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PLANT FIRE BRIGADE TRAINING

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PLANT FIRE BRIGADE TRAINING

Introduction

Every industrial plant, regardless of its size, needs the protection of a well-trained fire brigade to protect the plant successfully during the emergency of a fire.

A small plant, having only minor fire hazards and located in an area served by an efficient city fire department, may require only a well-trained small unit. On the other hand, a plant having major fire hazards and located in an isolated area needs a much larger, completely trained fire brigade.

In addition, a production department, which has a critical fire hazard in connection with one of its operations, will find it worth-while to have several well-trained fire fighters on each shift. These men can combat a fire until the larger, more completely equipped plant brigade can take over.

The collection of the necessary information and the planning of a training program for a Plant Fire Brigade involves considerable time and extra work. It is believed that much of this can be avoided by the use of this training manual. It is based on the accumulated experience of many of our plants in training fire brigades and the only subjects covered are those found essential for effective results.

If the material in this manual is used by a plant, as presented here, its fire brigade training will be completed effectively in a short time and at minimum cost.

PLANT FIRE BRIGADE TRAINING

Contents

		Pages
1.	Introduction	1
2.	Session No. 1 - Purpose, Organization and Responsibilities of a Plant Fire Brigade	3-8
3.	Review Questions - Session No. 1	9-10
4.	Session No. 2 - What Is Fire - How Fire Burns	11-14
5.	Session No. 2 - Plant Fire Protection - Chemical Extinguishers	15-36
6.	Review Questions - Session No. 2	37-38
7.	Session No. 3 - Field Demonstration - Chemical Extinguishers	39-40
8.	Session No. 4 - Plant Fire Protection - Water Equipment	41-50
9.	Review Questions - Session No. 4	51-52
10.	Session No. 5 - Inspection - Built-In Protection and Brigade Equipment	53-58
11.	Session No. 6 - Fighting a Simulated Fire	59-62
12.	General Safety Precautions in Fighting Plant Fires	63-64

PLANT FIRE BRIGADE TRAINING

Notes to the Leader -- For all Sessions

This Training Manual for Plant Fire Brigades has been written to help you, an Armstrong Plant Fire Chief, train your brigade members. It is designed to help you get these men to know the essential facts necessary to fight a plant fire. By learning these and by taking part in the discussions, watching the demonstrations and answering the questions, your men will be better qualified to fight a fire and will no doubt take more interest in the plant fire brigade activities.

For the lecture sessions, you will have (1) lecture notes, (2) charts, and (3) a set of Review Questions. You will also be using exhibits of certain pieces of brigade equipment as a visual means of training your men.

In the sessions covering field demonstrations, observations, and inspection of plant facilities, you will show your men how to actually put out fire with several types of extinguishers. They will see and learn about the operation of sprinklers, fire doors, hydrants, control valves, fire pumps, brigade equipment and how to take this equipment to the fire and its use.

In the drill session, you will be giving your men the opportunity to put into practice what they have learned in Session No. 6.

You will not find every element of fire fighting in this manual. The essential information needed by your men either to put out a plant fire or to control it until the arrival of outside aid is included.

You will find information at the beginning of each session on just how that particular one is to be used, why it is included in the manual, how to make your demonstrations and the like. It is suggested that you read this information included, at the beginning of each session, carefully and be prepared before the meeting.

You will also be given a manual published by the National Fire Protection Association entitled, "Industrial Fire Brigades." You will want to read and study this manual before conducting the Fire Brigade Training Sessions. This will give you additional information for your sessions and will help you to better understand the notes in each session.

You will give each man a set of the notes, charts, and Review Questions for each session. The notes and copies of the charts may be distributed at the end of each session, except the notes on "What Is Fire -- How Fire Burns." You will give these notes to the men before discussion. The Review Questions for each session will be distributed when the men are ready to answer these questions near the end of the session.

Material especially for the leader is printed on colored paper. All material on white paper will be given to brigade members. Do not give the colored sheets to brigade members.

PURPOSE, ORGANIZATION, AND RESPONSIBILITIES OF A PLANT FIRE BRIGADE

Session No. 1

Notes to the Leader -- How to Conduct the Session

The success of your plant fire brigade will depend to a great degree on how well each man understands:

1. why the fire brigade is necessary,
2. why it must be well organized,
3. the specific job of each man in the organization from the Chief to each member of a crew and
4. how well each man understands certain background information necessary in fire fighting.

You are provided here with the information needed to explain the purpose, organization, and responsibilities of each of your men in a fire brigade to cover every hour of the day or night on a three shift basis. Here are some suggestions for you to use, both before and during the session:

1. Prepare for the Meeting

Read the notes -- study them enough, so you can tell the story in your own words -- study the chart included -- be sure you can relate it to the notes -- be able to show how this organization applies to your plant -- why you have such an organization -- why each man is an essential part of it -- perhaps underlining will help -- make marginal or between line notes for your use -- add your knowledge of the subject.

2. Give Your Talk

Turn to the notes describing purpose of a fire brigade — explain each item carefully — use examples from your plant showing need for brigade — need for training the brigade — get reasons from the group — there may be more than covered in the notes — direct questions to various individuals — ask for their opinions — go on to a discussion of organization — use the chart — question various individuals on responsibilities of each job before going to next job on the chart — give any additional explanations necessary as brought out in questioning — be sure all can see the chart — have it on proper type easel — point to each job on the chart as you discuss it — answer questions as you go along.

3. Use Review Questions

After covering all the notes, have a review period — give each man the Review Questions — allow about five to seven minutes to answer — take one question at a time — have the group tell you the answer — allow time to discuss the question before you give the correct answer — ask each person to check each question as you go along — ask them to correct each mistake as you give the right answer — show the application of each point to your situation as you go along — at the end, have group call off number of correct answers so you can get an idea of their progress — allow them to keep corrected papers. (A set of Review Questions with correct answers is included for your use.)

Note: At the end of the session, give each man a cover for the material, a copy of the Introduction, page 1; the Contents, page 2; notes for Session No. 1, pages 3-8. You will have given him pages 9 and 10, Review Questions. He should also be given pages 11-14 of Session No. 2 so that he may read "What Is Fire — How Fire Burns" and be ready for the discussion of this the next time you meet.

PLANT FIRE BRIGADE TRAINING

Session No. 1

PURPOSE, ORGANIZATION, AND RESPONSIBILITIES OF A PLANT FIRE BRIGADE

During this course in fire fighting, you will learn the essential facts necessary to fight a plant fire successfully. Your training will consist of seven (7) sessions as follows:

Session No.	Subject	Type of Session	Approximate Time
1	Purpose, Organization, and Responsibilities of a Plant Fire Brigade	Lecture	1-1/2 hrs.
2	Plant Fire Protection - Chemical Extinguishers	Lecture	1-1/2 hrs.
3	Field Demonstration - Chemical Extinguishers	Demonstration	1-1/2 hrs.
4	Plant Fire Protection - Water Equipment	Lecture	1-1/2 hrs.
5	Inspection - Built-In Protection and Brigade Equipment	Plant Tour and Inspection	1-1/2 hrs. (Depends on siz of Plant)
6	Fighting a Simulated Fire	Lecture and Discussion	1-1/2 hrs.
7	Fire Drill	Drill	1 hour

1. PURPOSE

A plant fire brigade is organized for emergency service.

Its purpose is to:

Protect employees against injury or loss of life as a result of fire.

Protect plant property and equipment from damage by fire.

Fight all fires in the plant.

Cooperate with local fire departments.

ORGANIZATION

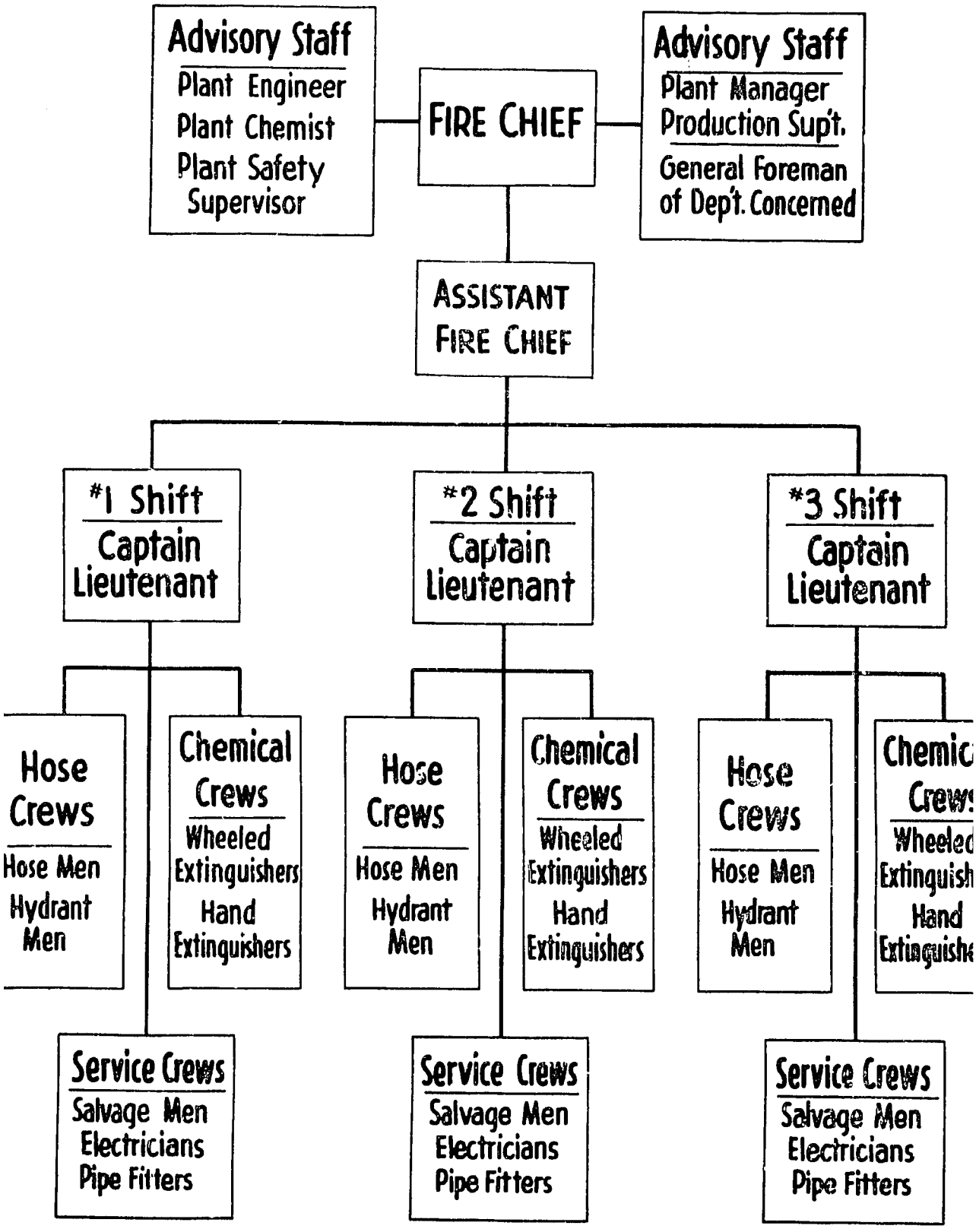


Chart A

2. ORGANIZATION -- See Chart A, opposite page

A plant fire brigade must be well organized in order to meet its responsibilities and to serve its intended purpose. In line with this, the following organization will best meet these needs:

Fire Chief
Advisory Staff
Assistant Fire Chief
Shift Captains
Shift Lieutenants
Crew Leaders
Hose Crews
Chemical Crews
Service Crew

3. RESPONSIBILITIES

Each man in the brigade, from the Chief to the individual crew members, has certain specific responsibilities. These individual responsibilities are as follows:

FIRE CHIEF

--Serve as commanding officer of brigade in performance of all its functions.

--Keep members of brigade instructed in modern fire fighting methods.

--Conduct brigade drills at regular intervals.

--Have equipment serviced and returned to proper place after each fire or drill.

--Maintain all equipment in proper working condition.

--Recommend additional brigade equipment as needed.

--Consult advisory staff when necessary.

--Be thoroughly familiar with entire plant and operations.

ADVISORY STAFF

--Serve as advisors during course of fire (contacts limited to officer in charge).

--Advise Chief of unusual or special situations or hazards as they arise (dusts, solvents, chemicals, etc.)

--Give advice on purchases of equipment and training of brigade.

ASSISTANT FIRE CHIEF	--Assume duties of chief in his absence. --Assist chief in transmitting instructions and in operation of the brigade.
SHIFT CAPTAINS	--Serve as commanding officer on the shift until Chief or Assistant Chief arrives. --Transmit instructions from officer in charge to crew leaders and have them carried out. --Keep Chief advised of all unusual occurrences during fire so that he may more accurately plan strategy. --Be familiar with plant layout, plant operations, and brigade equipment.
SHIFT LIEUTENANTS	--Assist shift Captain in transmitting instructions and in operation of the bridages. --Serve as shift leader during absence of his shift captain. --Be familiar with plant layout, plant operations, and brigade equipment.
CREW LEADERS	--Responsible for the direction of crews, of equipment taken to fire, and its operation on arrival. --Follow instructions of officer in charge.
HOSE CREWS 5 men per crew 2 crews (minimum at each fire as at least two hose lines should always be laid)	--Move their equipment, hose reels, supply wagon (if provided), extra nozzles, lanterns, axes, bars, etc. to each fire. --Connect line of hose of sufficient length to reach scene of each fire. --Stand by for instructions from Chief on what nozzle to use and when to apply water. --Handle hose stream (4 men). --Operate hydrant (1 man). --Clean equipment and return to its station after fire is out.

