

**STUDY MATERIAL FOR  
CERTIFICATE OF  
FITNESS FOR  
  
POWDER CARRIER AND  
EXPLOSIVES LOADER  
(E-97)**

This study material will help you prepare for the written examination **E-97** in order to qualify for the Certificates of Fitness for **Powder Carrier** or **Explosive Loader**, including storage, handling and use of explosives. The study material includes information taken from the Fire Prevention Code and the Fire Prevention Directives of the Bureau of Fire Prevention, NYFD. The study material does not contain all of the information you need to know in order to work safely when storing, handling, or using explosives. **It is your responsibility to become familiar with all the applicable rules and regulations of the City of New York even if they are not covered in this document.**

You must pass a multiple-choice test and a qualification assessment to be eligible for an E-97 Certificate of Fitness. As stated above, E-97 will allow you to perform the responsibilities of either Powder Carrier or Explosive Loader. Barring a system breakdown, the multiple-choice test will be computer-based and administered on a touch-screen monitor. The multiple-choice test must be taken and passed before taking the qualification assessment. A 70% passing mark is required in order to pass the multiple-choice test. All questions on the multiple-choice test have four answer options. Only one answer option is correct for each question. If you do not answer a question, your answer will be scored as incorrect. Read each question carefully before marking your answer. There is no penalty for guessing on the multiple-choice test.

### Sample Questions

**1. All explosives and blasting caps must be stored in:**

- (A) the blaster's truck.
- (B) a magazine.
- (C) the site supervisor's shed.
- (D) underground vaults.

The correct answer is **"B"**. You would press **"B"** on your computer's touch screen.

**2. The word "EXPLOSIVES" painted on the rear of a truck carrying explosives must be painted:**

- (A) black.
- (B) red.
- (C) green.
- (D) white.

The correct answer is **"D"**. You would press **"D"** on your computer's touch screen.

## **STORAGE, HANDLING AND USE OF EXPLOSIVES**

The key to preventing accidents involving explosives is to follow proper blasting procedures. Safe blasting practices must be followed at all times. Safe practices are required from the moment explosives are delivered to the magazine up to the inspection that is made after the blast.

There are several kinds of persons who work with explosives. It is important that each person knows and understands what he/she is permitted to do. A person working with explosives should never try to do something that he/she has not been trained to do. Every person who works with explosives must have a Certificate of Fitness. A person should not do anything with explosives unless he/she has a Certificate of Fitness for what they are doing.

**The blaster** is the most qualified person at the blasting site. The blaster has total responsibility for the use of explosives and record keeping. The blaster has responsibility for the safety of the public. The blaster is responsible for all work with explosives. The blaster plans the blasting work, supervises loading of the blast, and is responsible for setting off the blast. Only the blaster may give permission to fire a blast.

**The powder carrier** is essentially an "apprentice" blaster. The powder carrier helps to load holes with explosives. The powder carrier assists the blaster in preparing primer cartridges and in wiring charges.

**Explosives loaders** help the blaster in tunnel and shaft work. The explosives loader helps load the tunnel face to prepare for the blast.

**Explosives handlers** are the drivers of the trucks used to deliver explosives and blasting caps to the blast site. Explosives handlers are not permitted to do any other work with explosives.

**The magazine keeper** accepts delivery of explosives at the work site. The magazine keeper keeps records of explosives as they are received and used. The magazine keeper is responsible for the safe keeping of explosives in the magazines.

### **Storage**

All explosives and blasting caps must be stored in magazines specially made for that purpose. A magazine must be approved and have a permit to store explosives. Magazines must be under the direct supervision of a magazine keeper holding a Certificate of Fitness. The only duties of the magazine keeper are to guard the magazine and to maintain accurate records.

The magazines must be kept locked when they have explosives or blasting caps in them. The magazines should be unlocked only when materials are delivered to the magazine, or are removed for delivery to the blast site. Only the magazine keeper, the blaster or the powder carrier may have access to the keys to the storage magazines.

Accurate records of all explosive materials must be kept. These records are required to meet the regulations of the New York City Fire Department. Separate records are required for blasting caps and sticks of dynamite. The picture on the next page shows the form that is used for blasting caps.

The blasting cap record shows when blasting caps were received at the job site. The record also shows who received the blasting caps and how many blasting caps were delivered. The record shows when any blasting caps were taken from the magazine to be used in a blast.

