plus Fifty C. Standard extinguishers may be used to combat Class B fires (flammable liquids) or Class C fires (energized electrical equipment).

Never mix Standard with phosphate-based dry chemicals (ABC). A chemical reaction will result that will cause damage to the extinguisher. Therefore, when refilling these extinguisher, ONLY use the original type of agent as specified on the name plate.

ABC Multipurpose Dry Chemical

ABC multipurpose dry chemical has a base of monoammonium phosphate. It's yellow color makes the product easy to identify. ABC is a free-flowing water repellent, non-abrasive and when used as a fire fighting agent will not produce the toxic effects.

Moisture may combine with the agent in a post fire situation to produce a mild corrosion. Therefore, prompt clean up is recommended. If it can't be swept up quickly, warm water may be used as a solvent.

The common name for this product is A.B.C. or Foray. A.B.C. or Multipurpose can be used on Class A, B, and C fires.

Never mix A.B.C. with any other dry chemical. A chain reaction will take place and damage the extinguisher.

Purple K

Purple K has a base of potassium carbonate and is rated for Class B and C fires. It's one of the most effective agents against Class B fires. The product's purple color makes it easy to identify.

Never mix Purple K with a monoammonium phosphate-based dry chemical, such as A.B.C. A chain reaction will take place causing damage to the extinguisher.

Dry Powder

Dry powder is used on Class D fires and essentially what you are doing when using this type of extinguishment is burying the metal. Dry powder should be used according to directions on the extinguisher and only on the types of metals specified.

There are three types of dry powder agents:

- Graphite - powder or metal guard
- Sodium chloride - MET-L-X
- Sand - with scoop

Never put water on a Class D fire. Many metals react violently with water and will explode.

Inspection

Dry powder stored pressure or cartridge operated extinguishers are inspected in the same way as the dry chemical stored pressure or cartridge type extinguisher. Only pressure and hydrostatic test periods differ.

Note: Pails or drums containing dry powder agents for scoop or shovel application must be kept full and covered at all times. The dry powder shall be replaced if it becomes damp or contaminated.

FIRE EXTINGUISHER LABELS

An extinguisher must have an attached label, tag, stencil or similar device with the following information:

A. Contents product name as it appears on the manufacturer's Material Safety Data Sheet (MSDS).

B. A list identifying the hazardous material in accordance with the Workplace Hazardous Materials Identification Systems (WHMIS).

C. The manufacturer's name, mailing address, and phone number.

D. Date of last hydrostatic test.

E. Weight of extinguisher.

F. Class and operating instructions.

G. Inspection tag.

INSPECTION / MAINTENANCE / RECHARGING

Inspection

A fire extinguisher inspection is a “quick check” that an extinguisher is ready to use. It's meant to give reasonable assurance that the extinguisher is fully charged and operable.

Frequency

Extinguishers shall be inspected when first placed in service or after a 30 day interval. Extinguishers must also have an annual inspection regardless of whether it has been placed in service or not.

Procedure

Periodic inspection of extinguishers shall include a check of at least the following items:

- Ensure the operating instructions on the name plate are legible.
- Ensure seals and tamper indicators are **not** broken or missing.
- Determine fullness by weighing or hefting.
- Examine for obvious physical damage, corrosion, leakage, or clogged nozzle.
- Be sure the pressure gauge reading or indicator is in the operable range or position.

Maintenance

Maintenance is a thorough examination of the extinguisher. It is intended to give maximum assurance that an extinguisher will operate effectively and safely. It includes a thorough examination and any necessary repairs or replacements. Maintenance will usually reveal if hydrostatic testing is required.

Frequency

Maintenance is usually done when an extinguisher has been used or damaged, or when a hydrostatic test is conducted.

Procedure

Maintenance can't be done in the "tool crib." The extinguisher must be sent out to a company that has properly qualified service personnel and parts.