CHEMICAL CREWS	--Move all necessary wheeled and hand chemical fire extinguishers to each fire.
5 men per crew	--Bring equipment to a point where fire can be approached.
	--Stand by for instructions from Chief on what type of chemical extinguisher to use and when to apply it.
	--Operate equipment.
	--Clean and refill extinguishers and return them to proper location after fire is out.
SERVICE CREW	--Salvage men on arrival at fire will determine if all employees are out of building.
4 Salvage men 2 Electricians 2 Pipe Fitters	--On orders from Chief, close fire doors where necessary to prevent spread of flames.
	--Cover near-by machinery and stock to prevent excessive water or chemical damage.
	--Electricians, on arrival at fire, will report to Chief and advise him if there are high power lines in area of fire.
	--Provide temporary lighting when requested by Chief.
	--Pipe Fitters will check valves controlling sprinklers in area involved in fire to make certain they are open and operating.
	--Remain at sprinkler valves for further orders from Chief.
	--After fire is out, will replace all operated sprinkler heads and restore water pressure to building sprinklers.

PLANT FIRE BRIGADE TRAINING

Session No. 1

PURPOSE, ORGANIZATION, AND RESPONSIBILITIES OF A PLANT FIRE BRIGADE

Review Questions

DIRECTIONS: Place check mark (✓) opposite correct statement or fill in correct answer or missing words. There may be more than one correct answer to each question.

1. A plant fire brigade is organized for _____ service.

2. The plant fire brigade has the following purposes:

   (a) Protect plant property and equipment from damage by fire ( )
   (b) Helps the local fire department fight neighborhood fires ( )
   (c) Fights all fires in the plant ( )

3. The duties of the chief are as follows:

   (a) Serves as commanding officer of the brigade ( )
   (b) Instructs members of the brigade in fire fighting methods ( )
   (c) Takes orders from shift captain during a fire ( )
   (d) Cooperates with local fire department ( )

4. The chief should conduct brigade _____ at regular intervals.

5. The duties of the advisory staff as follows:

   (a) Serve as advisors to the chief during a fire ( )
   (b) Take complete charge of the brigade if the chief is absent ( )
   (c) Serve as crew leaders ( )

6. When the chief is absent his duties are assumed by the _____.

7. The shift captain serves as commanding officer on the shift until the _____ or the _____ arrives.

8. The duties of the Assistant Fire Chief are as follows:

   (a) Moves the hose equipment to the fire ( )
   (b) Assumes duties of Chief in his absence ( )
   (c) Helps the Chief in the operation of the brigade ( )

9. The shift captain transmits instructions from the _____ to the _____.

10. When a shift captain is absent his place is taken by the _____.

11. Any officer who commands the brigade must be familiar with _____,

_____, and _____.

12. Responsibility for the direction of crews belongs to the _____.

13. There are _____ men in a hose crew.

14. Hose crew's duties are as follows:

(a) Move their equipment to the fire ( )
(b) Connect hose lines to hydrants ( )
(c) Determine what nozzle to use on hose ( )
(d) Operate hydrants ( )
(e) Operate chemical equipment ( )

15. A chemical crew is composed of _____ men.

16. The chemical crew will _____ and _____ extinguishers and return them to proper location after the fire.

17. On orders from Chief, the salvage men will close _____ to prevent spread of flames.

18. The salvage men cover nearby _____ to prevent excessive water or chemical damage.

19. The work of the electricians is as follows:

(a) Advise Chief of danger from high power lines ( )
(b) Help the hose crew at the hydrant ( )
(c) Provide temporary lighting if needed ( )

20. The pipe fitter's job is to check sprinkler _____ to make certain they are open and operating.

PLANT FIRE PROTECTION - CHEMICAL EXTINGUISHERS

Session No. 2

Notes to the Leader -- How to Conduct the Session

In the study and demonstration of fire extinguishers, your men must learn their theory, operating principles, and types of fire on which they are to be used. Before this, they should know what fire is and how it burns. As a result, included before the discussion of chemical extinguishers, you will find notes on "What Is Fire -- How Fire Burns." You will have given a copy of this to your men at the end of Session No. 1. You are also provided here with the information needed to explain the uses, the hazards, and the theory of operation of the various extinguishers in your plant. You will need an empty (1) water pump, (2) soda-acid, (3) gas-cartridge, and (4) foam extinguisher to show your men. You will want to disassemble and show the component parts of each of these as you discuss each extinguisher. You will want to show, (5) a vaporizing liquid, (6) a carbon dioxide, and (7) a dry powder extinguisher. These cannot be opened but they can be shown and discussed. If you use all of these aids, you will be able to teach your brigade members the essentials of chemical fire protection.

Here are some suggestions for you to use, both before and during the session:

1. Prepare for the Meeting

Read the notes -- study them enough so you can tell the story in your own words -- study the charts included -- be sure you can relate them to the notes -- perhaps underlining will help -- make marginal or between the line notes for your use -- add your knowledge of the subject -- be ready to show where each extinguisher is used in your plant -- have your exhibit

extinguishers ready — have proper type easel for your charts — located so all can see.

2. Give Your Talk

Turn to the notes explaining, "What Is Fire — How Fire Burns" — explain each item carefully — use examples — get examples from the group — direct questions to various individuals — ask for their comments — go on to a discussion of each type extinguisher — use the charts — show exhibit extinguishers — question various individuals on uses of extinguishers — on hazards of use on certain fires — on means of identifying each — give any additional explanations necessary as brought out in discussion and questions — answer questions as you go along.

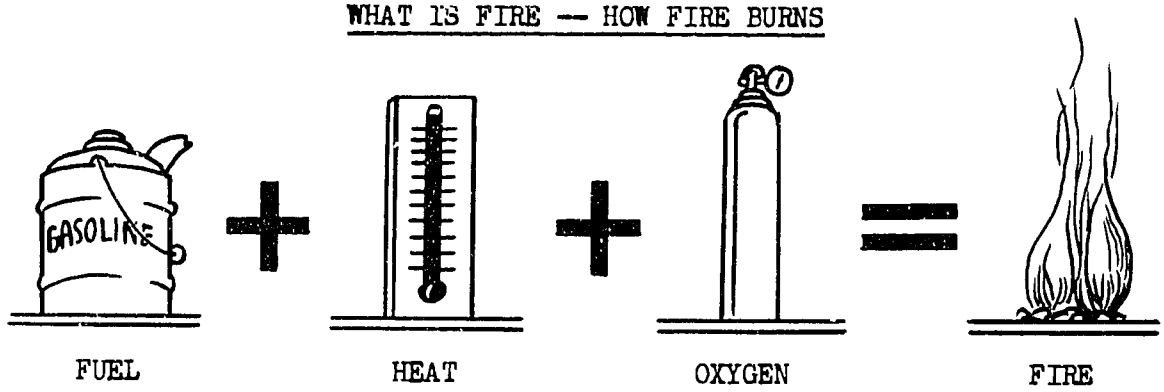
3. Use Review Questions

After covering all the notes, have a review period — give each man the Review Questions — allow about five to seven minutes to answer — take one question at a time — have the group tell you the answer — allow time to discuss the question before you give the correct answer — ask each person to check each question as you go along — ask them to correct each mistake as you give the right answer — show the application of each point to your plant as you go along — at the end, have group call off number of correct answers so you can get an idea of their progress — allow them to keep corrected papers. (A set of Review Questions with correct answers is included for your use.)

Note: At the end of the session, give each man a copy of the notes on this session, pages 15-36. You will have given him a copy of the Review Questions, pages 37-38.

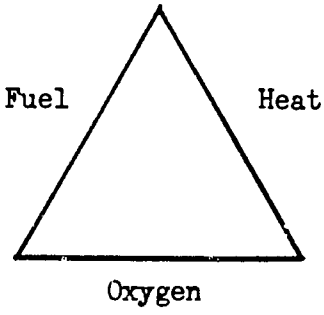
Session No. 2

WHAT IS FIRE — HOW FIRE BURNS



Fire starts when a combustible material is heated to a high enough temperature in the presence of oxygen. Thus, there are three factors, all of which must be present, if fire is to exist.

The Fire Triangle



You need the material or fuel, plus a supply of oxygen, plus heat. These three make fire burn. They form the "fire triangle." Each of the three sides is necessary. Put all three sides together and you always have a triangle or fire. Take one side away and you have no triangle and no fire. Take an ordinary gas stove burner as an example of how this works. The material is the gas (fuel); the heat is provided by the match or pilot light; the oxygen comes from the air.

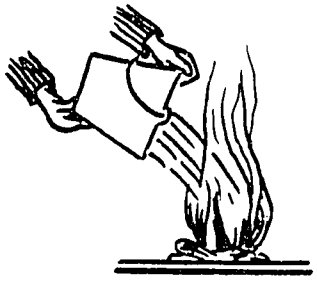
You must have all three of these elements, if you are to have a fire. If you take away any one of the three, you can't have a fire. Take away the gas (fuel), from your gas burner and you can't have a fire even if the match or pilot light works and the burner gets plenty of air. Take away the match or pilot light and the gas present will not burn as you don't have heat. Take away the air by lowering a lid over the burner and the flame goes out. No oxygen — no fire.

Three Essentials Needed to Make Fire Burn

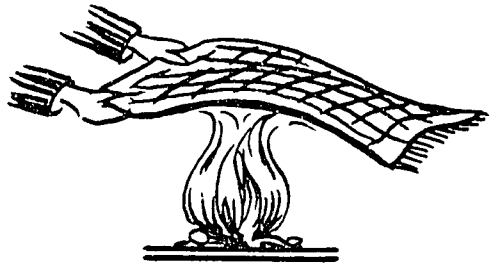
The first of these three essentials, the fuel, can be any of thousands of materials. We think of coal, gasoline, paper, wood, oil, and rags as some of the most common. These materials do not burn in their normal solid or liquid form. They must be converted to a vapor before they will burn. This may seem strange to you to learn that paper becomes a vapor before it burns, but this is a fact.

The second essential factor necessary to make a fire burn, is heat. Heat is what gives you the temperature required to vaporize the first essential, fuel, so it is ready to burn. Some fuels vaporize at comparatively low temperatures, others at higher temperatures, and still others at extremely high temperatures. We all know that it takes less heat to vaporize gasoline and cause it to burn than it does wood or coal. If we have enough heat, however, almost any fuel can be vaporized.

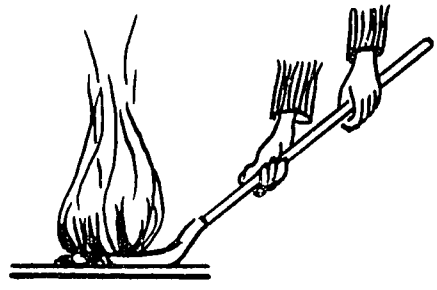
The third essential factor, necessary to make a fire burn, is oxygen. A fire needs oxygen in order to ignite or start burning. The more oxygen, the brighter the blaze. Cover a burning candle with a jar and the flame gradually goes out as the oxygen supply becomes exhausted.



REMOVE HEAT



REMOVE OXYGEN



REMOVE FUEL

Now, to control a fire and stop it from burning, it is necessary only to remove any one of the three essential factors listed above.

When you put water on a fire to extinguish it, you are cooling the material which is burning. In other words, you are removing the heat.

When you place a blanket over a small fire, the fire goes out. The blanket keeps the oxygen away.

When you don't put any more wood on the fire, eventually the flames go out. You have, in effect, removed the material or fuel. Thus, to do a good job of fire fighting, you must understand that the three factors above make fires burn and you may control and extinguish fire only by removing one of them.

PLANT FIRE BRIGADE TRAINING

Session No. 2

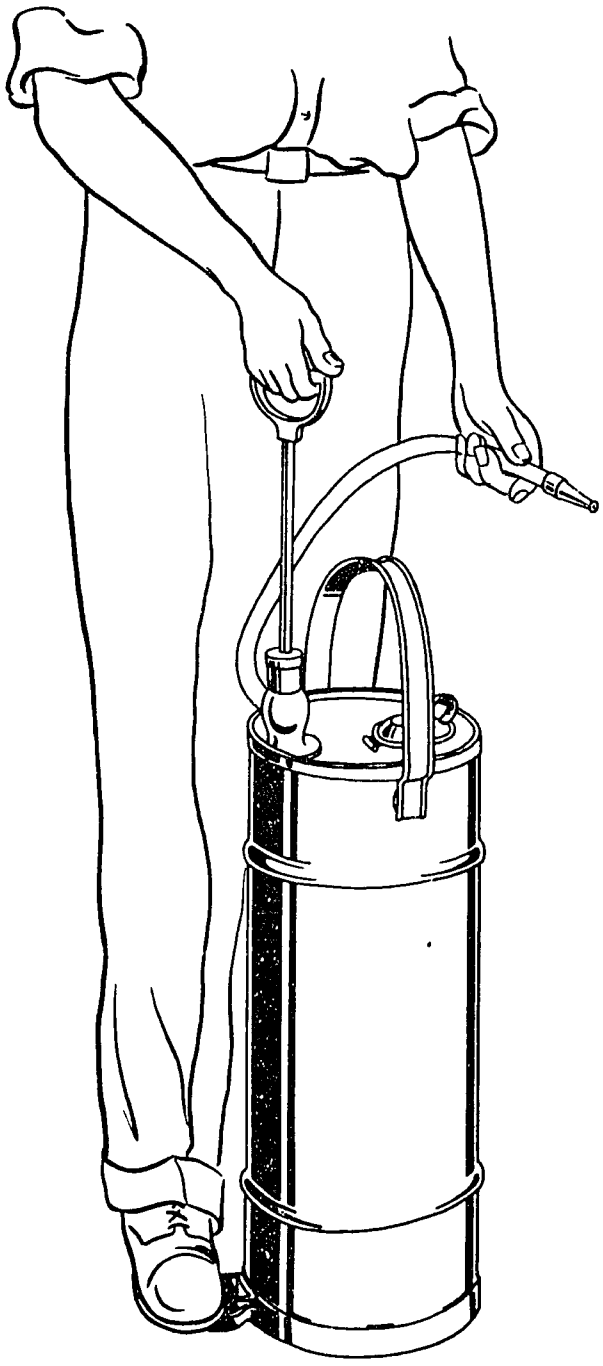
PLANT FIRE PROTECTION — CHEMICAL EXTINGUISHERS

Each major operation and building in the plant is provided with chemical fire extinguishers of the size and type most appropriate for the hazard which exists in that area. These chemical fire extinguishers, often called first aid fire protection, are intended mainly for use on small fires.

