PORTABLE EXTINGUISHERS

SAN FRANCISCO FIRE DEPARTMENT

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Portable Fire Extinguishers
Revised January 2008

San Francisco Fire Department
698 2nd Street
San Francisco CA, 94107

Chief of Department
Joanne Hayes-White

Manual Revision project
Deputy Chief Gary P. Massetani
Assistant Chief James A. Barden
Assistant Deputy Chief Thomas A. Siragusa
Captain Jose L. Velo

Project Manager, Portable Extinguishers Manual
Acting Battalion Chief Denise Newman

Contributors
Lieutenant Anita Paratley

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2310 Folsom St
San Francisco, Ca 94110
Phone: (415) 970-2000

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FOREWORD

The goal of this manual is to establish standard operating practices as authorized by the Chief of Department and implemented by the Division of Training.

The purpose of this manual is to provide all members with the essential information necessary to fulfill the duties of their positions, and to provide a standard text whereby company officers can:

- Enforce standard drill guidelines authorized as a basis of operation for all companies.
- Align company drills to standards as adopted by the Division of Training.
- Maintain a high degree of proficiency, both personally and among their subordinates.

All manuals shall be kept up to date so that all officers may use the material contained in the various manuals to meet the requirements of their responsibility.

Conditions will develop in fire fighting situations where standard methods of operation will not be applicable. Therefore, nothing contained in these manuals shall be interpreted as an obstacle to the experience, initiative, and ingenuity of officers in overcoming the complexities that exist under actual fire ground conditions.

To maintain the intent of standard guidelines and practices, no correction, modification, expansion, or other revision of this manual shall be made unless authorized by the Chief of Department. Suggestions for correction, modification or expansion of this manual shall be submitted to the Division of Training. Suggestions will be given due consideration, and if adopted, notice of their adoption and copies of the changes made will be made available to all members by the Division of Training.

Joanne Hayes-White
Chief of Department

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Table of Contents

SECTION 1. GENERAL INFORMATION

A portable fire extinguisher is an appliance or piece of equipment designed to supply a quantity of an extinguishing agent sufficient to extinguish small fires before they reach major proportions.

In order to understand clearly the value of portable extinguishers, one should first understand the basic characteristics of fire and the principles of fire extinguishment. Combustion is defined as a self-sustaining chemical reaction with a rapid chemical union of fuel with oxygen that releases heat and light. Substances, when heated to a certain temperature (known as the ignition temperature) combine with the oxygen of the atmosphere which results in combustion. Sufficient heat is usually liberated during this initial state to raise the temperature of adjoining substances to their ignition temperature.

Combustion will continue until:

- The combustible material is consumed or removed.
- The oxidizing agent concentration is lowered to below the concentration necessary to support combustion.
- The combustible material is cooled to below its ignition temperature.
- Flames are chemically inhibited.

There are several agents which can be used to stop combustion which portable extinguishers provide in quantities sufficient to control incipient fires.

This manual specifically describes the portable fire extinguishers used by the San Francisco Fire Department. Information pertaining to the classification, installation, maintenance, use, ratings and other information of all portable fire extinguishers may be obtained from the current pamphlets: NFPA #10 and NFPA #I0A.

All Department extinguishers shall be properly maintained at all times in accordance with Department Instructions. Requests for repair or recharging shall be made without delay to the Bureau of Equipment.

CLASSIFICATION OF FIRES

Fire can be defined as rapid oxidation producing heat, light, and products of combustion.

Fires are classified into five (5) classes. They are described below:

Class A

A fire extinguisher labeled with **letter "A"** is for use on Class A fires. Class A fires are fires that involve ordinary combustible materials such as cloth, wood, paper, rubber, and many plastics.

Class B

A fire extinguisher labeled with **letter "B"** is for use on Class B fires. Class B fires are fires that involve flammable and combustible liquids such as gasoline, alcohol, diesel oil, oil-based paints, lacquers, etc., and flammable gases.

Class C

A fire extinguisher labeled with **letter "C"** is for use on Class C fires. Class C fires are fires that involve energized electrical equipment.

Class D

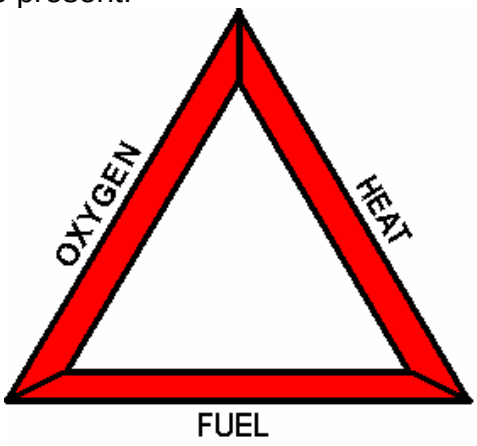
A fire extinguisher labeled with **letter "D"** is for use on Class D fires. Class D fires are fires that involve combustible metals such as magnesium, titanium and sodium.