Maintenance procedures should include a thorough examination of the three basic elements of an extinguisher:

1. Mechanical parts
2. Extinguishing agent
3. Expelling means

Note: During annual maintenance it is **not** necessary to internally examine non-rechargeable or stored pressure extinguishers.

Recharging

Recharging is the replacement of the extinguishing agent and also includes the expellent for certain types of fire extinguishers.

Frequency

Recharging is done when an extinguisher has been used or when a hydrostatic test has been conducted.

Procedure

Recharging cannot be done in the "tool crib." The extinguisher must be sent out to a company with properly qualified service personnel and equipment.

HYDROSTATIC TESTING

Hydrostatic testing should be performed by persons trained in pressure testing procedures, who have available the testing equipment, facilities and appropriate servicing manuals. Table 3-1 illustrates the hydrostatic testing intervals for portable fire extinguishers. If at any time an extinguisher shows evidence of corrosion or mechanical injury it shall be hydrostatically tested.

RECORD KEEPING

Each extinguisher shall have a tag securely attached that indicates the month and year the inspection, maintenance and recharging was performed and the initials of the person who performed the service.

In addition to the required tag, a permanent record log should include the following information as applicable:

- The inspection date and the name of the person performing the maintenance.
- The last recharging date and the name of the person performing the recharge.
- The hydrostatic retest date and the name of the agency performing the hydrostatic test.
- Description of dents remaining after passing a hydrostatic test.

Table 3-1
Hydrostatic Test Intervals

Hydrostatic Test Interval for Extinguishers

Extinguisher Type	Test Interval (Years)
Soda acid	Note
Cartridge-operated water and/or antifreeze	Note
Stored pressure water, loaded stream, and/or antifreeze	5
Wetting agent	5
Foam	Note
AFFF (aqueous film forming foam	5
FFFP (film forming fluoroprotein foam)	5
Dry chemical with stainless steel shells	5
Carbon dioxide	5
Dry chemical, stored pressure, with mild steel shells, brazed brass shells, or aluminum shells	12
Halogenated agents	12
Dry powder, stored pressure, cartridge or cylinder-operated, with mild steel shells	12

Source: NFPA 10 Portable Fire Extinguishers 1990 Edition

NOTE: Extinguishers with copper or brass shells joined by soft solder were prohibited from further hydrostatic testing effective May 18, 1978. Extinguishers with stainless steel or brazed brass shells that were permitted to remain in service had had a five-year hydrostatic test interval. Effective December 22, 1987 when the hydrostatic test date arrives, all types of inverting extinguishers shall not be tested but removed from service.

SECTION THREE - ASSIGNMENT SHEET

1. Identify the four classes of portable fire extinguishers.

_____

_____

_____

_____

2. Identify the two kinds of liquid extinguishers.

_____

_____

3. Identify the two kinds of gas extinguishers.

_____

_____

4. Identify the three kinds of solid extinguishers.

_____

_____

_____

SECTION THREE - ASSIGNMENT SHEET (continued)

5. List the three different dry chemical extinguishers.

_____

_____

_____

6. Describe the information found on a fire extinguisher label.

_____

_____

_____

_____

_____

_____

APPENDIX
REGULATIONS

Part Number 1910
Standard Number 1910.157
Title Portable fire extinguishers.

(a) Scope and application.

The requirements of this section apply to the placement, use, maintenance, and testing of portable fire extinguishers provided for the use of employees. Paragraph (d) of this section does not apply to extinguishers provided for employee use on the outside of workplace buildings or structures. Where extinguishers are provided but are not intended for employee use and the employer has an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, then only the requirements of paragraphs (e) and (f) of this section apply.

(b) Exemptions.

(1) Where the employer has established and implemented a written fire safety policy which requires the immediate and total evacuation of employees from the workplace upon the sounding of a fire alarm signal and which includes an emergency action plan and a fire prevention plan which meet the requirements of 1910.38, and when extinguishers are not available in the workplace, the employer is exempt from all requirements of this section unless a specific standard in Part 1910 requires that a portable fire extinguisher be provided.