There are several types of these chemical extinguishers and each has a value. However, not all types are equally effective on all kinds of fire. It is, therefore, important that everyone, who may have occasion to use a fire extinguisher, be familiar with it in order to secure the best possible results.

On occasion it may be necessary for a Plant Fire Brigade to use one or more of these extinguishers, especially the larger sizes. In view of this, all members of the brigade should be familiar with each of the different type extinguishers and their operation. The most common and generally used of these are as follows:

WATER PUMP EXTINGUISHER



USE ON

Wood
Paper
Rags, etc.

DO NOT USE ON

Oils
Paints
Gasoline or
Electrical Fires

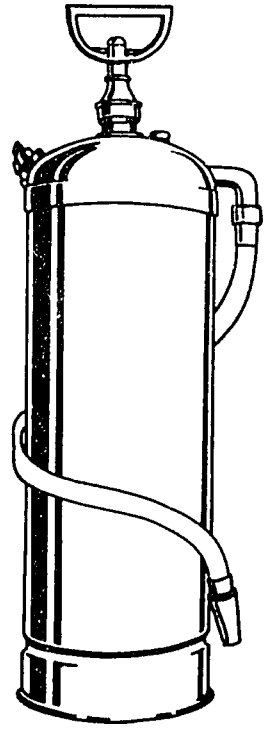


Chart B

WATER PUMP EXTINGUISHER (2½ AND 5 GALLON SIZE) - See Chart B, opposite page

Warning: Do not use this extinguisher on an oil, grease, paint, solvent, or electrical fire.

Suitable for ordinary combustibles, wood, paper, rags, and rubbish.

--Water is the extinguishing agent.

--Pressure is developed by hand pump.

--Carry to fire by top handle and in upright position.

--To operate, place foot on foot rest on bottom of tank. Move pump handle up and down in vertical direction with 6" to 8" stroke.

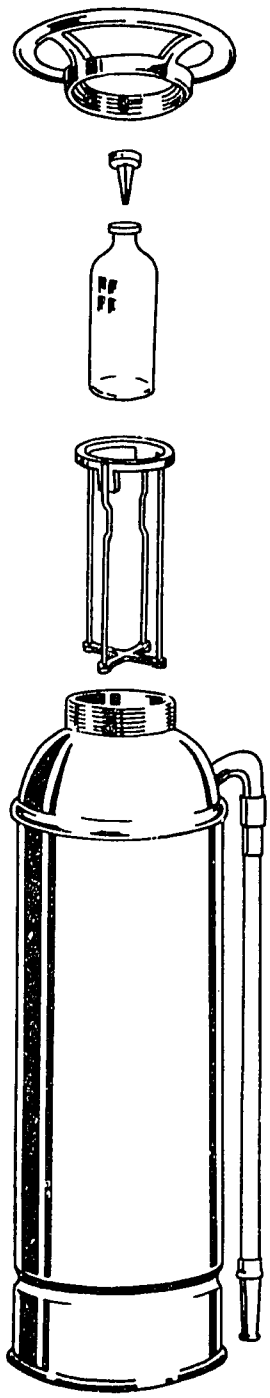
--Direct stream of water at the base of the fire. Follow flames as they recede and work around fire.

--This extinguisher must be protected against freezing. It need be recharged only when contents have been used.

SODA AND ACID EXTINGUISHER

USE ON
Wood
Paper
Rags, etc.

DO NOT USE ON
Oils
Paints
Gasoline or
Electrical Fires



A - Bicarbonate Solution

B - Acid Bottle - Sulphuric Acid

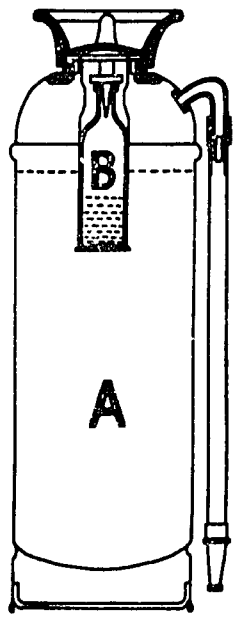


Chart C

SODA AND ACID EXTINGUISHER (2½ GALLON SIZE) - See Chart C, opposite page

Warning: Do not use this extinguisher on an oil, grease, paint, solvent or electrical fire.

Suitable for ordinary combustibles, wood, paper, rags and rubbish.

--Water is the extinguishing agent.

--Operating pressure is developed by the reaction of bicarbonate of soda (1½#) and sulphuric acid (4 oz.). Will throw a stream of water approximately 25 feet.

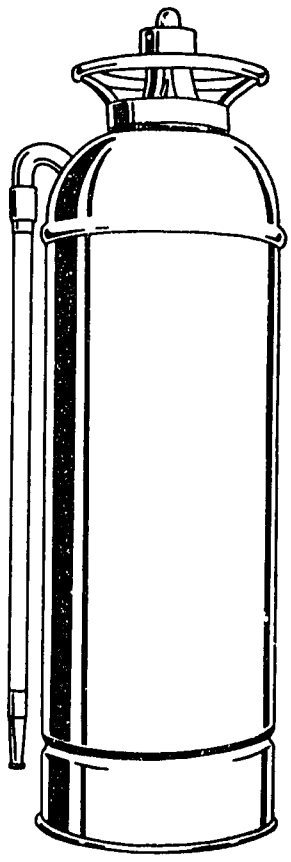
--Carry to fire by grasping top ring. Keep in an upright position to avoid premature operation.

--To operate, turn upside down holding bottom of extinguisher in one hand and hose nozzle in other hand.

--Direct stream of water at base of fire. Follow flames with stream and work around fire when possible.

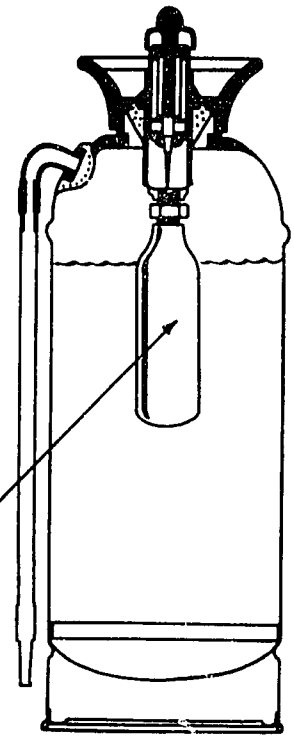
--This extinguisher must be protected against freezing. The soda and the acid will deteriorate through time, therefore, this extinguisher must be refilled each year or after being used.

GAS-CARTRIDGE WATER EXTINGUISHER



USE ON
Wood
Paper
Rags, etc.

DO NOT USE ON
Oils
Paints
Gasoline or
Electrical Fires



Carbon dioxide gas cartridge

Chart D

GAS-CARTRIDGE WATER EXTINGUISHER (2½ GALLON SIZE) - See Chart D, opposite page

Warning: Do not use this extinguisher on an oil, grease, paint, solvent, or electrical fire.

Suitable for ordinary combustibles, wood, paper, rags, and rubbish.

--Water is extinguishing agent.

--Operating pressure is secured by puncturing of small cartridge or cylinder containing carbon dioxide under pressure. Will expel stream of water approximately 25 feet.

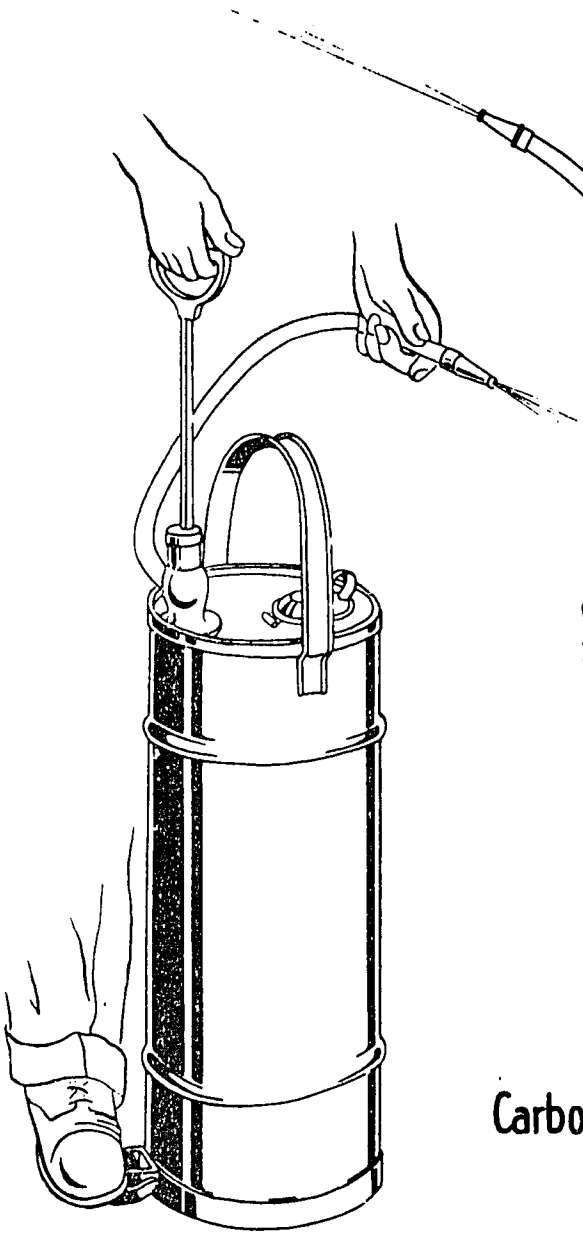
--Carry to fire by grasping top ring. Keep in upright position to avoid premature operation.

--To operate turn upside down. While in this position, raise extinguisher about three inches (3") off floor and bump it back on floor so that cutting knob will be depressed and pierce gas cartridge.

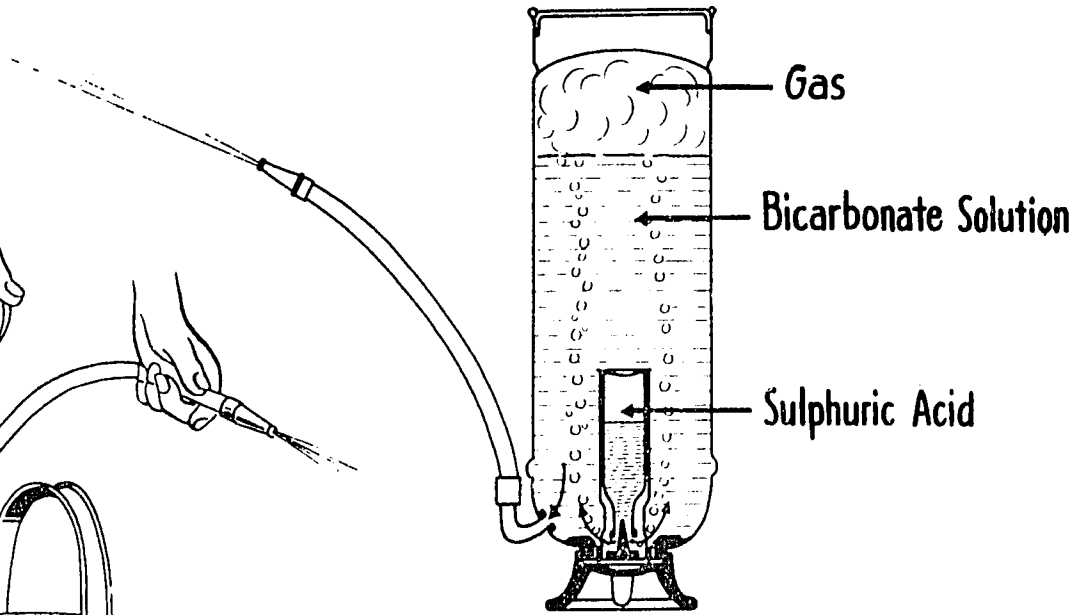
--As water is expelled through extinguisher hose by released gas pressure, it should be directed at base of flames.

--This extinguisher must be protected from freezing. Its contents will not deteriorate so that it need be refilled only after using.