A-66A (7/84) 98-133-0313

**FIRE DEPARTMENT  
CITY OF NEW YORK**  
BUREAU OF FIRE PREVENTION  
9 Metrotech Center  
Brooklyn, NY 11201-3857

**NOTICE!**  
Superintendent, Blaster and Magazine Keeper shall inspect job area, carrying Boxes and magazines and sign the Blasting cap record at the completion of each work day.

**NOTICE!**  
This slip is the property of the Fire Department; it must be kept in magazine at all times, and must not be surrendered, except to a duly authorized representative of the Fire Department.

**BLASTING CAP RECORD**

License No. \_\_\_\_\_ Contractor \_\_\_\_\_  
Expiration Date \_\_\_\_\_ Location \_\_\_\_\_

RECEIVED						TAKEN OUT				
Date	Caps On Hand	Caps Received	Hour	Man in Charge	No. of CoF	Caps	Hour	By whom	No. of CoF	Inspector

**Blasting Record**

The picture below shows the record that is kept for sticks of dynamite. The record keeps track of when explosives were received and when they were taken out. This way all explosive materials are accounted for at all times.

A-66A (7/84) 98-133-0313

**FIRE DEPARTMENT  
CITY OF NEW YORK**  
BUREAU OF FIRE PREVENTION  
9 Metrotech Center  
Brooklyn, NY 11201-3857

**NOTICE!**  
Superintendent, Blaster and Magazine Keeper shall inspect job area, carrying Boxes and magazines and sign the Blasting cap record at the completion of each work day.

**NOTICE!**  
This slip is the property of the Fire Department; it must be kept in magazine at all times, and must not be surrendered, except to a duly authorized representative of the Fire Department.

**DYNAMITE RECORD**

License No. \_\_\_\_\_ Contractor \_\_\_\_\_  
Expiration Date \_\_\_\_\_ Location \_\_\_\_\_

RECEIVED						TAKEN OUT				
Date	Sticks On Hand	Sticks Received	Hour	Man in Charge	No. of CoF	Sticks	Hour	By whom	No. of CoF	Inspector

**Dynamite Record**

The blasting cap record and the dynamite record are kept in the magazine. The records must be surrendered to a duly authorized Fire Department representative when requested.

Only the amount of explosives that will be used for the next blast that is being loaded should be removed from the magazine. Any explosives that are not used for the blast must be returned to the magazine as soon as possible. Explosives taken from the magazine should be carried only in their original containers or special carrying boxes. The original containers or special carrying boxes should be used to return unused explosives to the magazines

The magazines must be kept clean. Areas within 25 feet of the magazines must be kept clean and free of all rubbish. Dead grass and shrubbery and other obstructions must be removed. Empty cartons, packing materials and other combustible materials pose a dangerous fire hazard. Smoking, open flames, matches, lighters, etc. are prohibited inside or within 50 feet of a storage magazine. Persons should not be permitted to loiter in the area near the magazine.

The amount of explosives that may be kept in a magazine depends on the class of the permit for the magazine. The permit must be kept in the magazine and ready for inspection. The classes of magazines and the maximum amount of explosives that may be stored are as follow:

First Class	1,000 pounds
Second Class	500 pounds
Third Class	250 pounds
Fourth Class	100 pounds
Fifth Class	25 pounds

Explosives and blasting caps may not be kept in the same magazine. Two separate magazines are required. One magazine is used to store explosives. Another magazine is used to store the blasting caps. The magazines for explosives and blasting caps should be at least 100 feet apart. A special variance is required if the magazines must be closer than 100 feet apart.

The Superintendent, the Blaster and the Magazine Keeper must inspect the magazines at the end of each workday. They must also inspect the job area and the carrying boxes. After the inspection they must sign the Blasting Cap Record and the Dynamite Record. Any explosive materials that were not used during the day must be returned to the vendor.

Whenever a magazine keeper is relieved by another magazine keeper, both should inspect the magazine. They should check the explosives on hand and both sign the Magazine Record Slip in each other's presence. The Magazine Record Slip should be kept in the magazine. The Magazine Record Slip should be given upon request only to an authorized representative of the Fire Department. The conditions of the magazines are inspected regularly by representatives from the Fire Department. These inspections are also recorded on the Magazine Record Slip. The illustration on the next page shows the Magazine Record Slip.

