

# A Guide to the Safe Handling of Hazardous Materials Accidents



**ASTM** STP 825



**STP 825**

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# **A GUIDE TO THE SAFE HANDLING OF HAZARDOUS MATERIALS ACCIDENTS**

A Special Supplement, "Initial Emergency Assessment—Initial Response Action," can be found on the inside back cover.

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## ACKNOWLEDGMENT

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ASTM A

ASTM B

Flammable Gas

Flammable Gas, Flammable Liquid

Combustible Liquid

Combustible Solid

Toxic Material

Corrosive Material

Biological Agent

Explosive Material

Emergency Response Guide (insert)

Inside back cover



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## PURPOSE

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# PURPOSE STATEMENT

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The material contained in this document is intended to be used in planning and training. Planning a response and training personnel are necessary to assure the safest, most effective, handling of a hazardous material incident. It must be recognized that all plans are subject to modification based on the actual facts of the situation. The flow charts are designed to assist the on-scene emergency responder in the decision-making process during the handling of a hazardous material incident.







# INTRODUCTION

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In emergency situations the hazard classification system of the Department of Transportation is useful, familiar, and available on the scene. This document is arranged by Department of Transportation Hazard Class and shipment volume. Within some classes, a distinction is made between bulk and package shipments. Bulk shipments are those that equal or exceed 110 gallons liquid (415 liters) or 1000 pounds dry (450 kilograms) measure, such as tank car or tank truck. Package shipments are those that are less than 110 gallons liquid or 1000 pounds dry measure per package.

The text portions of this document discuss the DOT hazard classes, terms used in describing the classes or the materials, and incident control tactics.

Two symbols are used in the flow charts. The diamond indicates a condition and should be read as a question: "Does this condition exist?" The rectangle recommends an action or provides information.

The charts are arranged by hazard class and shipment volume, both shown in the upper right-hand corner of each chart. Once the appropriate chart has been located, answer the condition questions starting in the upper left-hand corner and proceed as directed by the answers *yes* or *no* until you reach the action recommendation. If the situation changes, repeat the process.

Accidents involving multiple hazard classifications pose risks not adequately addressed by single hazard class decision charts. These charts do not address possible results of mixing various materials.

All evacuation distances are for protection of emergency response personnel. It would be prudent to evacuate the public further to provide maneuvering room for emergency response personnel.





# EXPLOSIVES

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## DOT CLASSES

Class A Explosive, Class B Explosive, Class C Explosive

### **Note**

These classes form a continuum of decreasing explosive hazard in the order given.

## DEFINITIONS

### **Explosive**

Any chemical compound, mixture, or device, the primary or common purpose of which is to function by explosion, i.e., with substantially instantaneous release of gas and heat.

### **Class A Explosive**

An explosive of detonating or otherwise maximum hazard.

### **Class B Explosive**

An explosive that functions by rapid combustion rather than detonation. Includes:

1. Liquid or solid propellant explosives.
2. Some explosive devices such as special fireworks.
3. Some pyrotechnic signal devices.
4. Some smokeless powders.

### **Class C Explosive**

Manufactured articles containing Class A or Class B Explosives, or both, as components but in restricted quantities, including certain types of fireworks.

## ALL SHIPMENTS

If an explosion happens as the result of an accident, the only thing that can be done is to care for any injured and to prevent the spread of fire sometimes caused by explosions.

If a fire has started near explosives, every effort should be made to put out the fire safely, or to remove the explosives to a safer place. Some explosives explode immediately on ignition, others may burn for some time before exploding, others may be completely consumed without any explosion. Owing to the extreme likelihood of the detonation of burning explosives, efforts to extinguish burning explosives are *not recommended*. Application of water to burning Class A or Class B explosives may precipitate an explosion. Evacuate everyone to a distance of 5000 feet (1500 meters) if Class A Explosives or 2500 feet (750 meters) if Class B Explosives are involved in a fire. For Class C explosives, consult the decision mechanism chart.

If the accident does not cause the immediate ignition or explosion of the

explosives, the most important precaution is to prevent fire. The area should be guarded to keep away all unauthorized persons. Before beginning to clear a wreck in which a vehicle containing explosives is involved, contact the shipper for detailed advice and assistance.