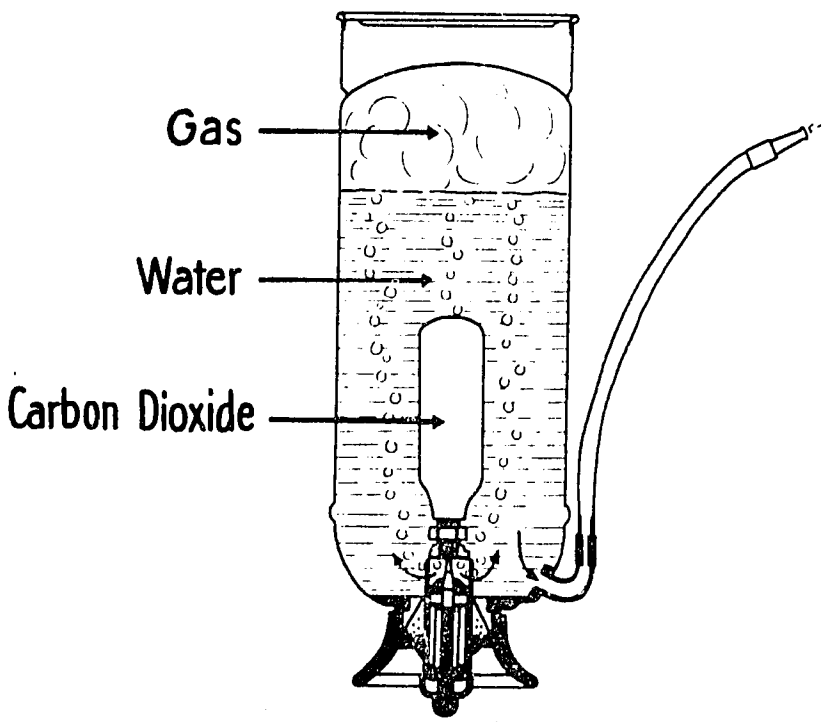
WATER COOLING EXTINGUISHERS IN ACTION



Water Pump Extinquisher



Soda and Acid Extinquisher



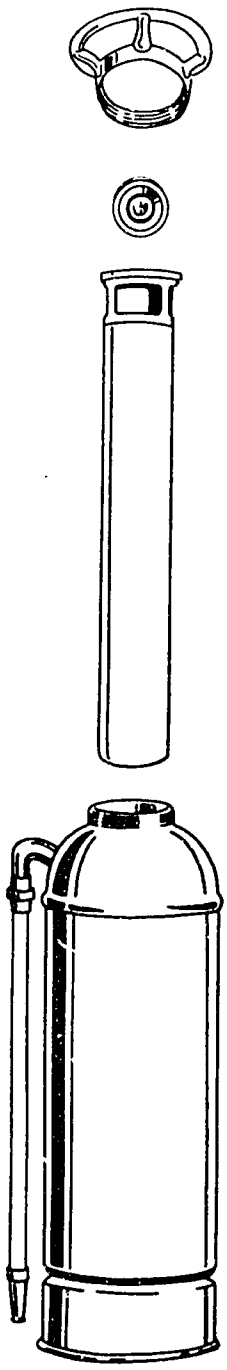
Gas-Cartridge Extinquisher

Chart E

WATER COOLING EXTINGUISHERS IN ACTION - See Chart E, opposite page

--You have here the three types of water cooling extinguishers shown in action. These are the three described on pages 17, 19, and 21.

FOAM EXTINGUISHER



USE ON

Oils
Grease
Paints
Gasoline or
Similar Volatiles

DO NOT USE ON

ELECTRICAL FIRES

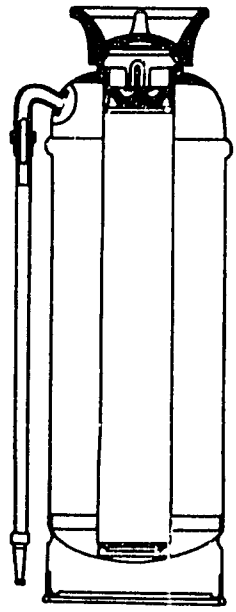


Chart F

FOAM EXTINGUISHER (2½ GALLON SIZE) - See Chart F, opposite page

Warning: Do not use foam on electrical fires. Do not use on alcohol, as foam breaks down when used on this liquid.

The foam extinguisher is especially suitable for oils, greases, paints, and solvents other than alcohol. Will also have a limited effect on burning combustibles such as wood, paper, rags, and rubbish.

--Foam is extinguishing agent.

--Pressure and foam are developed by mixing of bicarbonate of soda and a foaming agent in solution, with dissolved aluminum sulphate. Will expel stream of foam approximately 25 feet.

--Carry to fire by grasping top ring. Always keep in upright position to avoid premature operation.

--To operate, turn upside down holding bottom of extinguisher in one hand and hose nozzle in other hand.

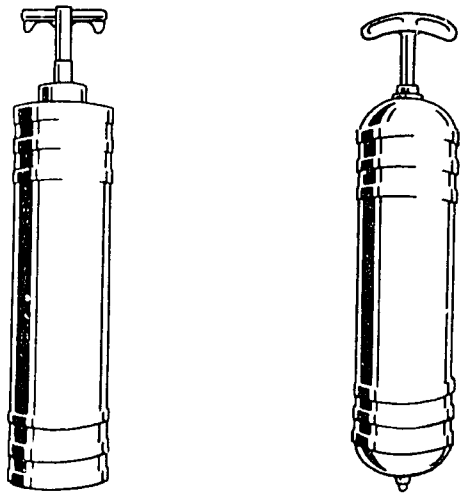
--Stream of foam should be directed against inside of opposite wall of container that is on fire and just above burning liquid so as not to cause a splash. Walk around fire, if possible, applying foam as you circle it.

--The foam extinguisher must be protected against freezing. Its contents will deteriorate through time, therefore, it must be recharged every year and after being used.

CARBON TETRA-CHLORIDE EXTINGUISHER

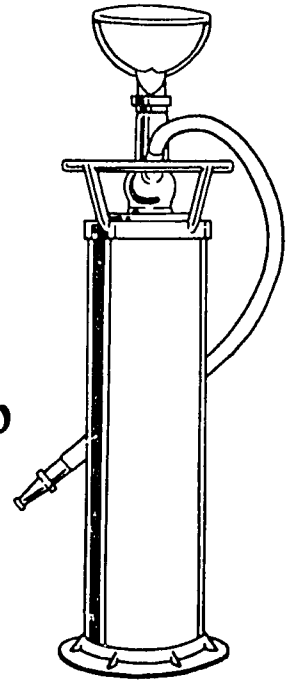
USE ON FIRES IN ELECTRICAL EQUIPMENT

Limited Value on Oil, Grease, Paint, Solvents, Wood, Paper and Rag Fires



1-Quart Types

1-Gallon Hand Pump Type



1-Gallon Pressure Type

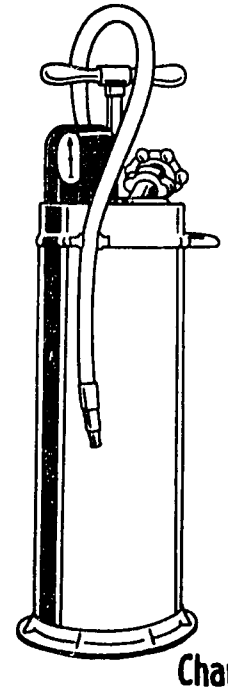


Chart G

VAPORIZING LIQUID OR CARBON TETRACHLORIDE EXTINGUISHER - See Chart G, opposite page
(Varies in size from one (1) quart to three (3) gallon unit)

The vaporizing liquid extinguisher is especially adapted to electrical fires as carbon tetrachloride is a non-conductor of electricity.

(It is also suitable for small oil, grease, paint or solvent fires.)

(There is also a limited value in small wood, paper, rag or rubbish fires.)

—Carbon tetrachloride is extinguishing agent.

—Operating pressure to expel carbon tetrachloride is by means of a hand-pump.

—Carry extinguisher to fire by pump handle.

—On reaching fire, the 1 quart and the 1½ quart extinguishers can be operated by giving top handle a slight turn and then pumping.

—The one (1), two (2), and three (3) gallon extinguishers are also operated by pumping or by stored air pressure in extinguisher.

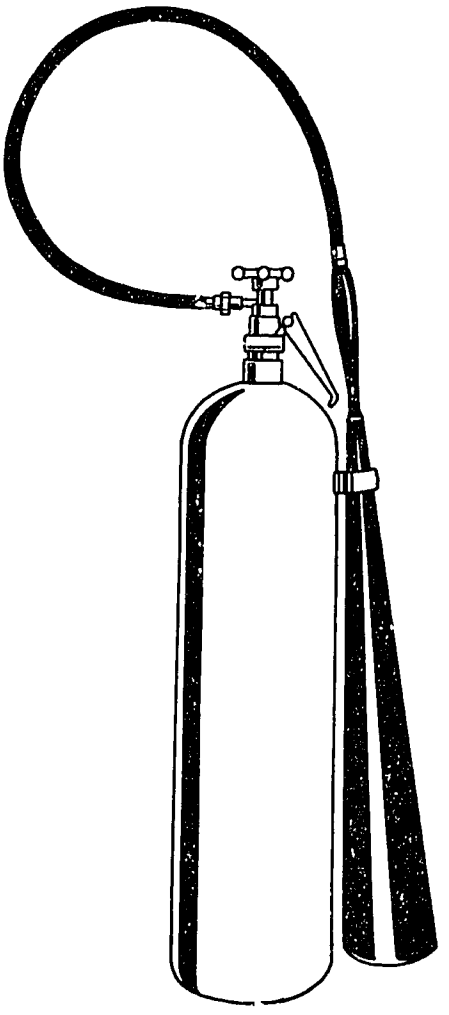
—Always direct extinguisher stream at base of flames.

—The carbon tetrachloride in the extingusher will not freeze in an exposed area. It will not deteriorate, therefore, this extinguisher need be refilled only after being used or in case of evaporation due to a leak.

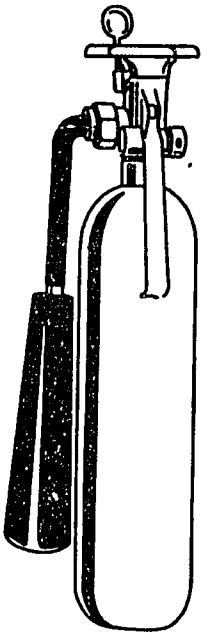
CARBON DIOXIDE EXTINGUISHER

USE ON ALL TYPES OF FIRES

Has limited value on Deep Seated Wood, Paper and Rag Fires



20-lb.
Disc Seal
Type



2-lb.
with Seat Type
Valve

Chart H

CARBON DIOXIDE EXTINGUISHER (VARIES IN SIZE FROM 2 LBS. TO 100 LBS.) - See Chart H, opposite page

The carbon dioxide fire extinguisher can be used on all types of fire. It does, however, have a limited value on deep seated wood, paper, and rag fires.

—Carbon dioxide under heavy pressure is the extinguishing agent.

—Operating pressure is obtained from stored up pressure in extinguisher.

—Can be carried by handle at top, or wheeled if one of larger types, to fire.

—On reaching fire pull the safety pin at the top and operate wheel on the control valve. (Turn counter-clockwise.)

—It has a working range of five to eight feet so that fire must be fought close-up. Direct discharge from fiber horn nozzle at edge of flames and endeavor to sweep them away.

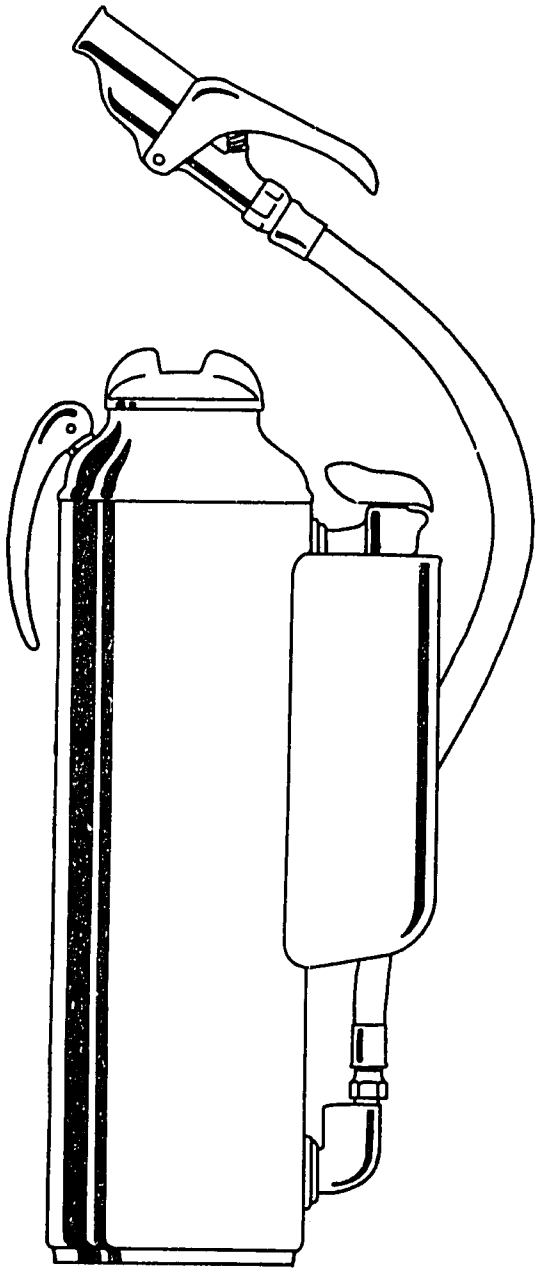
—The contents of extinguisher will not deteriorate, therefore, it need be refilled only after being used or in case of a leak.