EU071764 (3/87) 16-870203 REC-N

**MAGAZINE SLIP**

**MAGAZINE KEEPERS WHEN RELIEVING AND BEING RELIEVED MUST CHECK THE EXPLOSIVES ON HAND AND SIGN THE MAGAZINE RECORD SLIP IN THE PRESENCE OF EACH OTHER.**

**NOTICE!**  
THIS SLIP IS THE PROPERTY OF THE FIRE DEPARTMENT; IT MUST BE KEPT IN MAGAZINE AT ALL TIMES, AND MUST NOT BE SURRENDERED, EXCEPT TO A DULY AUTHORIZED REPRESENTATIVE OF THE FIRE DEPARTMENT.

**FIRE DEPARTMENT • CITY OF NEW YORK**  
BUREAU OF FIRE PREVENTION  
**EXPLOSIVE UNIT**  
9 Metrotech Center  
Brooklyn, NY 11201-3857

POST SIGNS READING  
**BLASTING**  
NO TRANSMITTING

THIS DEPARTMENT MUST BE NOTIFIED WHEN BLASTING OPERATIONS ARE SUSPENDED FOR MORE THAN 48 HOURS.

IN ALL ACCIDENTS OR FAULTY BLASTS:  
THE CONTRACTOR AND THE BLASTER ARE REQUIRED TO SUSPEND BLASTING AND IMMEDIATELY NOTIFY THE F.D.N.Y.

License No. \_\_\_\_\_ Issued To \_\_\_\_\_  
Expires \_\_\_\_\_ Location \_\_\_\_\_

INSPECTION		Sticks of Powder	Conditions of Magazine	Name of Man in Charge	Certificate of Fitness No. _____	Signature of Inspector
Date	Time					

**Magazine Record Slip**

**Transportation**

Only especially designed vehicles may be used to transport explosives. All vehicles used to transport explosives in New York City must have a permit. Two persons holding Certificates of Fitness as explosives handlers must be on each vehicle transporting explosives. This is in case one person is injured, becomes ill, etc. The explosive handlers are responsible for seeing that the vehicle is in safe operating condition. They must also check that proper fire extinguishing equipment and flags are in place. Smoking while transporting explosives is strictly prohibited. Matches, lighters or metal tools are also not permitted on any vehicle transporting explosives.

Blasting caps and explosives may not be carried together on the same truck. If a job site needs to have both blasting caps and explosives delivered two trucks must be used. If two trucks cannot be used the truck must make two trips. Explosives may be delivered only to an approved site for which a permit has been issued.

Only three deliveries may be made to the same site in one day. The amount of one delivery to a site cannot be more than what is permitted by the class of the magazine. For example, a site with a Fourth Class permit cannot receive more than 100 pounds of explosives in one delivery.

The total amount of explosives that can be delivered to a job site in one day depends on the class of permit. The total amount that is delivered cannot be more than three times the amount permitted for that site. For example, a site with a permit for a Third Class magazine may not receive a total of more than 750 pounds of explosives in one day.

A vehicle carrying explosives cannot have more than 1,000 pounds of explosives at one time. No more than 5,000 electric fuses or blasting caps can be carried at one time. A special permit is required if larger amounts must be transported. Vehicles used to carry explosives may not be used to carry equipment or other supplies. Only the explosives handlers may ride on the truck. Other persons are not permitted on the vehicle.

## **Blasting Procedures**

On a blasting job, the blaster has total responsibility for the use of explosives, record keeping and public safety. The blaster must ensure that only safe procedures are used. The blaster must also make sure that workers at the job site perform only those duties for which they have a Certificate of Fitness.

Blasting must be done only between the hours of 7:00 a.m. and 7:00 p.m., or between the hours of sunrise and sunset. Blasting may not be done during hours of darkness unless a special permit has been granted by the Fire Commissioner. Blasting is done only on Mondays through Fridays. A special permit is required to blast on Saturdays.

Before loading of blastholes is begun, all equipment not required for the loading operation should be removed from the blast site. Only authorized persons needed to perform the loading operation should be allowed at the blast site.

The primer or cartridge of explosive containing the detonator is generally loaded into the hole first. If there is no detonator well in the cartridge, space for the detonator is made by punching the cartridge with a nonsparking powder punch. The hole should be large and deep enough to be sure that the detonator is completely embedded in the primer cartridge. The detonator leads may be taped or tied to the cartridge with a half hitch to complete the primer assembly. Detonators must never be forced into the explosive cartridge.

After the primer cartridge is loaded, the detonator leads should be anchored at the collar of the hole. There should be enough tension to keep the leads against the wall of the drill hole. However, there should be enough slack to prevent excessive tension.