If the wreck involves a vehicle containing chemical ammunition, every precaution must be taken to prevent fire and casualties from gas leakage. Only those persons necessary to clear the wreckage should be allowed in the vicinity, and they should be adequately protected against any escaping gas.

If a shipment of propellant explosives, Class B, is involved, it will bear "Explosives B" placards. All packages in the vehicle will be marked to indicate that they contain propellant explosives. Propellant explosives may be in the form of very fine grains or extremely large solid pieces weighing several tons (500 tons is about 4500 kilograms). Class B Explosives are not likely to explode because of impacts or friction, although ignition of such explosives by friction is possible. Care must be exercised in handling broken or damaged packages. Every precaution must be taken to keep Class B Explosives away from sparks or flames since many of these explosives will burn with rapidity approaching explosive violence when ignited. Care must be exercised to avoid unnecessary inhalation of smoke since the products of combustion of a few kinds of propellant explosives are poisonous.

In all cases where explosives are involved in fires or serious accidents on the railroad, the Bureau of Explosives (202-835-9500) should be notified. The Bureau of Explosives representative will assist in determining whether the particular kind of explosive involved in the accident may have caused contamination of the area with explosive or toxic materials so that necessary procedures for decontamination may be organized.

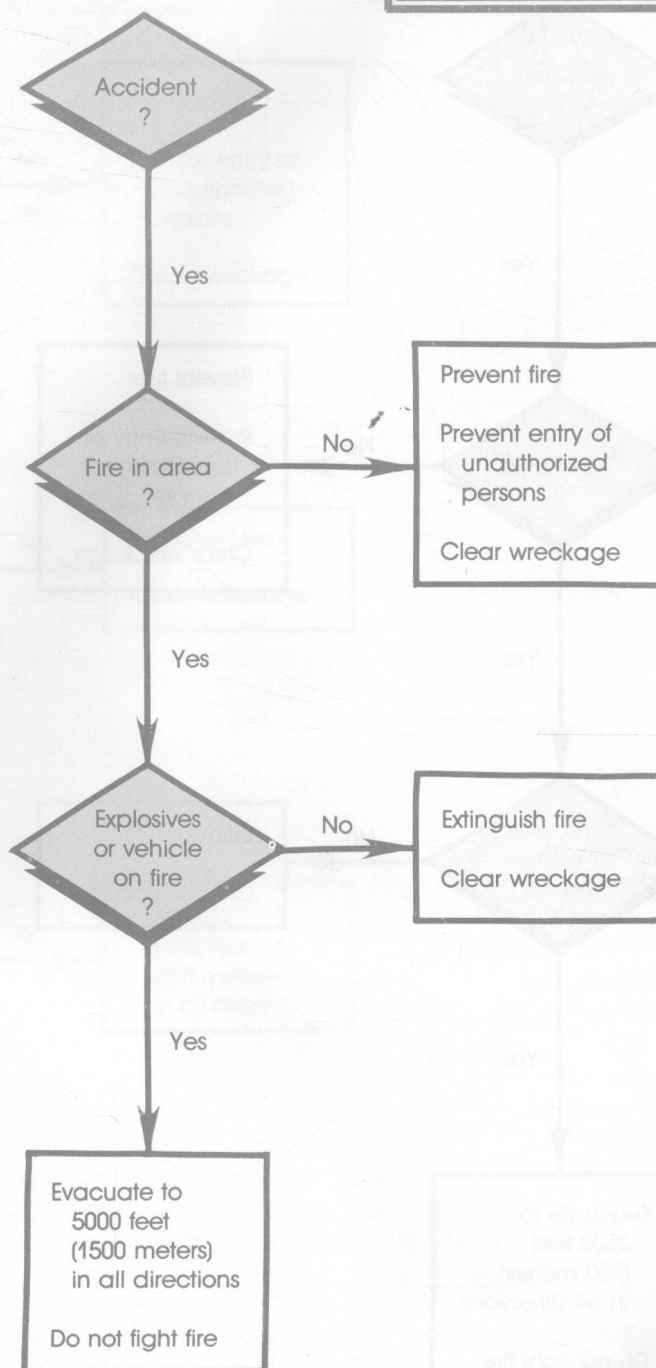


CLASS

CLASS "A" EXPLOSIVES

SIZE

ALL

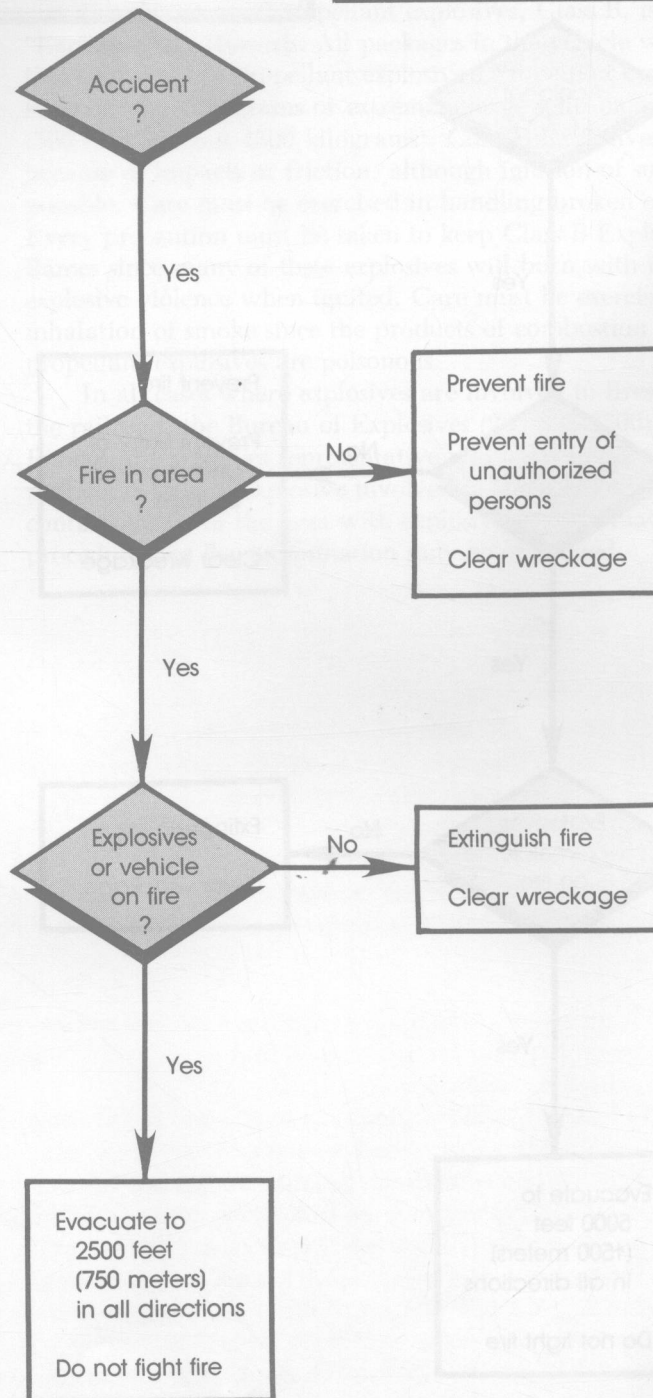


CLASS

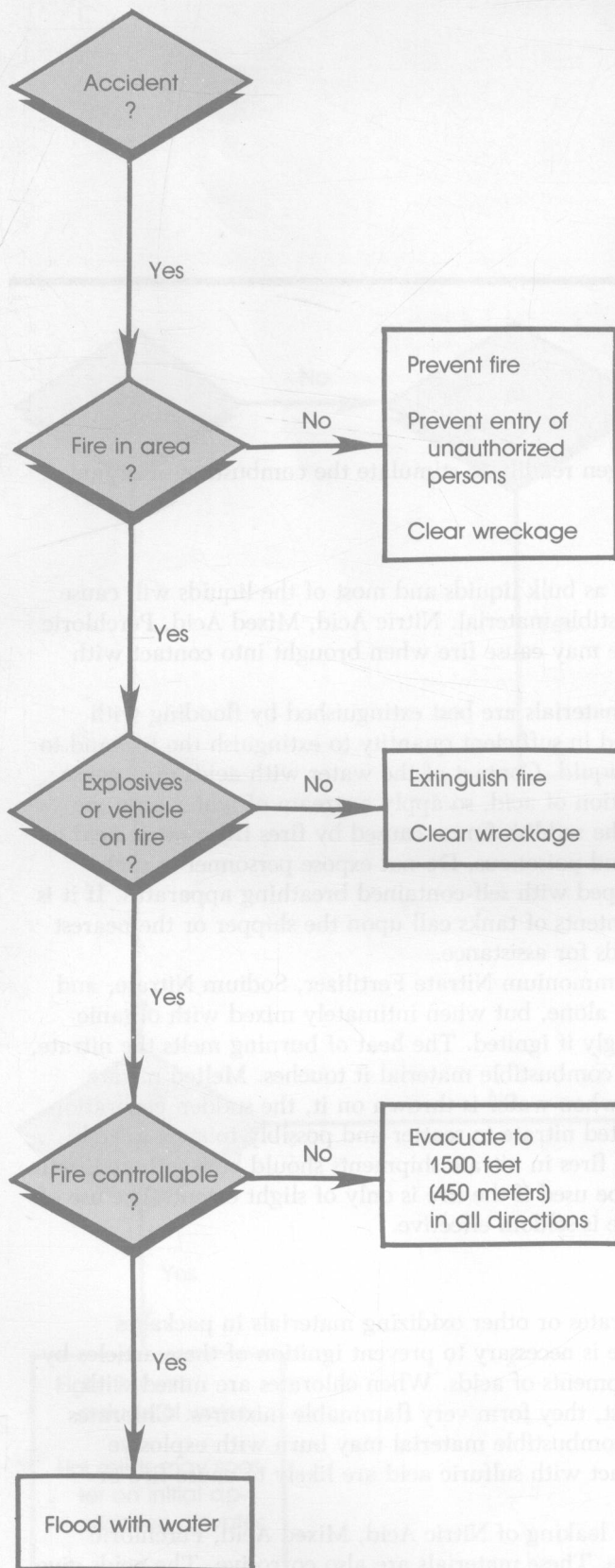
CLASS "B" EXPLOSIVES

SIZE

ALL







CLASS

**CLASS "C" EXPLOSIVES**

SIZE

**ALL**

# OXIDIZER

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## **DOT CLASS**

Oxidizer

## **DEFINITION**

A substance that yields oxygen readily to stimulate the combustion of organic matter.

## **BULK SHIPMENTS**

A few oxidizers are shipped as bulk liquids and most of the liquids will cause fire by contact with combustible material. Nitric Acid, Mixed Acid, Perchloric Acid, or Hydrogen Peroxide may cause fire when brought into contact with combustible materials.

Fires caused by these materials are best extinguished by flooding with water. Water should be used in sufficient quantity to extinguish the fire and to dilute and wash away the liquid. Contact of the water with acids may cause slight explosions and projection of acid, so apply a stream of water onto the fire from a safe distance. The reddish fumes caused by fires from nitric acid or mixed acids are irritating and poisonous. Do not expose personnel to such fumes unless they are equipped with self-contained breathing apparatus. If it is necessary to transfer the contents of tanks call upon the shipper or the nearest manufacturer of these liquids for assistance.