(2) Where the employer has an emergency action plan meeting the requirements of 1910.38 which designates certain employees to be the only employees authorized to use the available portable fire extinguishers, and which requires all other employees in the fire area to immediately evacuate the affected work area upon the sounding of the fire alarm, the employer is exempt from the distribution requirements in paragraph (d) of this section.

(c) General requirements.

(1) The employer shall provide portable fire extinguishers and shall mount, locate and identify them so that they are readily accessible to employees without subjecting the employees to possible injury.

(2) Only approved portable fire extinguishers shall be used to meet the requirements of this section.

(3) The employer shall not provide or make available in the workplace portable fire extinguishers using carbon tetrachloride or chlorobromomethane extinguishing agents.

(4) The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

(5) The employer shall permanently remove from service by January 1, 1982, all soldered or riveted shell self-generating soda acid or self-generating foam or gas cartridge water type portable fire extinguishers which are operated by inverting the extinguisher to rupture the cartridge or to initiate an uncontrollable pressure generating chemical reaction to expel the agent.

(d) Selection and Distribution.

(1) Portable fire extinguishers shall be provided for employee use and selected and distributed based on the classes of anticipated workplace fires and on the size and degree of hazard which would affect their use.

(2) The employer shall 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.

(3) The employer may use uniformly spaced standpipe systems or hose stations connected to a sprinkler system installed for emergency use by employees instead of Class A portable fire extinguishers, provided that such systems meet the respective requirements of 1910.158 or 1910.159, that they provide total coverage of the area to be protected, and that employees are trained at least annually in their use.

(4) The employer shall distribute portable fire extinguishers for use by employees on Class B fires so that the travel distance from the Class B hazard area to any extinguisher is 50 feet (15.2 m) or less.

(5) The employer shall distribute portable fire extinguishers used for Class C hazards on the basis of the appropriate pattern for the existing Class A or Class B hazards.

(6) The employer shall distribute portable fire extinguishers or other containers of Class D extinguishing agent for use by employees so that the travel distance from the combustible metal

working area to any extinguishing agent is 75 feet (22.9 m) or less. Portable fire extinguishers for Class D hazards are required in those combustible metal working areas where combustible metal powders, flakes, shavings, or similarly sized products are generated at least once every two weeks.

(e) Inspection, maintenance and testing.

(1) The employer shall be responsible for the inspection, maintenance and testing of all portable fire extinguishers in the workplace.

(2) Portable extinguishers or hose used in lieu thereof under paragraph (d)(3) of this section shall be visually inspected monthly.

(3) The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less. The record shall be available to the Assistant Secretary upon request.

(4) The employer shall assure that stored pressure dry chemical extinguishers that require a 12-year hydrostatic test are emptied and subjected to applicable maintenance procedures every 6 years. Dry chemical extinguishers having non-refillable disposable containers are exempt from this requirement. When recharging or hydrostatic testing is performed, the 6-year requirement begins from that date.

(5) The employer shall assure that alternate equivalent protection is provided when portable fire extinguishers are removed from service for maintenance and recharging.

(f) Hydrostatic testing.

(1) The employer shall assure that hydrostatic testing is performed by trained persons with suitable testing equipment and facilities.

(2) The employer shall assure that portable extinguishers are hydrostatically tested at the intervals listed in Table L-1 of this section, except under any of the following conditions:

(i) When the unit has been repaired by soldering, welding, brazing, or use of patching compounds;

(ii) When the cylinder or shell threads are damaged;

(iii) When there is corrosion that has caused pitting, including corrosion under removable name plate assemblies;

(iv) When the extinguisher has been burned in a fire; or

(v) When a calcium chloride extinguishing agent has been used in a stainless steel shell.

(3) In addition to an external visual examination, the employer shall assure that an internal examination of cylinders and shells to be tested is made prior to the hydrostatic tests.