All types of detonators are sensitive to accidental initiation by heat or impact. Detonators should be handled carefully and protected from excessive heat. Electric detonators are also sensitive to extraneous electricity. This could come from radios, high voltage power lines, or electrical storms. For this reason all blasting operations should be suspended when an electrical storm approaches. Blasting operations should not resume until the storm has completely left the area. Electric detonators should be checked before primer cartridges are made up.

Blasting charges should be tamped only with wooden or plastic tamping rods. The explosives should be pressed or set into place only with steady, even pressure. No tamping rod should be used if it is frayed or split at the end.

Only one blast at a time should be loaded on the same rock face or heading. Special precautions must be taken when blasting near buildings or utilities. The closest to public utilities blasting may be done without consulting the NYFD Explosives Unit is 25 feet.

After blastholes have been loaded the detonators should be checked to be sure that they have not been damaged before any stemming has begun. If there is a possibility that the primer system has been damaged, a backup primer should be loaded into the hole.

Stemming should be done carefully to ensure that downlines or legwires are not damaged. Stemming material should be relatively clean and free flowing. Large rocks or any combustible materials should not be used for stemming blastholes. After blastholes are stemmed, all excess explosive materials and empty packaging materials should be removed from the blast area. This should be done before actual hookup of the blast is begun. Unused explosives should be returned

to the storage magazine. During the hooking up of the blast circuit only those persons required to complete the tying in of the holes should remain in the basting area. The wiring of the blasting circuit should be under the control of the blaster in charge.

A shot should be fired as soon as possible after loading is completed. An audible blast-warning signal must be given before the shot is fired. The following signals are used.

One long whistle	3 minutes to blast
Two whistles	Ready to blast
Three short whistles	All clear

The warning procedure should be familiar to all personnel working in or near the blasting area. The warning procedure should be posted where it can be easily seen.

At least 3 minutes before a blast, the blaster should also position workers at every approach to the blast site. These workers should have a red flag. They are used to warn people and to keep unauthorized persons away from the blast site. Signs reading "**NO RADIO TRANSMITTING**" should also be posted in the area surrounding the blasting area.

After the hole has been loaded and tamped, the blast face must be covered on all exposed sides. This will help to prevent injury from flyrock resulting from the blast. The blast face must be covered with a strong woven matting of rope or wire. The rope or wire must be at least one and one-half inches in diameter. Persons on the blast crew required to be near the blast site when the blast is fired must be provided with adequate protection. Personnel must not be directly in front of the blast face at the time of firing, no matter how far away they are.

Only the blaster should connect the shooting wires to the switch box. The blaster is responsible for the actual firing of the blast. The blaster is also responsible for the safekeeping of the box or switch used to fire the blast. Before hooking the blasting circuit into the leading line, the line should be checked with a galvanometer to assure continuity of the circuit.

In tunnel or subway work, the blaster is the last person to leave the job after the loading is completed and the wires are connected. Only the blaster is permitted to throw in the electric switch to fire the blast. In open work, the blaster may direct an assistant to fire the blast. The blast should be fired only after all preparations have been made and safety precautions taken.

In tunnel or subway work, only the blaster or powder carrier may ride with explosives on the shaft cage or powder car. After a heading has been loaded, any unused explosives should be returned immediately to the main magazine.

Workers should not return to the blast area until all smoke, fumes and dust have cleared. The blast site must be inspected by the blaster before an "**ALL CLEAR**" is given. Workers should not return to the work area until an "all clear" signal is given. In tunnel or subway work, the waiting time is sometimes referred to as "smoke time." The amount of time allowed is usually about 20 minutes..

Before the "**ALL CLEAR**" signal is given special attention should be given to any evidence of misfires or unexploded materials. The muckpile should be inspected for any explosive materials that might be burning.

A misfire is the failure of an explosive charge to detonate at the proper time. Misfires are best handled by adequate planning and preparation. This will help prevent misfires from happening in the first place. When a misfire occurs all personnel should stay out of the area until it is safe to return. The power source used to fire the initiation system must be disconnected from the firing line. After the firing line is shunted or made safe, the blaster may enter the blast area to inspect the misfire. Any suspected unfired detonators or explosive materials should be treated as if they were live explosives.

Any explosives not used during the day must be returned to the vendor. If any unused explosives cannot be returned at the end of the day or before dark, the Bureau of Fire Prevention Explosives Unit must be notified. After the last shot has been fired for the day on a job, the Fire Department should be notified. This is done by calling the fire company responsible for the area where the magazine is located. Arrangements will be made for an inspection.