Ammonium Nitrate, Ammonium Nitrate Fertilizer, Sodium Nitrate, and other nitrates will not burn alone, but when intimately mixed with organic matter they will burn strongly if ignited. The heat of burning melts the nitrate, which may then ignite any combustible material it touches. Melted nitrate holds a great deal of heat; when water is thrown on it, the sudden generation of steam will cause the melted nitrate to scatter and possibly to start a fresh fire. Whenever practicable, fires in nitrate shipments should be smothered with earth or sand. Water may be used if the fire is only of slight extent. The use of water on a large nitrate fire is seldom effective.

## **PACKAGE SHIPMENTS**

In accidents involving chlorates or other oxidizing materials in packages bearing oxidizer labels, care is necessary to prevent ignition of these articles by friction or contact with shipments of acids. When chlorates are mixed with organic matter, or even dust, they form very flammable mixtures. Chlorates mixed with finely divided combustible material may burn with explosive violence. Chlorates in contact with sulfuric acid are likely to cause fire or explosion.

Fire may be caused by leaking of Nitric Acid, Mixed Acid, Perchloric Acid, or Hydrogen Peroxide. These materials are also corrosive. The acids give off irritating and poisonous fumes. If fire is started, it should be extinguished by flooding with water.



CLASS

OXIDIZER

SIZE

ALL