(4) The employer shall assure that portable fire extinguishers are hydrostatically tested whenever they show new evidence of corrosion or mechanical injury, except under the conditions listed in paragraphs (f)(2)(i)-(v) of this section.

(5) The employer shall assure that hydrostatic tests are performed on extinguisher hose assemblies which are equipped with a shut-off nozzle at the discharge end of the hose. The test interval shall be the same as specified for the extinguisher on which the hose is installed.

(6) The employer shall assure that carbon dioxide hose assemblies with a shut-off nozzle are hydrostatically tested at 1,250 psi (8,620 kPa).

(7) The employer shall assure that dry chemical and dry powder hose assemblies with a shut-off nozzle are hydrostatically tested at 300 psi (2,070 kPa).

(8) Hose assemblies passing a hydrostatic test do not require any type of recording or stamping.

(9) The employer shall assure that hose assemblies for carbon dioxide extinguishers that require a hydrostatic test are tested within a protective cage device.

(10) The employer shall assure that carbon dioxide extinguishers and nitrogen or carbon dioxide cylinders used with wheeled extinguishers are tested every 5 years at 5/3 of the service pressure as stamped into the cylinder. Nitrogen cylinders which comply with 49 CFR 173.34(e)(15) may be hydrostatically tested every 10 years.

(11) The employer shall assure that all stored pressure and Halon 1211 types of extinguishers are hydrostatically tested at the factory test pressure not to exceed two times the service pressure.

(12) The employer shall assure that acceptable self-generating type soda acid and foam extinguishers are tested at 350 psi (2,410 kPa).

(13) Air or gas pressure may not be used for hydrostatic testing.

(14) Extinguisher shells, cylinders, or cartridges which fail a hydrostatic pressure test, or which are not fit for testing shall be removed from service and from the workplace.

(15)*(i)* The equipment for testing compressed gas type cylinders shall be of the water jacket type. The equipment shall be provided with an expansion indicator which operates with an accuracy within one percent of the total expansion or .1cc (.1mL) of liquid.

(ii) The equipment for testing non-compressed gas type cylinders shall consist of the following:

(A) A hydrostatic test pump, hand or power operated, capable of producing not less than 150 percent of the test pressure, which shall include appropriate check valves and fittings;

(B) A flexible connection for attachment to fittings to test through the extinguisher nozzle, test bonnet, or hose outlet, as is applicable; and

(C) A protective cage or barrier for personal protection of the tester, designed to provide visual observation of the extinguisher under test.

(16) The employer shall maintain and provide upon request to the
Assistant Secretary evidence that the required hydrostatic testing of fire extinguishers has been performed at the time intervals shown in Table L-1. Such evidence shall be in the form of a certification record which includes the date of the test, the signature of the person who performed the test and the serial number, or other identifier, of the fire extinguisher that was tested. Such records shall be kept until the extinguisher is hydrostatically retested at the time interval specified in Table L-1 or until the extinguisher is taken out of service, whichever comes first.

(g) Training and education.

(1) Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

(2) The employer shall provide the education required in paragraph (g)(1) of this section upon initial employment and at least annually thereafter.

(3) The employer shall provide employees who have been designated to use fire fighting equipment as part of an emergency action plan with training in the use of the appropriate equipment.

(4) The employer shall provide the training required in paragraph (g)(3) of this section upon initial assignment to the designated group of employees and at least annually thereafter.

Part Number 1926.150
Standard Number 1926.150
Title Fire protection.

(a) General requirements.

(1) The employer shall be responsible for the development of a fire protection program to be followed throughout all phases of the construction and demolition work, and he shall provide for the firefighting equipment as specified in this subpart. As fire hazards occur, there shall be no delay in providing the necessary equipment.

(2) Access to all available firefighting equipment shall be maintained at all times.

(3) All firefighting equipment, provided by the employer, shall be conspicuously located.

(4) All firefighting equipment shall be periodically inspected and maintained in operating condition. Defective equipment shall be immediately replaced.