DRY POWDER EXTINGUISHER

USE ON ALL TYPES OF FIRES

Has Limited Value on Deep Seated Wood, Paper and Rag Fires

May have Abrasive Effect on Bearings and Motors



20 and 30 pound sizes

Chart J-1

DRY POWDER EXTINGUISHER (20 AND 30 LB. SIZE) - See Chart J-1, opposite page

Warning: Powder in this extinguisher may create an abrasive effect on moving surfaces of bearings, motors, etc.

- Suitable for all type fires, such as oil, solvent, electrical equipment. It has a limited value on deep seated fires in wood, paper, and rags.

--Sodium bicarbonate in dry powder form is extinguishing agent.

--Operating pressure is obtained by puncturing small cylinder of carbon dioxide under pressure. Will expel cloud of powder for approximately 10 feet horizontally.

--Carry to fire by grasping carrying handle at top.

--Always keep in upright position.

--To operate, set extinguisher on floor or ground. Depress release trigger at top of extinguisher to allow carton dioxide gas to enter dry powder chamber of unit. It is now ready for action and can be used as desired by operation of the shut-off valve at end of discharge hose.

--As sodium bicarbonate powder is discharged, it should be aimed at base and edge of flames. Attempt to sweep fire ahead of you as you progress.

--This extinguisher need not be protected against freezing. The inner carbon dioxide gas cylinder should be removed semi-annually and weighed as a check for possible leakage. In case of use, complete or partial, the used dry powder should be replaced and a new charged cylinder of carbon dioxide gas installed.

BLANKETING EXTINGUISHERS IN ACTION

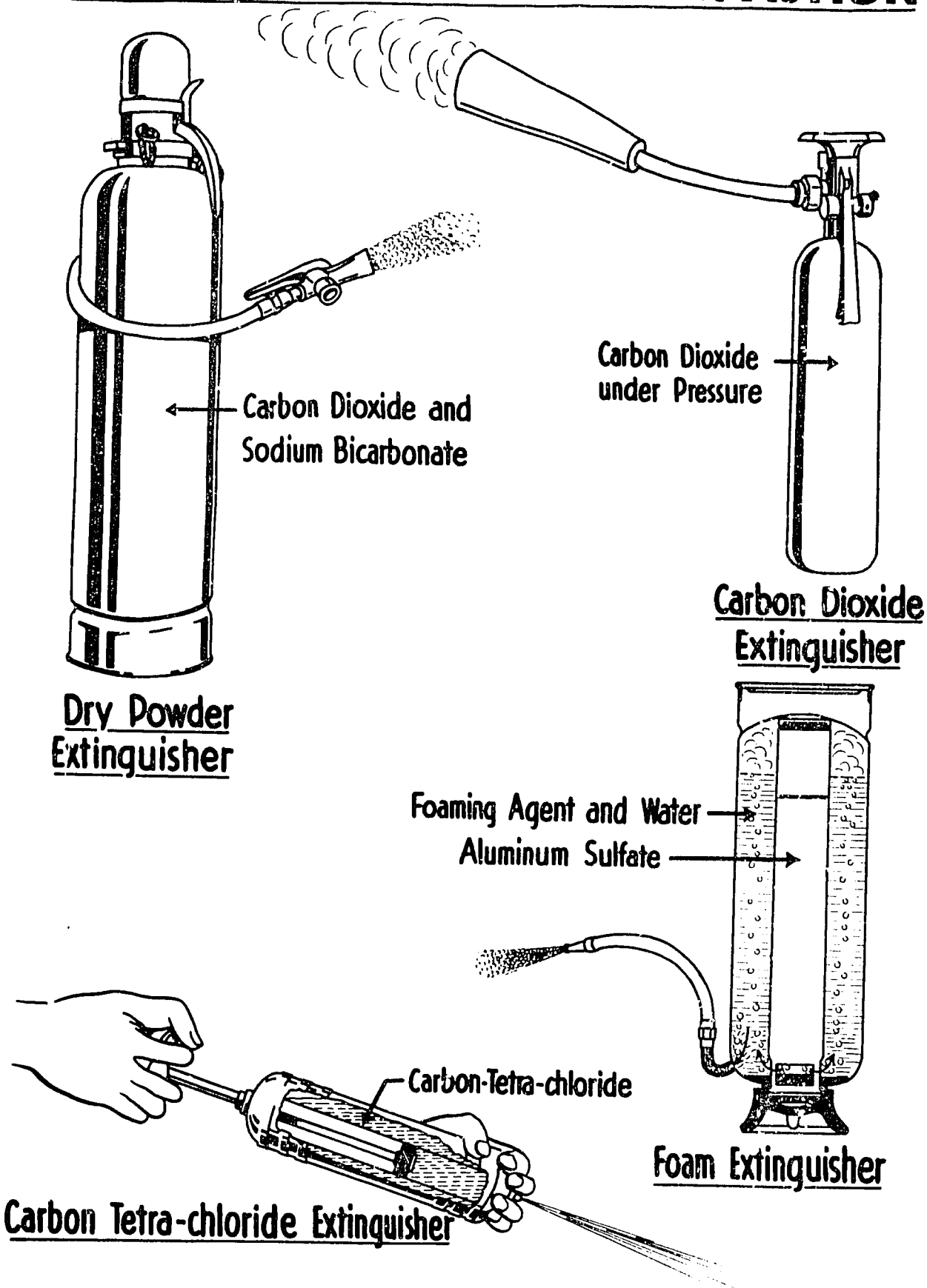


Chart I

BLANKETING EXTINGUISHERS IN ACTION - See Chart I, opposite page

--You have here the four types of blanketing extinguishers shown in action. These are the foam, carbon tetrachloride, carbon dioxide, and dry powder extinguishers.

WHEELED SODA & ACID EXTINGUISHER

USE ON
Wood
Paper
Rags, etc.

DO NOT USE ON
Oils
Paints
Gasoline or
Electrical Fires

WHEELED FOAM EXTINGUISHER

USE ON
Oils
Grease
Paints
Gasoline or
Similar Volatiles

DO NOT USE ON ELECTRICAL FIRES

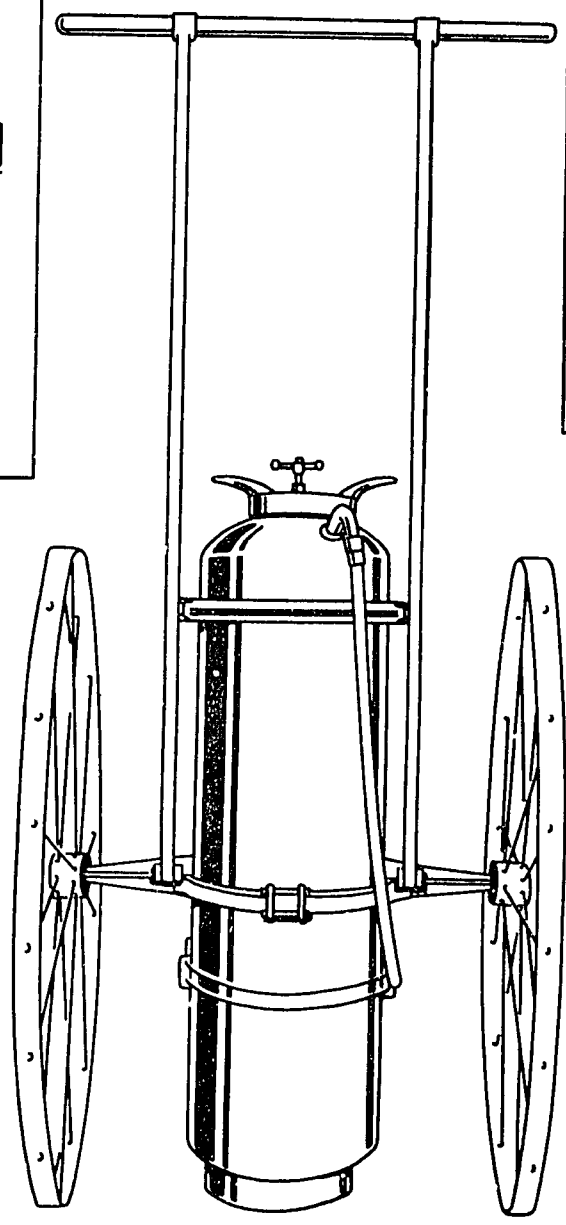


Chart J

WHEELED SODA AND ACID EXTINGUISHER (40 GALLON SIZE) - See Chart J, opposite page

Warning: Do not attempt to use this unit on oil, grease, paint, solvent, or electrical fires.

This 40-gallon soda-acid unit is effective only on ordinary combustibles, such as wood, paper, rags, and rubbish.

--Water is extinguishing agent.

--Pressure is developed by reaction from mixing of bicarbonate of soda (20 pounds) and sulphuric acid (5-3/4 pounds).

--Wheel to fire, either by hand or with industrial tractor.

--To operate rest pull handles on ground or floor and then open valve at top. Turn this hand-wheel counter-clockwise. This will allow bicarbonate of soda and sulphuric acid to mix and generate pressure for expelling of the water contents.

--Direct stream of water at base of fire. Follow flames as they recede with stream and work around to sides when possible.

--This extinguisher must be protected against freezing. The bicarbonate of soda and acid will deteriorate through time, therefore, it must be recharged annually and after being used.

WHEELED FOAM EXTINGUISHER (40 GALLON SIZE) - See Chart J, opposite page

Warning: Do not use foam on electrical fires. Do not use on alcohol, as foam breaks down when used on this liquid.

The foam extinguisher is especially suitable for oil, grease, paint, and solvent fires. It also has a limited effect on ordinary combustibles, such as wood, paper, rags, and rubbish.

--Foam is extinguishing agent.

--Pressure and foam are developed by mixing of bicarbonate of soda and foaming agent on solution, with the dissolved aluminum sulphate from the inner tube or cylinder. Will expel stream of foam approximately 30 feet.

--Wheel to fire, either by hand or with industrial tractor.

--To operate rest pull handles on ground and then open valve at top. Turn this hand-wheel counter-clockwise. This will allow two solutions to mix and generate both pressure and foam.

--The stream of foam should be directed against inside of the opposite wall of container that is on fire and just above burning liquid so as not to cause a splash. Move to sides of fire if possible so as to put a blanket of foam over top of liquid.

--The foam extinguisher must be protected against freezing. Its contents will also deteriorate through time, therefore, it must be recharged annually and after being used.

Note: If chemical fire extinguishing equipment (fixed system or portable) in addition to that listed above is in use in the plant, its location, intended use and operation should be covered in this session.

PLANT FIRE BRIGADE TRAINING

Session No. 2

PLANT FIRE PROTECTION — CHEMICAL EXTINGUISHERS

Review Questions

DIRECTIONS: Place check mark (✓) opposite correct statement or fill in correct answer or missing words. There may be more than one correct answer to each question.

1. Three factors needed to make a fire burn are _____, _____, and _____.

2. Fuel, before it will burn, must first become a _____.

3. Pressure is developed in the Water Pump Extinguisher by a _____.

4. The Water Pump Extinguisher may be used on the following:

(a) wood	( )	(c) oil	( )	(e) rubbish	( )
(b) paper	( )	(d) rags	( )	(f) electrical fire	( )

5. The Water Pump Extinguisher must not be used on the following:

(a) oil	( )	(c) paper	( )	(e) solvents	( )
(b) grease	( )	(d) paint	( )	(f) electrical fire	( )

6. The extinguishing agent in the Soda and Acid Extinguisher is _____.

7. The Soda and Acid Extinguisher is suitable for fires in _____, _____, and _____, _____, or any ordinary combustible.

8. The Soda and Acid Extinguisher must be filled at least _____ and _____.

9. Do not use the Soda and Acid Extinguisher on the following:

(a) wood	( )	(c) rags	( )	(e) paint	( )
(b) oil	( )	(d) grease	( )	(f) electrical fire	( )

10. The extinguishing agent in the Gas-Cartridge Extinguisher is _____.

11. The Gas-Cartridge Extinguisher is suitable for fires in:

(a) ordinary combustibles	( )	(d) solvents	( )
(b) oil	( )	(e) rags	( )
(c) paper	( )	(f) wood	( )

12. Do not use the Gas-Cartridge Extinguisher on fires in:

(a)	oil	( )	(c)	paper	( )	(e)	electrical equipment	( )
(b)	wood	( )	(d)	solvents	( )	(f)	paint	( )

13. The Gas-Cartridge Extinguisher needs refilling _____.

14. The extinguishing agent in the Foam Extinguisher is _____.

15. The Foam Extinguisher is especially suitable for fire in _____, _____, _____.

16. Do not use the Foam Extinguisher on _____ fires and _____ fires.

17. The Foam Extinguisher must be recharged _____ and _____.

18. The Vaporizing Liquid or Carbon-Tetrachloride Extinguisher is especially adapted to _____ fires.

19. The Carbon Dioxide Extinguisher can be used on _____types of fires.

20. The Soda-Acid Extinguisher must be protected against _____.

PLANT FIRE BRIGADE TRAINING

Session No. 3

FIELD DEMONSTRATION -- CHEMICAL EXTINGUISHERS

Notes to the Leader - How to Conduct the Session

In order for the personnel of your Plant Fire Brigade to become proficient in the handling of chemical fire extinguishers, it is necessary that you give them an opportunity to operate the extinguishers and observe their effects. You can do this by means of a field demonstration, where various types of fires can be started and extinguished by the use of chemical extinguishers. You are provided here with the information needed to conduct this demonstration. It consists entirely of notes. You will procure all the necessary equipment at your plant. You will want to demonstrate each extinguisher and then have one of the men use the same extinguisher on a similar fire.