Class K

A fire extinguisher labeled with **letter "K"** is for use on Class K fires. Class K fires are fires that involve vegetable oils, animal oils, or fats in cooking appliances. This is for commercial kitchens, including those found in restaurants, cafeterias, and caterers.

The Fire Triangle

For many years, fire was depicted by the fire triangle. In order for fire to occur, three elements had to be present:

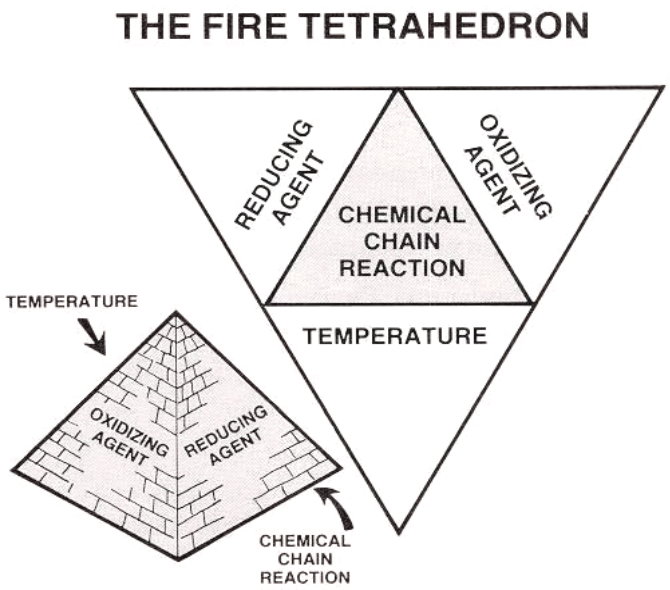


1. **Fuel** - Fuel sources can consist of gases, liquids, or solids.

2. **Oxygen** - Approximately 16% is required. Normal air contains 21% oxygen. Some fuel materials contain sufficient oxygen to support burning.

3. **Heat** - Ignition temperature can be reached by any heat source - open flame, the sun, hot surfaces, sparks or arcs, friction, chemical reaction, electrical energy, compression, etc.

The Fire Tetrahedron



An additional theory, the Fire Tetrahedron, was later introduced to explain the fact that fire is actually further propagated by products in the combustion process. The fire tetrahedron is comprised of the same three elements:

1. Reducing Agent (fuel)
2. Oxidizing Agent (commonly thought of as oxygen, but not limited to oxygen)
3. Temperature
4. Chemical Chain Reaction

In the chemical chain reaction, fuel vapors combine with heat to produce free radical fuel fragments. These free radical fuel fragments combine with oxygen to form hydroxyl free radicals and heat. The hydroxyl free radicals are now free to burn again. Thus, the chain is propagated and the process repeats itself.

Fuel Reducing Agent

A fuel is any substance that will produce heat during combustion. Fuels are also known as reducing agents, substances that are capable of reducing an oxidizer and losing electrons in the process.

Fuels can exist in three physical forms: solid, liquid, and gas. Regardless of its original form, the fuel must first be vaporized (turned to gas) before it can be ignited. Solids and liquids do not burn, they give off flammable gases which burn. The fuel for a flammable or combustible liquid is the vapor. Generally, it is easier to ignite a gaseous fuel than a solid fuel because it doesn't need to be vaporized first.

Oxygen (Oxidizing Agent)

All matter will oxidize when exposed to air. This is called the oxidation process. Normal oxidation is the slow combination of a material with oxygen, resulting in the liberation of both products of combustion and heat energy. Normal oxidation is a slow process

because little or no heat is added. The rusting of a metal or the yellowing of paper are examples. When heat is added, the process is accelerated and the result is combustion. Oxygen is not a flammable gas. Rather, it supports and assists the combustion process. The available concentration of oxygen directly affects the combustion process.

Four Ways to Extinguish (Suppress) Fire

1. **Remove Fuel**
   - Turn off the fuel supply
   - Remove solids
   - Dilute with water

2. **Dilute the Oxygen**
   - Steam within a confined area
   - Lid over pot
   - CO2 over the surface
   - CO2 into cargo hold

3. **Cooling the Fuel**
   - Lowering Temperature of fuel below ignition temperature
   - Absorb heat/Remove source of heat
   - Heat carried away by conduction, convection, or radiation

4. **Chemical Flame Inhibition** (works only during flaming mode)
   - Active molecules (OH, H and O) are not allowed to fulfill their role in sustaining the flame.

Heat Transfer

There are four basic methods by which heat-fire from the combustion of materials is transferred:

1. Conduction
2. Convection
3. Radiation
4. Direct Flame Contact

Conduction

Conduction is the travel of heat through a solid body. Conduction, by way of pipes, metal girders, and joists,can cause heat to pass through walls. Heat may be conducted from one body to another by direct contact of the two bodies or by an intervening heat-conducting medium. The amount of heat that will be transferred and its rate of travel by this method

depends upon the material through which the heat passes. Not all materials have the same heat conductivity. Aluminum, copper and iron are good conductors. Other solids such as stone and wood are poor conductors. Porous materials, such as felt, cloth and paper are poor conductors. Liquids and gases are very poor conductors of heat because of free movement of their molecules. Air is the poorest heat conductor.