(5) As warranted by the project, the employer shall provide a trained and equipped firefighting organization (Fire Brigade) to assure adequate protection to life.

(b) Water supply.

(1) A temporary or permanent water supply, of sufficient volume, duration, and pressure, required to properly operate the firefighting equipment shall be made available as soon as combustible materials accumulate.

(2) Where underground water mains are to be provided, they shall be installed, completed, and made available for use as soon as practicable.

(c) Portable firefighting equipment

(1) Fire extinguishers and small hose lines.

(i) A fire extinguisher, rated not less than 2A, shall be provided for each 3,000 square feet of the protected building area, or major fraction thereof.

Travel distance from any point of the protected area to the nearest fire extinguisher shall not exceed 100 feet.

(ii) One 55-gallon open drum of water with two fire pails may be substituted for a fire extinguisher having a 2A rating.

(iii) A 1/2-inch diameter garden-type hose line, not to exceed 100 feet in length and equipped with a nozzle, may be substituted for a 2A-rated fire extinguisher, providing it is capable of discharging a minimum of 5 gallons per minute with a minimum hose stream range of 30 feet horizontally. The garden-type hose lines shall be mounted on conventional racks or reels. The number and location of hose racks or reels shall be such that at least one hose stream can be applied to all points in the area.

(iv) One or more fire extinguishers, rated not less than 2A, shall be provided on each floor. In multistory buildings, at least one fire extinguisher shall be located adjacent to stairway.

(v) Extinguishers and water drums, subject to freezing, shall be protected from freezing.

(vi) A fire extinguisher, rated not less than 10B, shall be provided within 50 feet of wherever more than 5 gallons of flammable or combustible liquids or 5 pounds of flammable gas are being used on the jobsite. This requirement does not apply to the integral fuel tanks of motor vehicles.

(vii) Carbon tetrachloride and other toxic vaporizing liquid fire extinguishers are prohibited.

(viii) Portable fire extinguishers shall be inspected periodically and maintained in accordance with Maintenance and Use of Portable Fire Extinguishers, NFPA No. 10A-1970.

(ix) Fire extinguishers which have been listed or approved by a nationally recognized testing laboratory, shall be used to meet the requirements of this subpart.

(x) Table F-1 may be used as a guide for selecting the appropriate portable fire extinguishers.

(xi) "Employment and training." Where the employer has provided portable fire extinguishers for employee use in the workplace, the employer shall also provide an educational program to familiarize employees with the general principles of fire extinguisher use and the hazards involved with incipient stage fire fighting.

(xii) The employer shall provide the education required in paragraph (c)(1)(xi) of this section upon initial employment and at least annually thereafter.

(xiii) The employer shall assure that portable fire extinguishers are maintained in a fully charged and operable condition and kept in their designated places at all times except during use.

(xiv) The employer shall assure that portable fire extinguishers are subjected to an annual maintenance check. Stored pressure extinguishers do not require an internal examination. The employer shall record the annual maintenance date and retain this record for one year after the last entry or the life of the shell, whichever is less. The record shall be available to the Assistant Secretary upon request.

(2) Fire hose and connections.

(i) One hundred feet, or less, of 1 1/2-inch hose, with a nozzle capable of discharging water at 25 gallons or more per minute, may be substituted for a fire extinguisher rated not more than 2A in the designated area provided that the hose line can reach all points in the area.

(ii) If fire hose connections are not compatible with local firefighting equipment, the contractor shall provide adapters, or equivalent, to permit connections.

(iii) During demolition involving combustible materials, charged hose lines, supplied by hydrants, water tank trucks with pumps, or equivalent, shall be made available.

(d) Fixed firefighting equipment

(1) Sprinkler protection.

(i) If the facility being constructed includes the installation of automatic sprinkler protection, the installation shall closely follow the construction and be placed in service as soon as applicable laws permit following completion of each story.