Here are some suggestions for you to use, both before and during the demonstrations:

1. Prepare for the demonstrations

Read the notes -- be sure materials and equipment are ready in advance -- use dimensions of containers and size fires as listed in notes -- select an open yard area free from grass -- don't use cinder-filled ground -- flammable liquid fires may reflash on both grass or porous surfaces -- never run your demonstration indoors -- keep away from buildings -- have help to set up fires -- cover each demonstration for each type of extinguisher in your factory -- inspect all extinguishers before the demonstration -- have a surplus of extinguishers to cover emergencies.

2. Give the Demonstrations

Start with the first test — use methods from lecture notes in Session No. 2 — use care in the presentation accompanying the test — describe the action as the tests continue — keep all but helpers 15' to 20' away from setups — beware of reflashes — extinguish each fire before proceeding to the next one — don't apply discharge too close to liquid surfaces — remove all excess liquids and materials after the demonstration — either take them away or burn them up — explain any mistakes made by demonstration and have test repeated — answer any questions as you go along — don't go on to next fire until you are sure everyone understands what has just been demonstrated — know what you are doing — don't proceed unless you are absolutely sure.

Note: At the end of the session, give each man a copy of the notes on this session, pages 39-40.

Session No. 3

FIELD DEMONSTRATION — CHEMICAL EXTINGUISHERS

A. Hand Pump Water Extinguisher (2½ gallon size)

Build a small fire of wood and paper approximately two feet in diameter and eighteen inches in height.

One of the fire brigade members should then use the hand pump extinguisher to extinguish this fire.

B. Soda and Acid Extinguisher (2½ gallon size)

Build a small fire (duplicate of No. 1)

One of the fire brigade members should then use a soda-acid extinguisher to extinguish this fire.

C. Cartridge-type Water Extinguisher (2½ gallon size)

Build a small fire (duplicate of No. 1)

One of the brigade members should then use a cartridge-type water extinguisher to extinguish this fire.

D. Hand Water Pump, Soda-Acid or Cartridge-type Water Extinguisher

Excavate a pit in the ground 4' x 4' x 1' in depth or use a metal container of same surface area 16 sq. ft. Fill the pit or container with water to a depth of four (4) inches and then add spent lubricating oil to a depth of two (2) inches. When ready to start demonstration, add a small quantity of gasoline just sufficient to support flame until oil is ignited.

After fire is in progress for one (1) minute, a member of the fire brigade should apply one of the three aforementioned water extinguishers to show that this type of fire equipment will <u>not</u> extinguish an oil fire.

E. Carbon Dioxide Extinguisher (15 lb. size)

To show that, by the use of a proper type of extinguisher, an oil fire can be extinguished, a member of the plant brigade should apply a 15-pound or larger carbon dioxide extinguisher to the fire started in No. 4 demonstration.

F. Dry Powder Extinguisher (20 lb. size)

Repeat oil fire in pit by addition of a small quantity of gasoline.

A member of the fire brigade should then apply the dry powder extinguisher to the blaze making certain that the flame is swept ahead of him as he advances.

G. Foam Extinguisher ($2\frac{1}{2}$ gallon size)

Repeat oil fire in pit by addition of a small quantity of gasoline.

A member of the fire brigade should then apply two (2), $2\frac{1}{2}$ gallon foam extinguishers to the blaze making certain that the foam flows across the top of the burning liquid in the form of a blanket cover.

If desirable, a small fire of wood and paper, (same as No. 1) may be started and a foam extinguisher applied to it. Note that if this fire is allowed to burn sufficiently long enough to fully ignite all of the wood, it is more difficult to extinguish with a foam extinguisher.

H. Vaporizing Liquid - Carton Tetrachloride Extinguisher (1 quart size)

Build a small fire of wood and paper. Same as No. 1.

A member of the fire brigade should then apply a one (1) quart vaporizing liquid extinguisher until the flames are extinguished.

Fill a two (2) gallon metal container about one-third full with spent lubricating oil. To this, a small quantity of gasoline sufficient to support flame until the oil ignites, should be added. This can then be ignited when ready to proceed with the demonstration.

A member of the fire brigade should then apply the contents of a vaporizing extinguisher to the flames to show how the carbon tetrachloride is vaporized by the heat of the fire and blankets off the flames.

Session No. 4

PLANT FIRE PROTECTION -- WATER EQUIPMENT

Notes to the Leader - How to Conduct the Session

Many plants are constructed of fire resistive materials. They are planned so that a fire in one section of the plant will not easily spread to the next section. Another precaution, a silent watchman to prevent the spread of fire, is the automatic sprinkler system which is installed in most of the plant buildings. These protections are supplemented with one or more hydrants, depending on the size of your plant, to which you can connect hose lines in order to fight a fire. Your plant fire brigade will be using these facilities. Thus it is necessary that you teach each brigade member about their purpose and operation. You are provided here with the information needed to explain this to your brigade members. You will want to furnish, from the plant equipment, examples of items normally contained in a hose house. As you show each item of this equipment, you will explain its use. Some sprinkler systems are more complicated than others. The lecture notes describe two systems, those found in most plants. You will want to adapt these notes to the type system installed in your plant.

Here are some suggestions for you to use, both before and during the discussion.

1. Prepare for the Meeting

Read the notes -- study them enough so you can tell the story in your own words -- study the charts included -- be sure you can relate them to the notes -- perhaps underlining will help -- make marginal or between the

line notes for your use — add your knowledge of the subject — be able to adapt the notes to your plant, to describe your system — have proper easel for your charts — located so all can see.

2. Give Your Talk

Turn to the notes explaining, "Plant Fire Protection - Water Equipment" — explain each item carefully — use examples in your plant — get examples from the group — direct questions to various individuals — ask for their comments — use the charts — give additional explanations necessary as brought out in the discussion and questions — answer questions as you go along.

3. Use Review Questions

After covering all the notes, have a review period — give each man the review questions — allow about five to seven minutes to answer — take one at a time — have the group tell you the answer — allow time to discuss the question before you give the correct answer — ask each person to check each question as you go along — ask them to correct each mistake as you give the right answer — show the application of each point to your plant as you go along — at the end have group call off number of correct answers so you can get an idea of their progress — allow them to keep corrected papers. (A set of Review Questions with correct answers is included for your use.)

Note: At the end of the session, give each man a copy of the notes on this session, pages 41-50. You will have given him a copy of the review questions, pages 51-52.

PLANT FIRE BRIGADE TRAINING

Session No. 4

PLANT FIRE PROTECTION — WATER EQUIPMENT

PLANT IS LAID OUT AND BUILT TO AID FIRE PROTECTION.

Most buildings are constructed of fire resistive materials.

Major buildings are separated from each other, either by open yard areas or by masonry fire walls.

Where openings are necessary in these fire walls, the opening is protected by a self-closing fire door. (A fusible link which melts under heat is used to close the doors.)

TYPICAL PLANT SPRINKLER AND HYDRANT LAYOUT

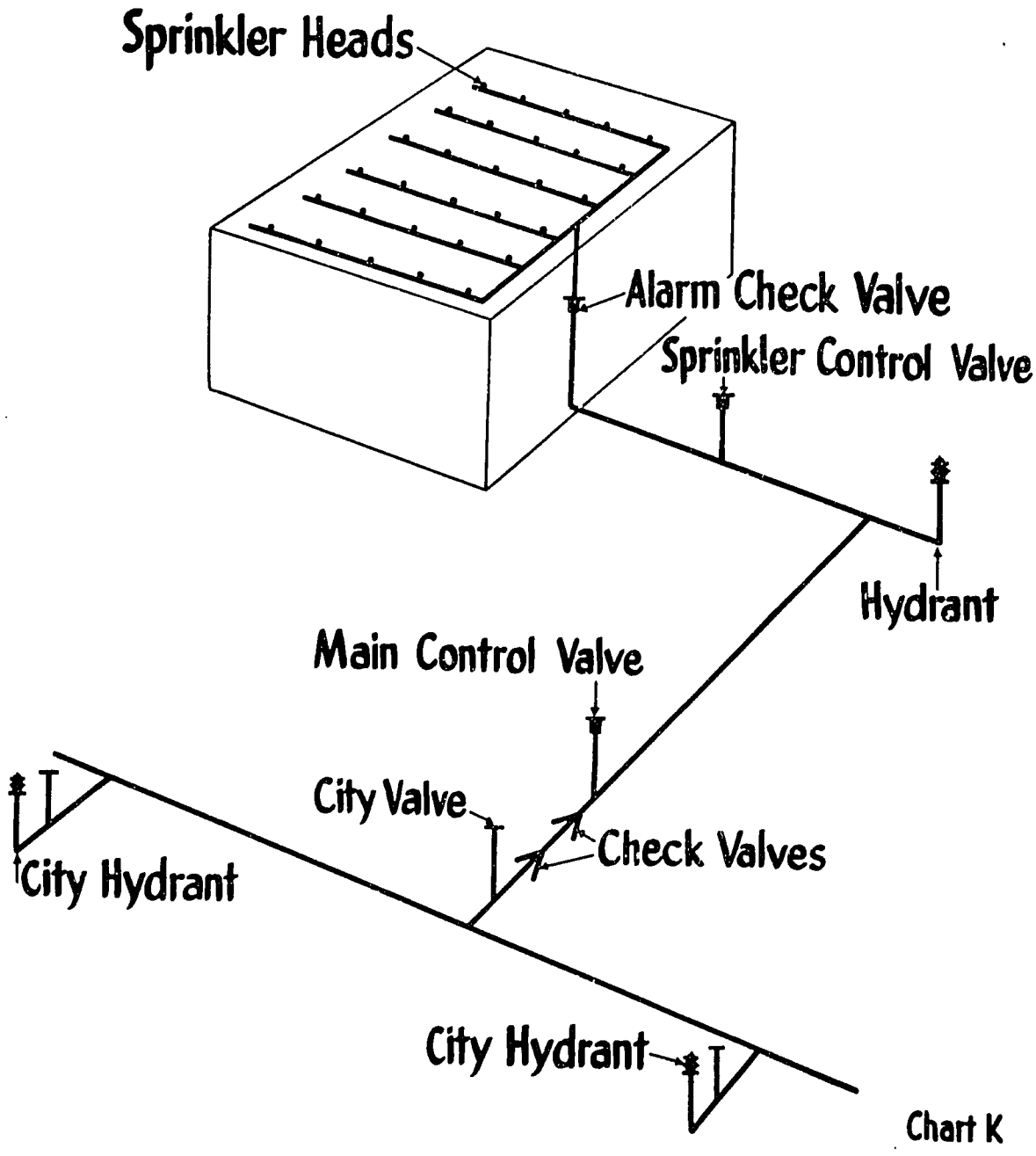


Chart K

AUTOMATIC SPRINKLER PROTECTION IS PROVIDED FOR PRACTICALLY ALL BUILDINGS.

Water for these sprinklers is supplied direct from city mains through underground piping.

NOTE: See Chart K, opposite page, showing a typical plant sprinkler and hydrant piping layout.

This piping leads to the sprinkler system in each building and to each hydrant and is of sufficient size to assure an adequate supply of water even with all sprinkler heads in any one building open and in operation.

Unheated buildings are equipped with a dry valve and the exposed piping filled with air under pressure.

TYPICAL PLANT SPRINKLER & HYDRANT LAYOUT

(Using Dual Water Supply)

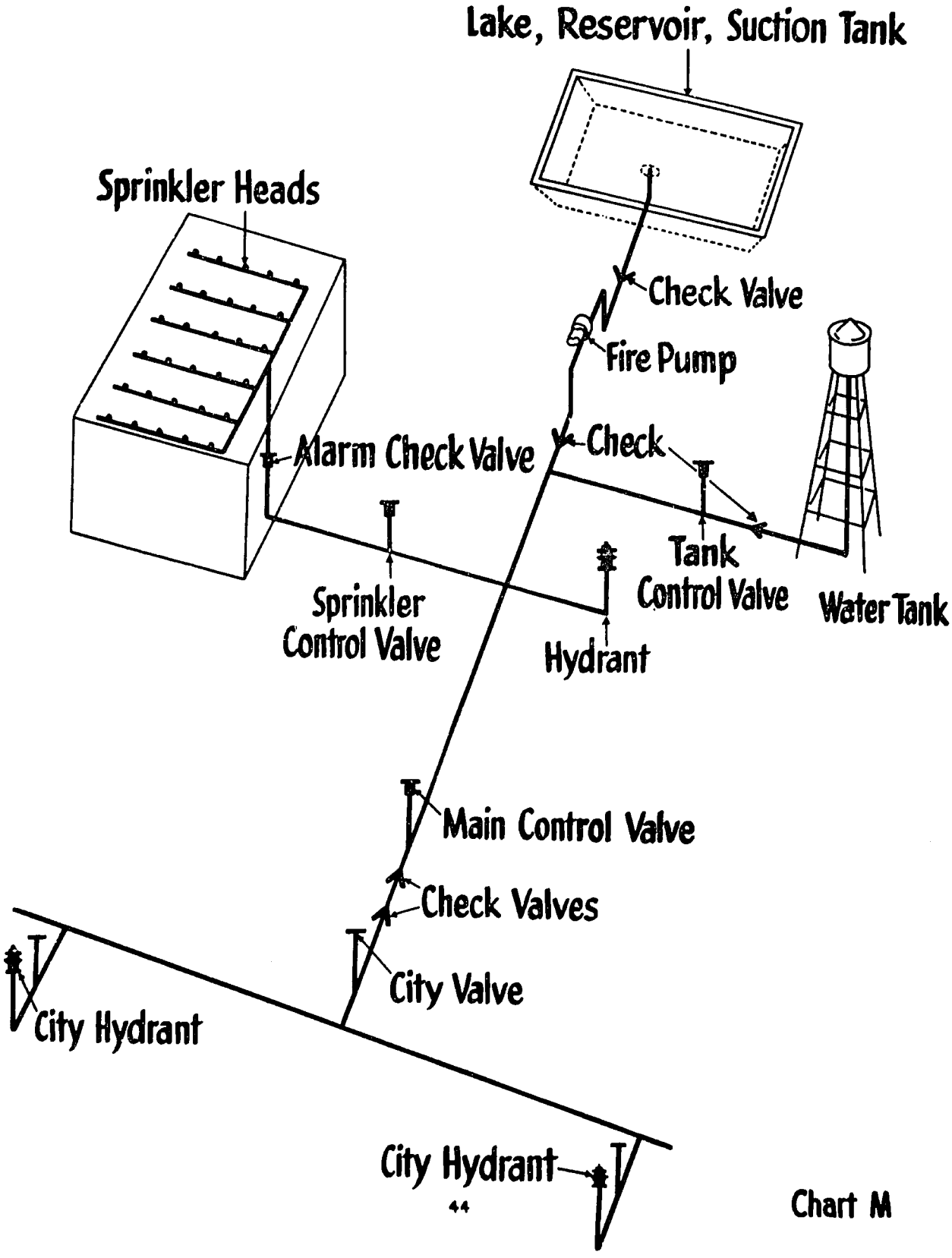


Chart M

NOTE: (THE FOLLOWING SECTION APPLIES TO MOST PLANTS. IF APPLICABLE, SEE CHART M.)