Firefighters must also be aware that heat can be conducted in all directions, if the building design and features in the fire area permit. Conduction can also be dangerous to firefighters. Certain types of structures have steel building and roof supports that are completely open to fire. Heat spreading through these supports raises their temperature, and may cause them to warp and fail, possibly causing the walls and roof to collapse.

Convection

Convection includes any or all of the following:

By circulating motion, air currents, or upward physical movement of heat, fire creates its own thermal current or column in which hot gases rise, pulling in fresh air at the bottom of the fire. Convection is the travel of heat through the motion of the heated matter. This is through the motion of smoke, hot air, heated gases, and flying embers.

When confined within a structure, convected heat moves in predictable patterns. The fire produces gases that, being lighter than air, rise toward the top of the building. Heated air also rises, as does the smoke produced by combustion. As these heated combustion products rise, cool air takes their place. The cool air is heated and then also rises to the highest point it can reach. As the hot air and gases rise away from the fire they begin to cool. As they do, they drop down to be re-heated and rise again. This cycle continues and the upper parts of the building fill with hot gases and smoke products

Convection is the primary means by which fire spreads within a building. It causes heat movement from floor-to-floor and from room to room, through corridors, up stairwells and elevator shafts, between walls, and through attics. When the building fills at the top with hot smoke and gases, and is not ventilated properly, these products of combustion will back down the building, spreading heat and igniting combustibles on upper floors. This is called mushrooming.

Convection is the primary method of heat transfer that should concern firefighters.

Radiation

Radiation is the transfer of heat from a fire through space until it comes into contact with an opaque object, which is heated. Radiation is the travel of heat through space evenly in all directions. Once the fire has built to sizable proportions, radiation is the greatest, cause of exposure fires.

Within a building, radiant heat quickly raises the temperature of air and combustible material both near and at some distance from the fire, which sets up conditions leading to flashover. Proper ventilation is of little help against concentration of radiant heat. Venting will remove the smoke, hot air and heated gases, lessening the chance or rapid fire spread and flashover. The radiant heat remains and must be counteracted through proper application of water on the seat of the fire.

Radiant heat, by itself and in combination with convected heat, can cause great physical distress to the firefighter. Full protective clothing is a must. Radiation may contribute to flashover in areas that do not block radiant heat travel.

Direct Flame Contact

Fire spreads along and through a material that will subsequently burn by direct flame contact. When a substance is heated to a point where flammable vapors are given off, these vapors may be ignited. Any other flammable material that may be in contact with the burning vapors or flame can be heated to a temperature which may cause it to ignite and burn.

One characteristic that all fuels have in common is an ignition temperature. That is the minimum temperature that is required to cause self sustained combustion, independent of heat source. Ignition temperatures vary widely between different fuels.

Approximate ignition temperatures of some common fuels based on NFPA Fire Protection Guide to Hazardous Materials, 11th Edition.

Solids		Liquids		Gases	
Example	Ignition ^{o}F	Example	Ignition ^{o}F	Example	Ignition ^{o}F
Matches	325	Acetone	869	Methane	999
Carbon Soot	366	Kerosene	410	Propane	842
paper	450	Acrolein	455	Butane	550
Wood (avg.)	392	Gas (low oct)	536	Carbon Mon	1128
Cotton Fibers	490-750	Ethyl Alcohol	685	Hydrogen	932
PVC	800-900	Iso Alcohol	750	Anhy.Ammon	1204
Polyester	840-1040	Turpentine	488	Acetylene	581

These ignition temperatures are approximations based on laboratory testing. Every fire situation is different. The same fuel may ignite at different temperatures in different situations.

SECTION 2. PORTABLE EXTINGUISHERS

The basic types of portable extinguishers which are considered in this manual are:

- Water Tank Extinguishers.
- Carbon Dioxide Extinguishers.
- Dry Chemical Extinguishers.

TYPE OF FIRE

Extinguisher	Agent	A	B	C	D	Weight	Duration	Distance
2-1/2 Gal. Water	Water	**x**					1 minute	40 feet
CO^2	Carbon dioxide		**x**	**x**		10 lb.	10 -30 sec.	8 ft
Dry Chemical	Mono Ammonium Phosphate	**x**	**x**	**x**		30 lb.	10 seconds	25 feet

Information concerning these and other types of portable fire extinguishers is given in the current NFPA pamphlets #10 and #I0A.

WATER TANK EXTINGUISHERS

Water-type portable fire extinguishers used in this Department are stored air-pressure water tank extinguishers of 2 1/2 gallon capacity.

Water extinguishers are effective on incipient fires in ordinary combustible materials such as wood, paper, textiles, rubbish, etc., (Class A fires) where the cooling effect of quantities of water is of importance.