(ii) During demolition or alterations, existing automatic sprinkler installations shall be retained in service as long as reasonable. The operation of sprinkler control valves shall be permitted only by properly authorized persons. Modification of sprinkler systems to permit alterations or additional demolition should be expedited so that the automatic protection may be

returned to service as quickly as possible. Sprinkler control valves shall be checked daily at close of work to ascertain that the protection is in service.

(2) Standpipes.

In all structures in which standpipes are required, or where standpipes exist in structures being altered, they shall be brought up as soon as applicable laws permit, and shall be maintained as construction progresses in such a manner that they are always ready for fire protection use. The standpipes shall be provided with Siamese fire department connections on the outside of the structure, at the street level, which shall be conspicuously marked. There shall be at least one standard hose outlet at each floor.

(e) Fire alarm devices.

(**1**) An alarm system, e.g., telephone system, siren, etc., shall be established by the employer whereby employees on the site and the local fire department can be alerted for an emergency.

(**2**) The alarm code and reporting instructions shall be conspicuously posted at phones and at employee entrances.

(f) Fire cutoffs.

(**1**) Fire walls and exit stairways, required for the completed buildings, shall be given construction priority. Fire doors, with automatic closing devices, shall be hung on openings as soon as practicable.

(**2**) Fire cutoffs shall be retained in buildings undergoing alterations or demolition until operations necessitate their removal

Part Number 1926
Standard Number 1926.352
Title Fire prevention.

(a) When practical, objects to be welded, cut, or heated shall be moved to a designated safe location or, if the objects to be welded, cut, or heated cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place, or otherwise protected.

(b) If the object to be welded, cut, or heated cannot be moved and if all the fire hazards cannot be removed, positive means shall be taken to confine the heat, sparks, and slag, and to protect the immovable fire hazards from them.

(c) No welding, cutting, or heating shall be done where the application of flammable paints, or the presence of other flammable compounds, or heavy dust concentrations creates a hazard.

(d) Suitable fire extinguishing equipment shall be immediately available in the work area and shall be maintained in a state of readiness for instant use.

(e) When the welding, cutting, or heating operation is such that normal fire prevention precautions are not sufficient, additional personnel shall be assigned to guard against fire while the actual welding, cutting, or heating operation is being performed, and for a sufficient period of time after completion of the work to ensure that no possibility of fire exists. Such personnel shall be instructed as to the specific anticipated fire hazards and how the firefighting equipment provided is to be used.

(f) When welding, cutting, or heating is performed on walls, floors, and ceilings, since direct penetration of sparks or heat transfer may introduce a fire hazard to an adjacent area, the same precautions shall be taken on the opposite side as are taken on the side on which the welding is being performed.

(g) For the elimination of possible fire in enclosed spaces as a result of gas escaping through leaking or improperly closed torch valves, the gas supply to the torch shall be positively shut off at some point outside the enclosed space whenever the torch is not to be used or whenever the torch is left unattended for a substantial period of time, such as during the lunch period. Overnight and at the change of shifts, the torch and hose shall be removed from the confined space. Open end fuel gas and oxygen hoses shall be immediately removed from enclosed spaces when they are disconnected from the torch or other gas-consuming device.

(h) Except when the contents are being removed or transferred, drums, pails, and other containers which contain or have contained flammable liquids shall be kept closed. Empty containers shall be removed to a safe area apart from hot work operations or open flames.

(i) Drums containers, or hollow structures which have contained toxic or undertaken on them, either be filled with water or thoroughly cleaned of such substances and ventilated and tested. For welding, cutting and heating on steel pipelines containing natural gas, the pertinent portions of regulations issued by the Department of Transportation, Office of Pipeline Safety, 49 CFR Part 192, Minimum Federal Safety Standards for Gas Pipelines, shall apply.

(j) Before heat is applied to a drum, container, or hollow structure, a vent or opening shall be provided for the release of any built-up pressure during the application of heat.