In some areas, city water pressure is not sufficient to maintain protection on the upper stories of multi-story buildings, or again the city mains may not be large enough to cope with a serious fire where an unusual amount of water might be needed.

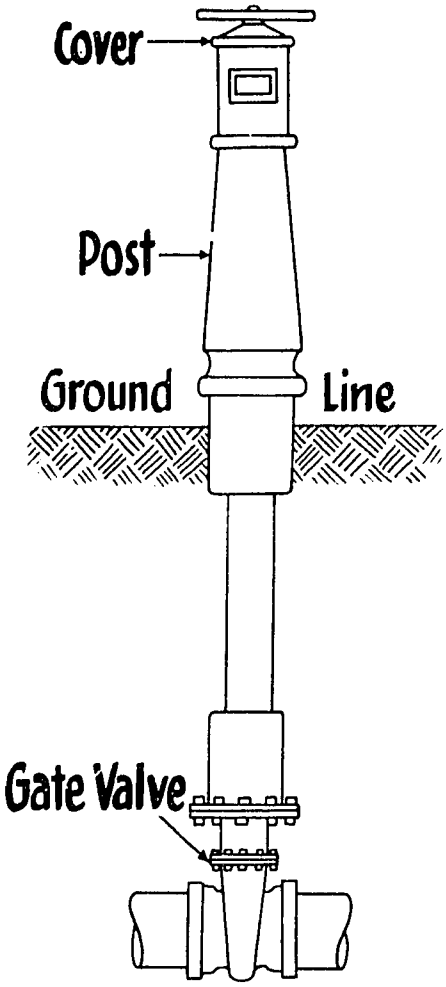
To meet this situation, either an automatic fire pump, or a fire pump and an elevated sprinkler tank are provided.

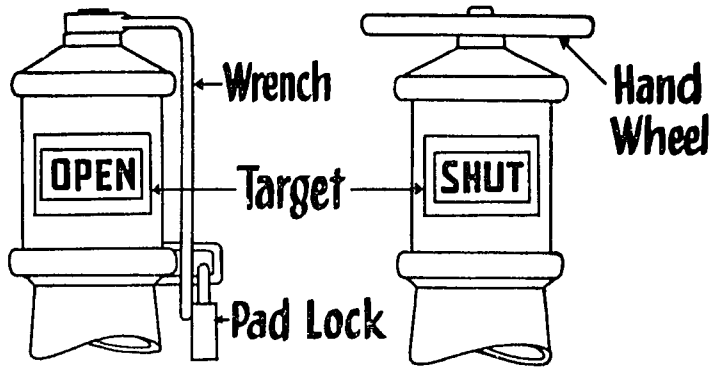
The tank is elevated above the roof of the highest building in the plant, to maintain constant water pressure on the sprinklers in this and other high buildings, and to supply a reserve of water for other fire protection services.

The fire pump is arranged to take suction from the low-pressure city mains, a ground level storage tank, a reservoir or a nearby river or lake.

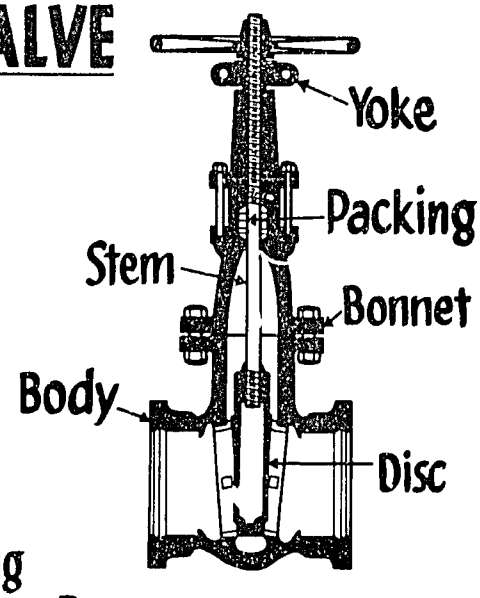
By operation of the fire pump it is possible to keep the elevated sprinkler tank filled at all times, or to pump direct into the plant underground mains and raise the water pressure in them up to any point desired for the operation of hose streams and other fire protection equipment.

STANDARD POST INDICATOR VALVE





OUTSIDE SCREW & YOKE GATE VALVE



INSIDE SCREW GATE VALVE

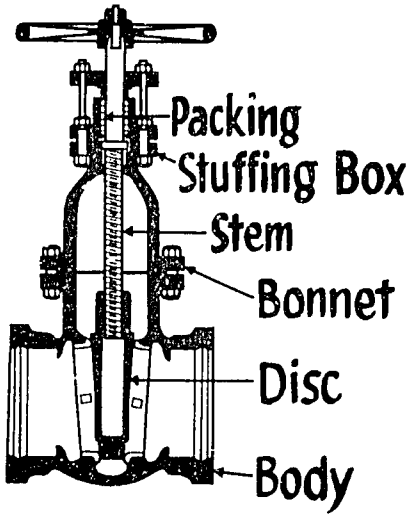


Chart L

CONTROL VALVES ARE LOCATED AT STRATEGIC POINTS IN THIS UNDERGROUND PIPING SO THAT WATER CAN BE TURNED ON OR OFF AS OCCASION MAY REQUIRE.

NOTE: See Chart L, opposite page, showing the three standard types of valves in use today.

These valves normally are open all the time and it is especially important that they be kept open so as to maintain full protection in case of a fire.

Should it be necessary to close one of these valves to make repairs or changes to the system, it is wise to station a man at this closed valve all during the period it is closed so that it can be opened quickly in an emergency.

TYPICAL HYDRANT

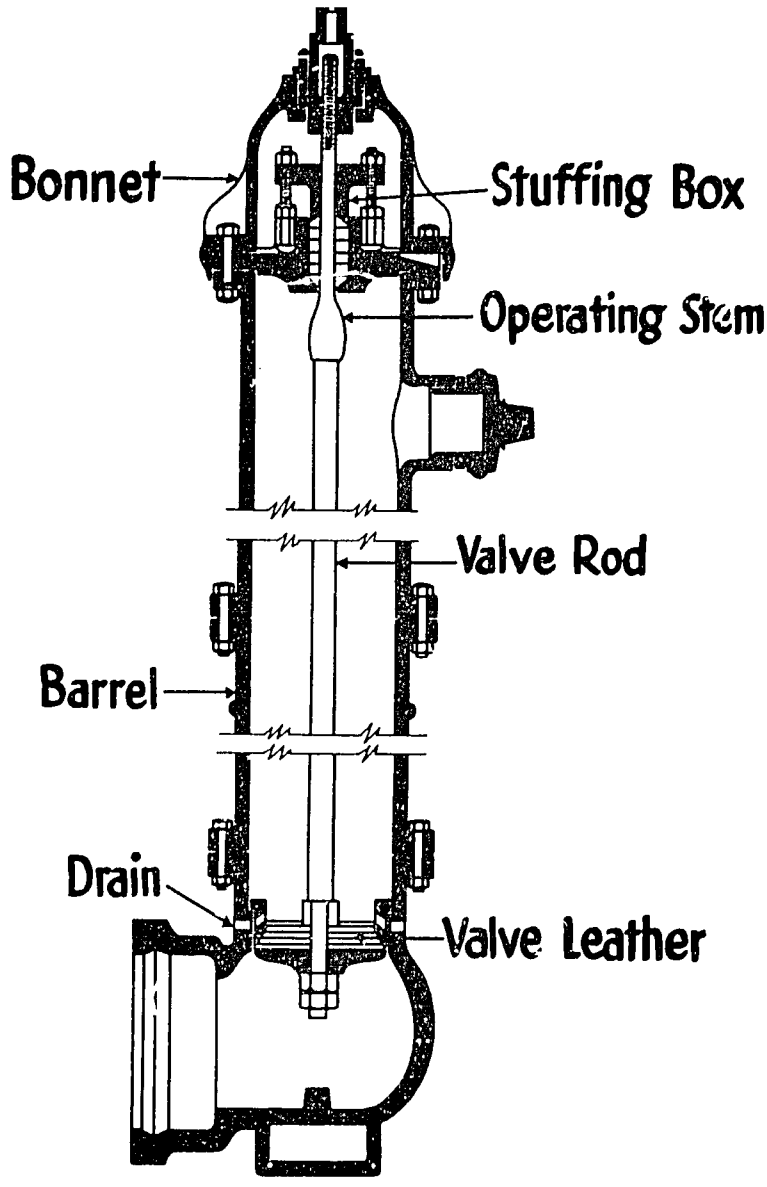


Chart N

HYDRANT CONSTRUCTION AND OPERATION

Hydrants are located throughout the plant yard and are so spaced that any one point in the plant can be reached from two of them by the use of 200 feet of hose on each of the two hydrants.

The construction of the ordinary fire hydrant is quite simple. On the bottom is what is known as the body of the valve which contains the ball closing mechanism for shutting off the water. Reaching from it to the ground level is the barrel of the hydrant enclosing the valve stem for opening and shutting it off. Above ground are the hose butts or connections for the hose and the top of the stem to which a wrench is fitted for the operation of the hydrant.

NOTE: See Chart N, opposite page, showing a typical hydrant.

HYDRANT HOUSES AND EQUIPMENT

Each hydrant house normally contains the following equipment:

At least 150 feet 2½" Cotton Rubber Lined Hose
2 Underwriters Play Pipes
2 Hydrant Wrenches
2 Canvas Ladder Straps
3 Tabor Hose Spanners
1 Mill Lantern
25 Feet ½" Manila Rope
5 Extra Hose Washers
1 Crow Bar
1 Axe

Two lengths of hose and a play pipe are coupled constantly to one of the side outlets of the hydrant. This hose is coiled on the lower shelf ready to pull out and use.

The one or more extra lengths of hose are coiled on the top shelf and arranged to be pulled out quickly with the female connection in front.

PLANT FIRE BRIGADE TRAINING

Session No. 4

PLANT FIRE PROTECTION -- WATER EQUIPMENT

Review Questions

DIRECTIONS: Place check mark (✓) opposite correct statement or fill in correct answer or missing words. There may be more than one correct answer to each question.

1. Major buildings are separated by _____ or by _____

2. A _____ which melts under heat is used to close fire doors.

3. Water for the sprinkler system is supplied from city mains or an

   _____.

4. Unheated sprinklered buildings are equipped with _____ valves

5. Exposed sprinkler system piping in unheated buildings is filled with

   _____.

6. _____ are located at strategic points in the underground sprinkler piping.

7. A fire pump is arranged to take suction from:

   (a) low pressure city mains ( ) (c) lake or river ( )
   (b) a reservoir ( ) (d) sprinkler system ( )

8. Sprinkler control valves should always be _____.

9. City water mains are sometimes not adequate to protect a plant because they do not maintain enough _____ or they are too _____.

10. Any one point in the plant can be reached from two hydrants by the use of _____ feet of hose on each of the two hydrants.

11. Fire hydrants are constructed so that when they are closed the water is (a) above ( ), (b) below ( ) the ground level.

12. You will find the following equipment in a normal hydrant house:

    (a) 2 hydrant wrenches ( ) (d) 1 mill lantern ( )
    (b) 5 extra hose washers ( ) (e) a fire alarm box ( )
    (c) a soda-acid extinguisher ( ) (f) supply of hose ( )

PLANT FIRE BRIGADE TRAINING

Session No. 5

INSPECTION -- WATER PROTECTION AND BRIGADE EQUIPMENT

Notes to the Leader

When responding to a fire alarm, each member of your brigade must know where to report. He must know what fire fighting equipment is available in the involved area and the location of this equipment. You will want him to be thoroughly schooled in the running out of hose lines and the location of hydrants. He must know the location of reserve equipment, too, so that he can get it quickly in an emergency.

A set of notes is provided for your use in conducting this session. These notes take you through a tour of inspection of the water protection facilities of your plant. They also go through an inspection of brigade equipment which you undoubtedly will have in a central location, easily accessible, and ready to take to a fire. The brigade equipment listed may not be exactly what you have in your plant. However, in order for your fire brigade to function effectively, you will want it to have equipment, appropriate and adequate, for the conditions with which it may be called upon to cope in the event of a major fire. You will want to be certain you have this basic equipment.