They are not effective on fires involving flammable liquids, greases, etc., in open vats, open vessels, etc., (Class B fires) where the blanketing effect is essential. However, they are of value on incipient fires involving floors soaked with oils, greases, etc., where the cooling effect of quantities of water is of importance.

The use of water extinguishers in connection with fires in electrical equipment such as panel boards, switchboards, motors, and the like (Class C fires) is not recommended. In some cases, however, fires in electrical equipment may be such that the cooling effect of water is necessary. In such cases the electrical equipment should be made electrically dead before applying water.

The stream from a water extinguisher is usually most effective when applied close to the fire. For 2 1/2 gallon stored pressure water tank extinguishers, the maximum range of discharge is approximately 40 feet, and the duration of discharge is approximately one minute.

Care and Maintenance

1. Keep extinguisher filled to proper water level and charged to proper air pressure (air gauge). Follow instructions on extinguisher data plate.

2. Avoid dropping or damaging extinguisher.

3. Precautions when refilling:

    a. Invert extinguisher. Release remaining air pressure through main operating valve.

    b. Unscrew swivel nut to remove valve assembly. Place one hand on body of extinguisher, the other on swivel nut (use wrench to release same only when absolutely necessary). It should be hand tight.

    Note: Do not turn complete valve assembly or use carrying or operating handles for this purpose. Such action causes valve assembly to unscrew from the swivel nut resulting in irreparable damage to the "O" rings in the extinguisher neck and in the main valve assembly, TURN SWIVEL NUT ONLY.

    c. Fill extinguisher with water in accordance with instructions on extinguisher data plate. 2-1/2 gallons of water is the maximum capacity for efficient operation.

    d. Inspect "O" ring in neck opening for cuts or tears. Apply Lubriplate or cup grease sparingly to "O" ring.

    e. Insert pickup tube into extinguisher body and align air pressure gauge with extinguisher data plate.

    f. Hold valve assembly firmly in place while tightening swivel nut. Secure swivel nut firmly - hand tight. (**Do** not use a wrench unless absolutely necessary and then only with a very slight pressure). Extinguisher is constructed to produce adequate seal with hand pressure.

    g. Pressurize extinguisher through air valve at side of main valve assembly. Bring pressure to 90-100 psi but always within "green zone" on air gauge. Replace valve cap on air valve stem.

    Do not over-pressurize. There is a rupture valve located in the air gauge designed to relieve pressure. This prevents the container from rupturing. However, when the rupture valve “pops” from over-pressurization, injury can result.

    Note: Air pressure may be obtained from station compressor, from air chuck connections on modern fire department apparatus, or from air compressors at service stations.

    Companies experiencing difficulty in recharging due to unavailability of air pressure shall obtain a temporary replacement extinguisher through the Bureau of Equipment.

h. Pick up extinguisher and shake vigorously to equalize stored pressure. Place extinguisher in upright position and observe air pressure gauge for at least one minute. Increase air pressure, if necessary. If extinguisher fails to hold air pressure, examine for leaks.

i. Examine nozzle for obstruction. Insert safety ring-lock pin in squeeze grip. Install safety seal (if provided). Restore on apparatus.

4. Extinguisher will supply steady stream for approximately one minute with a maximum range of approximately 40 feet.

5. If extinguisher is only partially used, remaining water may be retained by inverting extinguisher and depressing operating handle to release air pressure (see 3a.).

6. Engine Drivers and Truck Tiller Operators are required to check these extinguishers daily and after every use.

CARBON DIOXIDE EXTINGUISHERS

Carbon dioxide extinguishers contain liquid carbon dioxide under pressure. The extinguisher consists of a pressure container, a valve for releasing the carbon dioxide, and a means of effectively applying the carbon dioxide on the fire.

Carbon Dioxide gas is an inert gas and will not support combustion. It has a smothering effect on fire, is heavier than air, and excludes atmospheric oxygen from the fire.

A discharge tube extending from the inside of the extinguisher shell to the discharge valve permits only liquid carbon dioxide to reach the discharge horn. After all of the contents have been discharged (at normal temperatures), an ineffective cloud of gaseous carbon dioxide is expelled. For this reason the EXTINGUISHER MUST BE OPERATED IN AN UPRIGHT POSITION.

Carbon dioxide extinguishers are designed to be carried to the fire by the handle. Operation expels a cloud of carbon dioxide gas with some "snow" through the horn.

On all fires, the discharge should be directed as close to the fire as possible. The discharge should be applied to the burned surface even after the flames are extinguished to prevent possible reflash.

On flammable liquid fires, best results are obtained when the discharge from the extinguisher is employed in a sweeping manner over the burning surface applying the discharge first at the near edge of the fire and gradually progressing forward, moving the discharge horn slowly from side to side.

Carbon dioxide extinguishers are effective on fires of small quantities of flammable liquids, greases, etc., in open vessels, or on floors, and on other Class B fires where the CO_2 gas may be used to blanket the burning surface. They are effective on incipient fires in electrical equipment (Class C Fires) where a non-conducting extinguishing agent is of importance.