**Shot Records**

The blaster must keep a record of all shots made under his supervision during his working shift. The shot report is kept on the form shown in the illustration below. This form is provided by the Fire Department. The shot report shows the number of sticks and caps received from the magazine. The shot report indicates the date and time of each shot. It also shows the number of sticks and caps that were actually shot. The shot report shows what was done with any sticks and caps that were not used in a blast.

**FIRE DEPARTMENT  
CITY OF NEW YORK  
BUREAU OF FIRE PREVENTION**  
9 Metrotech Center  
Brooklyn, NY 11201-3857

**NOTICE**  
Superintendent, Blaster and Magazine Keeper shall inspect job area, carrying Boxes and magazines and sign the Record at the completion of each day's work.

**SHOT RECORD AND BLASTER'S  
DAILY REPORT**

**NOTICE**  
This slip is the property of the Fire Department, it must be kept in the magazine at all times and must not be surrendered, except to a duly Authorized representative of the Fire Department.

License No. \_\_\_\_\_ Contractor \_\_\_\_\_

Expiration Date \_\_\_\_\_ Location \_\_\_\_\_

Date	Sticks	Caps	Time	Sticks	Caps	Time	Sticks	Caps	Disposition
	Received			Shot			Balance		

**Blaster's Shot Report**

The work site superintendent, the blaster, and the magazine keeper at the end of each day's work must sign the shot report. The shot reports are kept in the magazine for inspection by the Fire Department Blasting Inspector or other authorized representative.

**Loading and Safety Techniques**

When making a hole in a cartridge for a primer, all loaders must use a wooden punch. No other means is permitted by the New York City Fire Department. Not following this directive would create safety hazards. The punch hole must be deeper than the length of the cap when inserted into the cartridge. Loaders are not permitted to make up any primers before loading operations begin due to safety reasons.

The loading of the blast hole can only be done under the supervision of a blaster certified by the New York City Fire Department. The overall blasting job is under the blaster's jurisdiction and loaders must follow their instructions. The "business end" of the blasting cap must be placed facing upward of the bore hole at all times. The shunt covering on a blasting cap must be left on at all times. The shunt covering acts as a safety device and prevents premature detonation.

Proper preparation before loading is necessary. Holes that were previously blasted must be thoroughly washed out. The washing removes any explosive that may have been left in the holes. In addition, it is a safety risk to drill into a previously blasted hole. Under no circumstances would you ever drill into a previously fired hole. Furthermore, no part of the loader's body should ever be placed over a blast hole while loading explosives. This safety technique would prevent serious injury, or even death, to a loader in the event of premature detonation.

Fifteen minutes of "smoke time" must pass after the blast has been fired before resuming work. This period allows sufficient time for the air to clear safely.

Caps and powder should never be transported together on a shaft cage. The caps and powder should be separated for safety reasons. Loaders are required to make two separate trips. Due to the hazards of explosives, no smoking is permitted at any time, under any circumstances whenever explosives are present. There are no exceptions to this rule.

Explosives at work sites must be under the constant supervision of a Certificate of Fitness holder at all times. Explosives are never to be left unattended at any time.

### **Devices and Equipment**

**The tamping pole** is used to tamp the powder in the bore hole. The pole must be made of plastic, fiberglass or wood. No other materials are acceptable since they pose a safety risk. Only a specifically approved **loading light** is permitted to be used when loading the tunnel face. Electric lights are prohibited because they may detonate the electric caps prematurely.

For safety reasons, **only one case of dynamite can be opened at a time**. This practice allows for proper control over the explosives. Dynamite is packed in fifty pound cases. Approved **safety cables or chains** must be used on all bull hose connections at all times. Only these devices ensure the utmost safety by preventing the hose from coming apart. Other devices cannot ensure this safety feature.

### **Certificate of Fitness**

Holding a Certificate of Fitness carries responsibilities to yourself and your colleagues. Any Certificate of Fitness holder at a blasting site who is observed consuming or in the possession of unauthorized drugs or alcohol will have his/her Certificate of Fitness revoked. There will be no exceptions to this rule. The Certificate of Fitness is valid for ONE year and renewals are at the discretion of the Fire Commissioner. Individuals submitting renewal applications for expired certificates will be required to take a new test.