Here are some suggestions for you to use, both before and during the inspection.

1. Prepare for the Inspection

Read the notes -- study them enough so you know just what you are going to do next -- where you are going next -- be able to adapt them to your plant -- think this through before the meeting -- underline if necessary -

make marginal or between the line notes for your use -- add your knowledge of the subject -- be sure brigade equipment is ready and in order -- you will want to take it out of storage -- try some of it out such as masks for salvage crew to get the feel -- return it to its proper place.

2. Make your Inspection

Take your notes along -- take your tour as planned -- start at logical point and proceed according to plan -- cover your plant thoroughly -- omit reference to any equipment you do not have -- this may apply to certain control valves, etc. -- you may want to start the fire pump, if your plant has one -- show men how to check for missing equipment -- defective equipment -- show brigade equipment last -- cover each piece of equipment thoroughly -- show its location, use, etc. -- have men handle it and replace it to its proper place.

Note: At the end of the session, give each man a copy of the notes for this session, pages 53-58.

Session No. 5

INSPECTION -- BUILT-IN PROTECTION AND BRIGADE EQUIPMENT

BUILT-IN PROTECTION

1. Fire Walls

   Visit one or more buildings in plant which are separated by fire walls. Observe that fire walls extend from building foundation up to and above the roof for a matter of several feet and have a tile cap at top.

2. Fire Doors

   Inspect several fire doors. Note that the fusible link on doors usually extends beyond edge of door into the opening so that it is in path of possible flames or heat.

3. Underground Piping

   Visit location of plant underground fire service piping connection with city water mains. Look at control valves on this connection and the double check valves to prevent possible contamination of city water from back flow.

4. Sprinkler System Control Valves

   Inspect one of each type of sprinkler system control valves.

   Standard Post Indicator Valve.

   Note the target which shows if valve is open or closed.

   Outside Screw and Yoke Gate Valve (O.S. & Y.)

   Note that the position of the threaded screw indicates if the valve is open or closed.

Inside Screw Gate Valve

Note that the open or closed position of this valve cannot be checked by visual observation. Can be checked only by manual test with valve wrench.

When looking at sprinkler control valves it should be noted that each is sealed with a short section of fine copper wire. If the valve has been checked by the Fire Insurance Inspector, the seal carries his stamp. This inspection is made by the Insurance Company every three months.

Visit the sprinkler control valve for one building noting that the valve is usually in a position several feet from the building it controls so that it can be reached for operation in the event of fire. Enter the building and inspect alarm check valve on the sprinkler riser. Note that its function is to sound an audible alarm in the event a sprinkler head opens prematurely or in case of fire.

5. Hydrant Houses

Each hydrant house in the plant should be opened and its equipment inspected by the brigade members on the tour. The location of each hydrant house should be noted and the buildings that can be reached with hose streams from it explained.

6. Elevated Sprinkler Tank

If plant has an elevated sprinkler tank for the purpose of maintaining adequate pressure on the sprinklers in the high buildings, a visit to this installation is in order. Its purpose, to provide necessary pressure and a reserve supply of water, will then be better understood by the brigade members.

7. Fire Pump

If the plant has a fire pump installation, it will be to the interest of hose crewmen to look at the installation, as the pump provides the higher pressure for the operation of hose streams.

8. Extra Water Supply System

From the pump, the brigade members can have the location of the pump suction tank, reservoir, river or lake pointed out so that a more complete mental picture of the important parts of the plant fire protection system will be gained.

BRIGADE EQUIPMENT

1. Smoke Masks

Will be either the standard mask equipped with "All Service" cannister or a self-contained mask that will supply its own oxyg

The standard mask equipped with the "All Service" cannister fills a very definite need in fire fighting. It permits entry (1) into smoke filled rooms for rescue work, (2) closing of gas and ammonia lines, and (3) aids in locating the seat of the fir on occasion.

In using it, due regard must be given to the fact that its cannister cannot absorb and neutralize in excess of three (3) per cent of gas in air. This, along with the added hazard of a limited vision, should be kept in mind when attempting to ente a smoke filled room. To be safe, tie a rope around your waist and have someone stand at the building entrance and hold the other end of the rope to guide you.

Several types of self-contained oxygen masks are now available for fire department use. The self-contained feature necessitates their being somewhat bulky, therefore, they cannot be used in a limited space. They also present the same problem of limited vision as other masks when used in a smoke-filled room. To be safe, use a rope tied around your waist, when entering a smoke-filled room and have someone stand at the door to guide you.

2. Electric Hand Lanterns

If called on to fight a night-time fire, several electric lanterns are practically a necessity, particularly in coupling up hose, locating and operating sprinkler valves, and other miscellaneous duties involved in fire brigade work.

3. Ladders

Readily available ladders for fire fighting purposes are an advantage. If, however, this type equipment is always available from the Maintenance or Production operations, they can be omitted from the formal fire brigade supply list. Location of ladders, in either case, must be noted so they are always on hand.

4. Extra Hose Nozzles

One or two extra Standard Underwriters nozzles are practically a necessity as it sometimes happens that when a hydrant house is opened, the stock nozzles are found missing.

One or more adjustable spray nozzles are an advantage in plants when flammable dusts are used in the manufacturing process. The use of this type nozzle in spray form will avoid stirring up a dust cloud such as happens when a straight stream is played on a dust fire.

In plants where major quantities of oils, paints or asphalts are used, a fog nozzle has been found advantageous in cooling down and in displacing the oxygen in this type fire.

5. Standard Cotton Rubber Lined Hose (2½")

Several extra lengths of standard C.R.L. 2½" fire hose on a reel are frequently needed when a long line of hose has to be run out to fight a fire at some distance from a hydrant house. In small plants, this reel may not be needed and the extra hose can be stored in one of the centrally located hydrant houses.

6. Hydrant Wrenches, Hose Spanners, Hose Straps, Axes, Bars, and Hose Washers

An extra, centrally located stock of this equipment will be on hand for emergencies and for quick replacement of missing or defective articles and for use during the progress of a fire.

7. Wheeled Chemical Extinguishers

Each plant will have available for the use of the fire brigade, one or more Wheeled Chemical fire extinguishers of the type (soda-acid, foam, carbon dioxide) best suited to the hazards which exist within the plant. These wheeled units normally may be stationed at or near the operations where major fire hazards occur in the process. In the event of a fire these units become a part of the fire brigade equipment to be taken to the scene as a help in combating the flames.

PLANT FIRE BRIGADE TRAINING

Session No. 6

FIGHTING A SIMULATED FIRE

Notes to the Leader -- How to Conduct the Session

You will start this conference session by explaining to the brigade members that you are going to imagine a fire in progress in one of the most hazardous operations in the plant. You will then have the men decide, from a description of this fire, what type of material is involved and how the fire must be fought, step by step. You will have for your help in the discussion, a series of points to be discussed. These are in question form and cover material outlined in previous sessions. You will want to add to them as you go, adapting the material to your plant.

No definite procedure for fighting this fire is presented for you. Variances in plant layouts, building construction, nature of occupancy and type of equipment available at each plant makes this impossible. You will develop this procedure from previous session material and from the manual, "Industrial Fire Brigades."

You will guide the men in making several important decisions regarding the fighting of this simulated fire. Here are some suggestions to help you do this.

1. Prepare for the Meeting

Read the points for discussion -- decide on the location and type of imaginary fire you will use in the discussion -- study the questions enough so you know what you are going to do next -- be able to adapt them to your imaginary fire -- think this through before the meeting -- visit the location chosen -- make necessary notes -- underline, add and make

marginal or between the line notes -- have every step prepared before the meeting -- check and be sure you are right.

2. Hold Your Meeting

Start by explaining what you are going to do -- describe the imaginary fire in detail -- have the men take notes -- start with the first question -- use any additions you have made to these -- have a discussion of signal system in your plant first -- determine signal to be used for this fire -- proceed to materials involved -- determine method of fighting (water, chemicals, or both) -- continue developing procedure for this fire by following questions -- bring out functions of each unit of brigade -- the job of each unit and each man in the unit -- hydrants to be used -- type nozzles to be used -- extinguishers to be readied and how they will be used -- do the same for Service Crew, Salvage, Electricians and Pipe Fitters -- draw each man into discussion -- pin him down to his job -- his duties at this specific fire -- fight your fire before it happens -- use a second simulated fire until you have covered all hazardous operations -- you will want to hold other sessions from time to time to do this.

PLANT FIRE BRIGADE TRAINING

Session No. 6

FIGHTING A SIMULATED FIRE

1. What code or signal would be sounded to indicate that a fire is in progress at the location being discussed?

   Answer:

2. What materials are involved in the fire?
   (wood, paper, rags, dust, solvents, oil, paint, electrical)

   Answer:

3. Should the production supervisor of the section involved be checked to determine what is involved?

   Answer:

4. Who should investigate to make certain that all employees are out of the building? Why?

   Answer:

5. Is it necessary to close certain fire doors to prevent the spread of smoke and who should close them?

   Answer:

6. Is high voltage electric lines or equipment involved in the fire and what precautions must be taken?

Answer:

7. Is there danger of an explosion due to volatile solvents, flammable dusts or gases being stored in the area involved and if so what precautions must be taken?

Answer:

8. Is there excessive smoke indicating incomplete combustion and a possibility of a smoke explosion if bottom doors are opened and fresh air allowed to enter?

Answer:

9. Should an attempt be made to ventilate this smoke at the roof of the building before bottom doors are opened and firemen attempt to enter?

Answer:

10. Are a number of sprinkler heads open and operating and should they be shut off before firemen enter and attempt to extinguish the fire with hose streams? With chemicals?

Answer:

11. Assuming that this is a fire in ordinary combustibles, what method should be used in an attempt to extinguish the flames?

Answer:

12. Who would do this job and what fire equipment would be used?

Answer:

13. Assuming this was a solvent, oil or paint fire, what method would be used in attempting to extinguish the flames?

Answer:

14. Who would do the job and what fire equipment would be most effective?

Answer:

15. Assuming this was a fire involving finely ground dust (cork, wood flour, pigments), what method should be used to extinguish the flames?

Answer:

16. Explain why this is important?

Answer:

17. Who would do the job and what equipment would be used?

Answer:

18. Assuming that the fire was confined to a large motor or other important electrical unit, what method should be used to extinguish the flames?

Answer:

19. If you were certain that the current was off, would you still use the same method?

Answer:

20. After the fire is out who will replace all opened sprinkler heads and restore protection?

Answer:

PLANT FIRE BRIGADE TRAINING

Session No. 7

FIRE DRILL

Notes to the Leader

Within a few days after the conference covered as a part of Session No. 6, the plant fire alarm will be sounded indicating an imaginary fire at the operation covered by the discussion. Your brigade will carry out the procedures determined by the discussions in the various sessions during this drill as well as the practices described under, "Fighting A Simulated Fire."

In addition, you will want to be assured that the interest and the efficiency of the brigade members is constantly maintained in the future. One way to do this will be to periodically hold a conference covering a simulated fire on one of the more critical plant operations. You will then follow this with a drill covering the same area. Actually you will be repeating Sessions 6 and 7, periodically.

GENERAL SAFETY PRECAUTIONS IN FIGHTING FIRES

In fire fighting, the major objective is always to extinguish the flames as quickly as possible. This requires that the firemen having the task, be able to locate the seat or source of the fire and then, by approaching it as close as possible, apply the proper extinguishing agent directly at the base of the flames.

In following these principles of fire fighting, it is important that the fireman be acquainted with, and have a respect for, the hazards which may exist when a fire is in progress. With this thought in mind, the following precautions have been developed in order to make certain that no one of them is overlooked in the excitement of combating a fire.

1. When opening a door leading into the room or building in which a fire is in progress, always stand to one side and not directly in front of the door. By opening the door, you may be admitting air to a fire in need of oxygen. When this occurs, there can be a smoke explosion and a flash of fire through the open door as the pent-up gases vent themselves.
2. When going into a smoke-filled room, keep your head as close to the floor as possible. This will permit better vision and allow easier breathing as the smoke tends to rise toward the ceiling.
3. Station an assistant at the door before you enter a smoke-filled room. An even better method is to tie a rope around your waist and then have the assistant hold the other end of the rope to guide you out.
4. Be on the alert for open trapdoors or feed holes into which you may fall.
5. If you have to fight a fire from a ladder, make certain that it is on a firm foundation and has the proper slant. A further precaution is to have the first man up the ladder lash it securely to some stationary object at or near the top.

6. Never direct a solid stream of water on a fire in finely ground dust. The force of the hose stream may stir up the dust causing a flash of fire. Always use a spray or fog nozzle.

7. When fighting an electrical fire, make certain that the current to the equipment on fire is first turned off before you attempt to extinguish the flames.

8. Watch out for flashbacks when fighting an oil or solvent fire. If you are too close and this occurs you may be trapped in the flames.

9. If the area in which the fire is in progress contains a solvent in drums, do not approach too closely as the heat from the flames may cause the drums to rupture resulting in a flash of fire. Whenever, possible, keep back of a building beam or a door for protection.

10. Fire hose lines should always be held securely to avoid the pressure of the water jerking the nozzle from your hands. A loose free hose line will whip in any direction and can cause a serious injury.

11. As a fireman, your safety is your first consideration. Learn to recognize the hazards which may confront you so that you can avoid them. Do not take unnecessary chances which may lead to an injury.