They are not effective on deep seated fires in ordinary combustible materials such as wood, paper, textiles, rubbish, or Class A fires which require the cooling effect of water for complete extinguishment. They may be effective however, for small surface fires in small quantities of such material where the smothering effects of the gas may be utilized or in confined spaces (e.g. Post Office letter boxes).

The force, range, and duration of the discharge are independent of the operator when the valve is open. However, the CO2 is rated for a duration of 10-30 seconds with a range of 8 feet. Carbon dioxide extinguishers are readily operated while being carried about, but must be kept upright in order to provide an effective discharge as the discharge tube must draw the liquid from the bottom of the cylinder.

The Carbon Dioxide Extinguisher carried on Department apparatus is a 10 pound capacity. The discharge valve mechanism is either squeeze grip or thumb-valve design. To operate the discharge valve, after pulling the locking pin, it is only necessary to either squeeze the handle or to press down on the thumb trigger.

Important: When using Carbon Dioxide extinguishers , especially in unventilated spaces such as small rooms, closets, or confined spaces, the operator should take precautions to avoid respiratory distress which may be caused by breathing the vapors or gases liberated or produced, or lowering the oxygen content of the atmosphere below that required by a human being. Consider using a SCBA in a confined area.

Specific instructions in regard to maintenance and inspection of SFFD C02 extinguishers are as follows;

Carbon dioxide extinguishers (10-pound capacity) shall be recharged after use. In addition, they shall be thoroughly inspected and weighed every six months, and if it is found that there has been a loss in weight of 12 ounces or more, they shall be recharged. Maintenance, refilling and weighing is performed by the Bureau of Equipment.

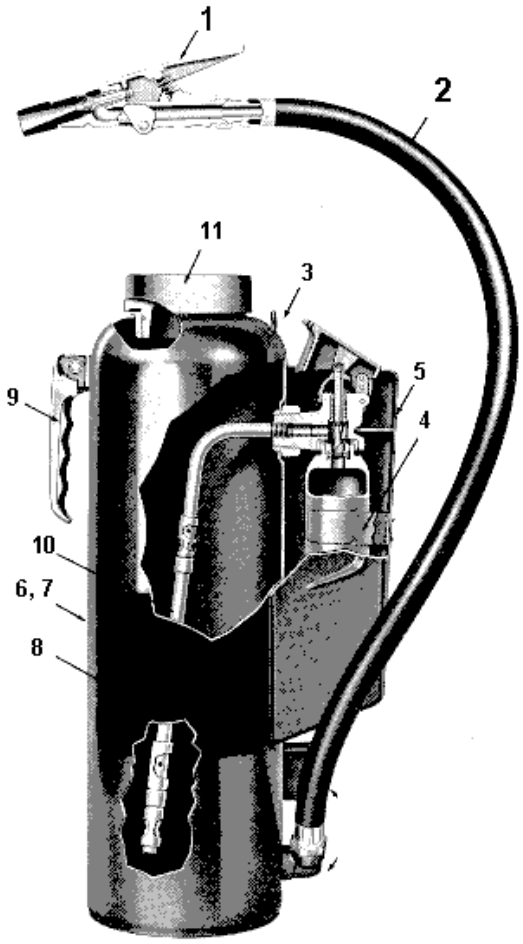
Engine Drivers and Truck Tiller Operators are required to check these extinguishers daily and after every use.

DRY CHEMICAL EXTINGUISHERS

Dry Chemical extinguishers are made in many sizes, having various capacities of dry chemical. The types of extinguishers used in this Department are of 5 lb capacity for vehicles and 30 lb capacity for engines, trucks, and rescue apparatus. Other apparatus may be supplied with 5 lb. Dry Chemical extinguishers.

The dry chemical agent used is monoammonium phosphate with additives to improve storage, flow, and water repellent characteristics.

The expelling force is provided by a cartridge of carbon dioxide. The extinguishing action is most commonly explained as a "chain breaking reaction" wherein the chemicals used prevent the union of free radical particles in the combustion process so that combustion does not continue when the flame front is completely covered with the agent. Reflashing can occur if hot surfaces or other ignition sources remain in the fire area, or if the dry chemical does not cover the entire flaming area.



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These extinguishers are effective on fires in small quantities of flammable liquids, greases, etc. (Class B fires) in open vessels spills, etc. Dry Chemical extinguishers are also effective on incipient fires in electrical equipment (Class C fires) where a non-conducting extinguishing agent is of importance.

Dry Chemical extinguishers are not effective on deep-seated fires in ordinary combustible materials which require the cooling effect of water for complete extinguishment; however, they may be of value for surface fires in small quantities of such material.

With nozzle open and the extinguisher in operation, the force, range, and duration of stream are not dependent upon the operator. They are readily operated while being carried about. When using extinguishers of this type, consideration should be given to the possible hazard which may be created by reduction in visibility due to the cloud of dry chemical.

Dry Chemical extinguishers shall be inspected daily to make sure that they have not been tampered with nor removed from their designated places, to detect any damage, and to see that the orifice of the hose nozzle is not clogged. The discharge hose must be free from dry chemical or other obstruction.