## FIRE EXTINGUISHERS

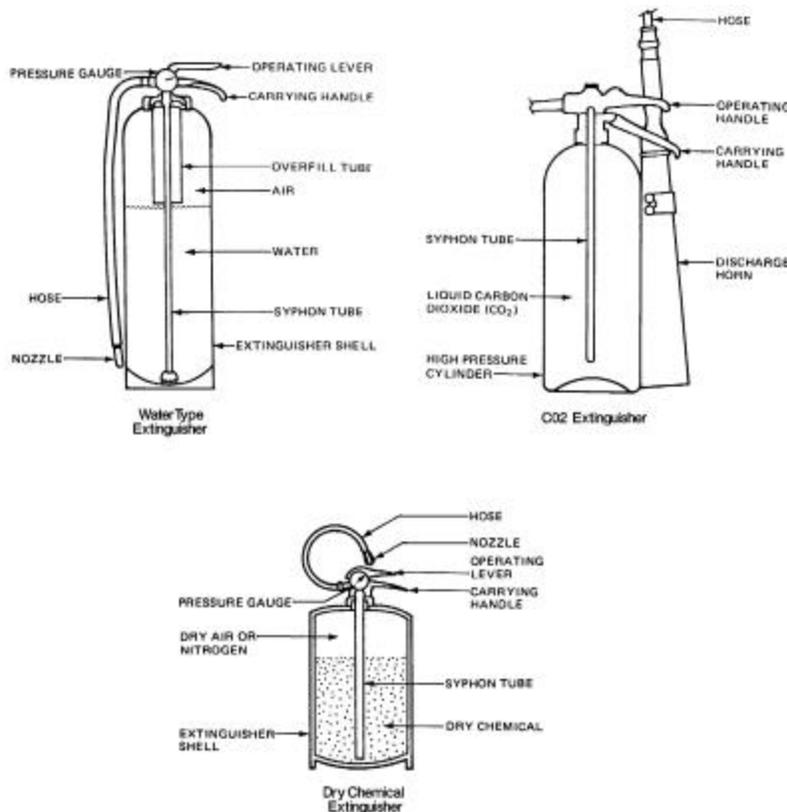
The user of explosives must be familiar with the different types of fire extinguishers that are present. The user must know how to operate the extinguishers in a safe and efficient manner. He/she must know the difference between the various types of extinguishers and when they should be used. Three classes of fires and the right kind of extinguishers are described below.

**Class A fires** occur when ordinary combustible materials are ignited. For example, wood and paper fires are classified as class A fires. Water type extinguishers should be used to extinguish these fires. The water type extinguishers cool the fire while quenching the flame.

**Class B fires** occur when flammable liquids or greases are ignited. These fires must be extinguished by smothering the flame. The flame may be smothered using CO<sub>2</sub>, dry chemical or foam extinguishers. Water type extinguishers are not effective for class B fires.

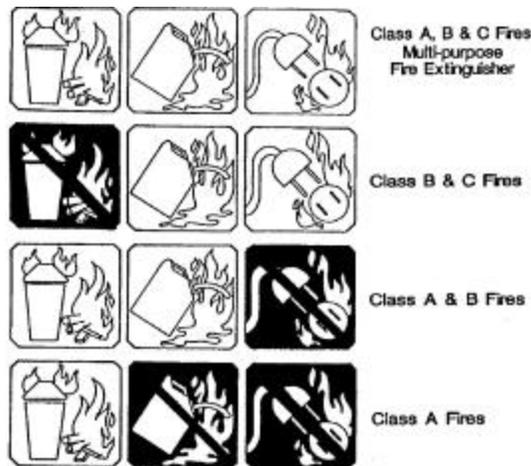
**Class C fires** occur when electrical equipment catches fire. These fires must be fought with fire extinguishers that do not conduct electricity. CO<sub>2</sub> and dry chemical extinguishers must be used to extinguish electrical fires. Foam and water type extinguishers must not be used to extinguish electrical fires.

Examples of Water type, CO<sub>2</sub> and Dry Chemical extinguishers are shown below.



### Typical Fire Extinguishers

Symbols may also be painted on the extinguisher. The symbols indicate what kind of fires the extinguishers may be used on. Examples of these symbols are shown on the following page.



**Typical Symbols Painted on Fire Extinguishers**

The symbol with the shaded background and the slash indicate that when the extinguisher must not be used. The explosives user must understand these symbols.

Generally, operation instructions are clearly painted on the side of the fire extinguisher. They clearly describe how to use the extinguisher in case of an emergency. An example of these instructions is shown below.



**Operation Instructions for a Fire Extinguisher**

PAGE {3}

13