1. Nozzle
2. Hose
3. Strap ring
4. Cartridge
5. Cartridge housing
6. & 7. Cylinder & cylinder wall
8. Chamber
9. Carrying handle
10. Pick up tube
11. Cap

The operator may stand erect while using this extinguisher so the cloud of discharged dry chemical serves as a heat barrier.

The maximum effective range of discharge for a 5 lb extinguisher is approximately 12 feet. The average duration of discharge is approximately 10 seconds (based upon Ansul performance charts).

The maximum range of discharge for a 30 lb extinguisher is approximately 25 feet. The duration of discharge is approximately 10-seconds (based upon Ansul performance charts).

After an extinguisher has been pressurized, the pressure may be maintained for several hours by keeping the nozzle closed which will provide stand-by service should a rekindle occur. The Bureau of Equipment shall be notified if the extinguisher has been pressurized. Normally, they will provide an exchange "charged" extinguisher. If an exchange is not available, the Bureau of Equipment will recharge the used extinguisher.

SAFETY PRECAUTION: Dry Chemical Extinguishers have been known to fly violently upward upon activation. DO NOT lean over extinguisher when pressurizing. Reach out from a side position.

SFFD PORTABLE FIRE EXTINGUISHER CHART

	WATER	**CO2**	**DRY CHEMICAL (ANSUL)**
SAFETY	Always check gauge	Displaces O2; wear gloves; consider SCBA	Don't stand over extinguisher when pressurizing
CLASS	A	B-C	A-B-C
AGENT	Water	Carbon Dioxide	Mono-Ammonium Phosphate
AMOUNT/WEIGHT	2 1/2 gallons	10 lbs.	5lb./30 lb.
RANGE	40 ft.	8ft.	12 ft./25 ft.
DURATION	1 minute	10-30 seconds	10 seconds
STREAM	Direct at base of fire	Direct slow sweeping motion – side to side	Direct fast sweeping motion – side to side
METHOD	Reduction of Temperature	Smothering	Disrupt chemical reaction
SERVICED BY	Company Level	BOE	BOE

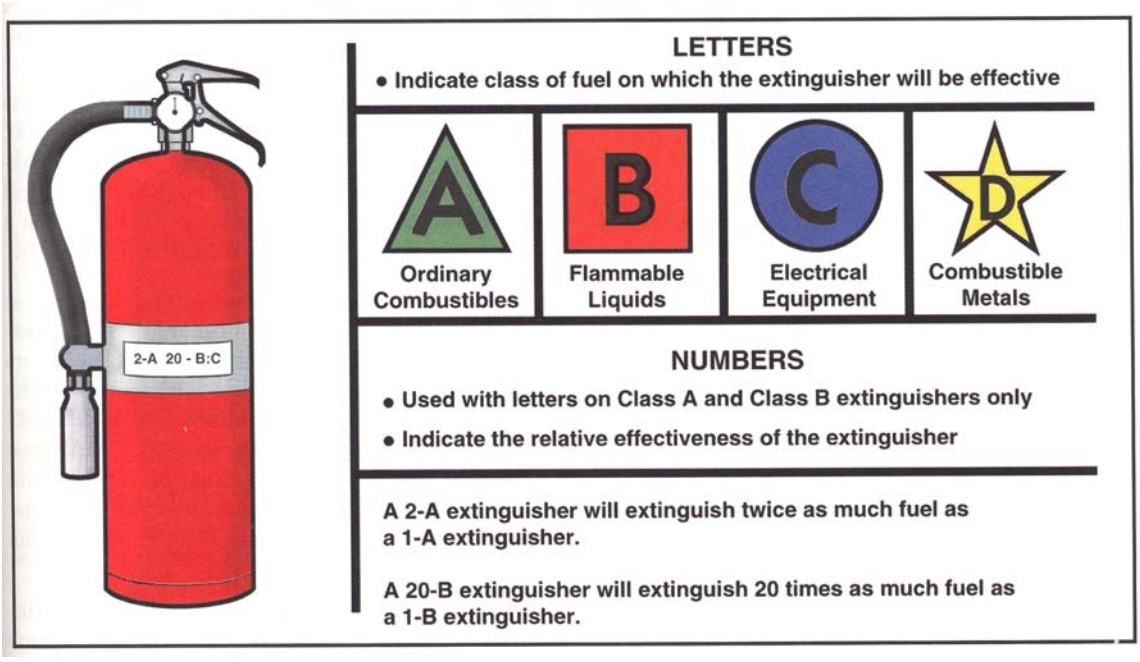
APPENDIX A:

ADDITIONAL PORTABLE EXTINGUISHERS AND PRE-ENGINEERED FIXED FIRE EXTINGUISHING SYSTEMS

I. Introduction:

The San Francisco Fire Department uses three fire extinguishers: Water tank extinguisher, Carbon Dioxide extinguisher and Dry chemical extinguisher. Within the City of San Francisco, though, there are other types of extinguishers and extinguishing systems. We find these systems in many of the buildings such as apartment buildings, high rises, restaurants, public buildings and commercial buildings. As firefighters we need to be familiar with some of these types of systems we may come upon during fire fighting operations. This section will briefly describe some of these systems. Like high rise buildings and their differences, there can be many differences between systems throughout each building in San Francisco. The best way to know what you have in your first alarm area is pre-inspections of all buildings; know beforehand what you have and the possible dangers attached to any systems within your area.

II. ABC Portable Fire Extinguishers:



A. Apartment Buildings:

The most common fire extinguisher in apartment buildings is the ABC extinguisher. The minimum rating is 2A:10-B:C or higher (most commonly seen is the 3A:40-B:C). These extinguishers should have a tag indicating when it was last serviced. They must be serviced annually and retagged. Should you come upon an outdated tag (usually during annual inspections) the officer should notify the responsible party to have the extinguishers serviced as soon as possible to be in compliance with the California Building Code. In an apartment building, each floor must have a minimum of one extinguisher within a 75 foot travel distance.

. Although this dry powder is considered harmless, you should ventilate the area as soon as possible so that firefighters and occupants are not exposed to the chemical any more than necessary.

B. Other Establishments:

Most other buildings in San Francisco will have ABC portable fire extinguishers. These include high rise commercial and residental buildings, commercial buildings, public buildings, private buildings that have a certain occupancy load, and even single residential homes. Each building can have ABC portable fire extinguishers with different ratings. Some may have the minimum rating of 2A:10-B:C and some may have 3A:40-B:C or higher. Ultimately they all work the same; however, some are capable of extinguishing more fire depending on the rating.

III. Class D Fire Extinguishers:

Class D fires are those fires that involve combustible metals. Powdered extinguishing agents are the most commonly used. Some powdered agents can be applied with portable extinguishers, but others must be applied by a shovel or scoop. No single agent will control or extinguish in all combustible metals. Some agents are effective against fires in several metals; others are effective on fires in only one type of metal. Portable extinguishers for Class D fires can be both hand held and wheeled models.

IV. Class K Fire Extinguishers:

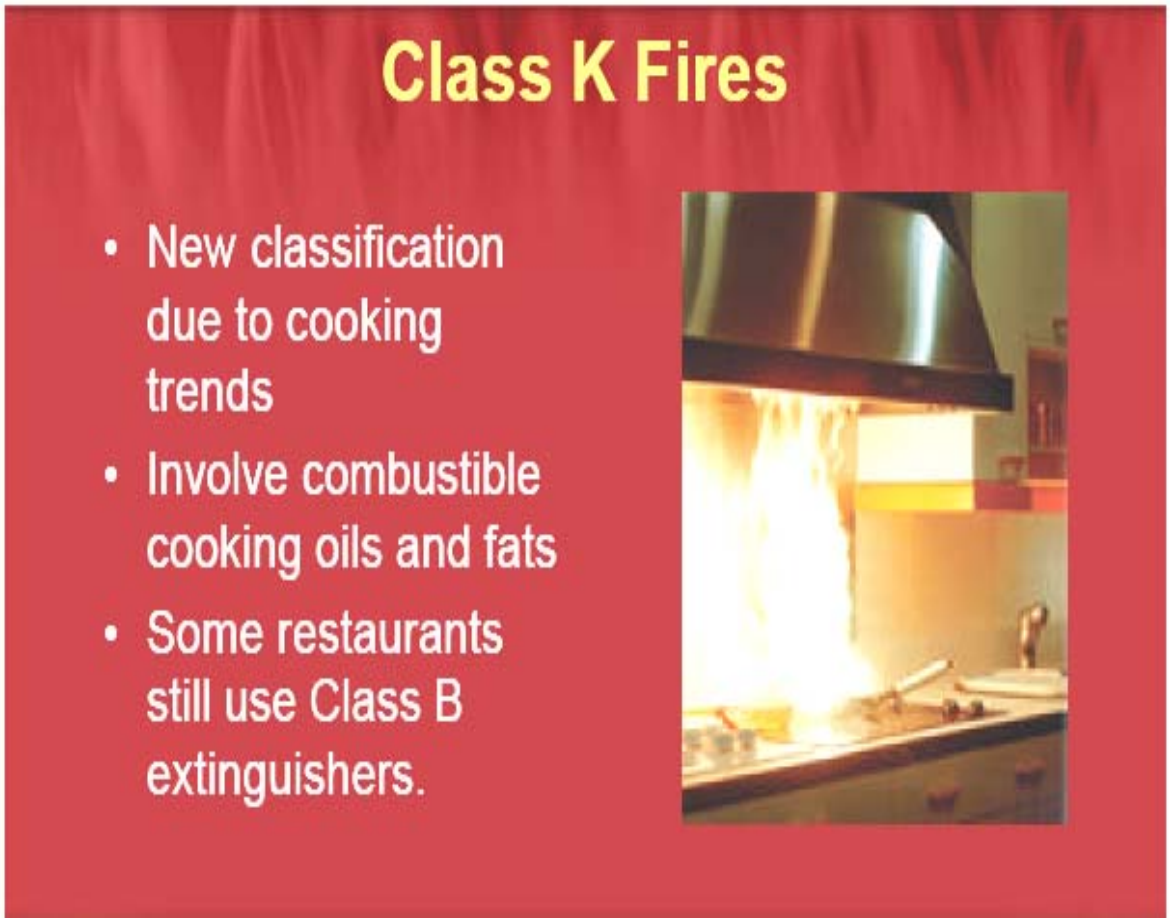
A. Restaurants and Commercial Kitchens:

The most common portable extinguisher found in a restaurant is the Ansul dry chemical or Class B extinguisher. The hoods of commercial stoves also contain a Class B extinguishing agent which is made up of either a bicarbonate or potassium bicarbonate dry chemical. Until recently, most commercial deep fat fryers and the range hoods and portable fire extinguishers in commercial kitchens were designed for use with animal-fat based oils and grease. Due to a number of different factors, the cooking industry has switched to the use of vegetable based oils and greases. These vegetable based oils and greases cook at a higher temperature than the equivalent animal fat based products. Once a fire starts in a deep fat fryer it cannot always be extinguished by traditional range hoods or portable fire extinguishers using Class B fire extinguishing products. Because of this change, the creation of a new classification of fire, Class K resulted. Testing by Underwriters Laboratories has shown that wet chemical extinguishers with a K classification have several times the extinguishing capability of a 40-B rated sodium bicarbonate or potassium bicarbonate extinguisher in controlling cooking fires. The Class K extinguisher offers improved fire control for this type of hazard by:

- Creating a foam blanket by saponifying (converting into a soap) the hot cooking oils.
- Cooling both the appliance and the hot cooking oils.
- Offering improved visibility during fire fighting.
- Minimizing splash hazard.
- Providing easier clean-up than when using dry chemical agents.

Manufacturers of hood extinguishing systems are now using the potassium-based liquid agents (potassium acetate, potassium carbonate, and potassium citrate) for installation in commercial kitchens because sodium bicarbonate is no longer used. The portable Class K fire extinguishers are to replace the old Class B portable extinguishers found in commercial kitchens. In San Francisco all restaurants and commercial kitchens must convert their system from the Ansul or other brand name system over to the wet chemical extinguishing system consistent with fire extinguishing agents classified for Class K fires by January 1st, 2009. Bureau of Fire Prevention in coordination with the Department of Public

Health are coordinating this change over. This also includes all portable fire extinguishers. All systems must be UL300 compliant. NOTE: Class K fire extinguishers are only to be used *after* the fixed hood and duct extinguishing system has been activated.



NEW COOKING MEDIUMS CAN NO LONGER BE EXTINGUISHED BY TRADITIONAL CLASS B SYSTEMS

Class K: Cooking Oils and Fats

Remember: Class K = Kitchen Cooking

V. Halons (1211, 1301) and Clean Agents (HFC-227ea):

A. Halons

Halon is a colorless, odorless, and gaseous agent that inhibits the chemical reaction of fire. It is commonly used when there is a critical need to protect data in process, as in computer rooms, and where such equipment must return to service in a timely manner. In 1994 Halon was banned because its properties contribute to ozone depletion and it has a long atmospheric lifetime. Even though it is banned for production, stockpiles remain in the United States and reuse is still permitted**.**

Since there are still portable Halon extinguishers and extinguishing systems with the Halon product existing at some companies, firefighters shall wear full PPEs including SCBAs should there be a deployment of any Halon product.

HALON

- Class "A", "B", or "C" fires *(smaller sizes ineffective against Class "A").*
- 9-17 lb. Halon 1211 (pressurized liquid) released as vapor *(8-18 seconds discharge time).*
- Has pressure gauge to allow visual capacity check.
- 9-16 ft. maximum effective range.
- Works best in confined area--ideal for electronics fire due to lack of residue.
- Extinguishes by ***smothering*** burning materials.
- Fumes toxic if inhaled.
- Halon is ozone depleting chemical--production halted in Jan '94.

B. Clean Agents

New agents are slowly replacing Halon. Known as a Clean Agent, there are no ozone depletion properties and atmospheric lifetimes. However, they are less effective. Clean Agents, such as HFC-227ea (heptafluoropropane), are an acceptable replacement for Halon. It is stored as a liquid and dispensed into a hazard as an odorless, colorless, electronically nonconductive vapor that is clear and does not obscure vision. HFC-227ea does not displace oxygen and therefore is viewed safe for use in occupied spaces.

As with systems with Halon, it is also recommended that all firefighter personnel wear full PPEs including SCBAs for any system that has deployed a Clean Agent.

Both Halon or Clean Agent systems can be found in locations such as:

- Data Processing Centers
- Telephone Switches
- Process Control Rooms
- Electrical and Electronic Equipment Rooms
- Art and Historical Collection

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