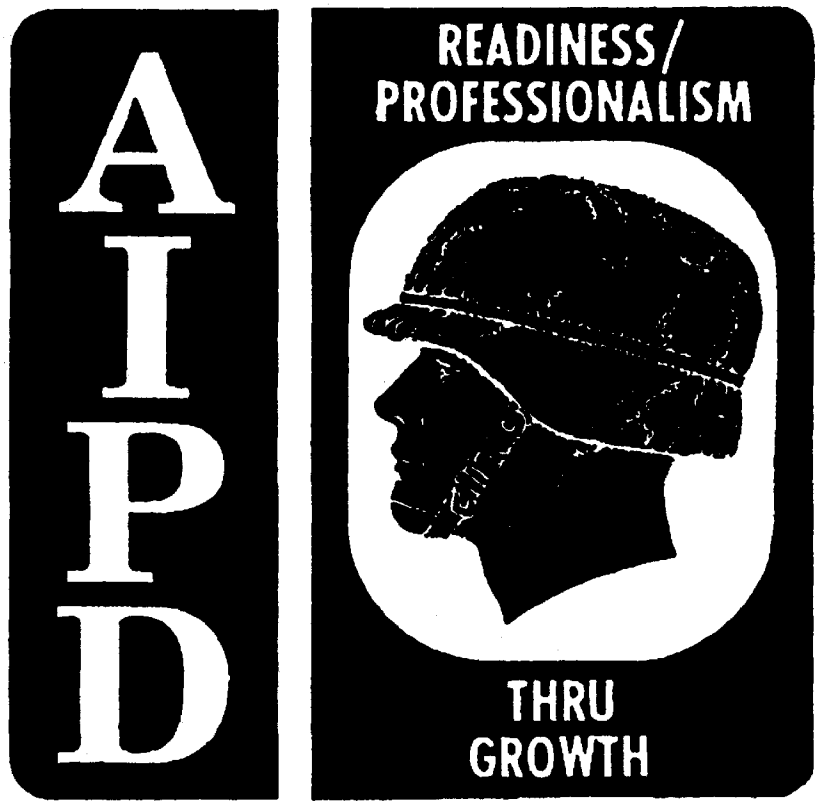
SUBCOURSE	EDITION
MM4647	9

AMMUNITION/EXPLOSIVE

STORAGE STANDARDS



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT

ARMY CORRESPONDENCE COURSE PROGRAM

AMMUNITION/EXPLOSIVE STORAGE STANDARDS

Subcourse Number MM4647

EDITION 9

Missile and Munitions
United States Army Combined Arms Support Command
Fort Lee, Virginia 23801-1809

3 Credit Hours

Edition Date: July 1989

SUBCOURSE OVERVIEW

This subcourse is designed to teach you the fundamental standards for ammunition and explosive storage. This subcourse has instructions on storage, types of storage facilities, barricade construction requirements, fire protection, and hazard markings.

There are no prerequisites for this subcourse.

Current doctrine was used to prepare this subcourse. In your own work situation, always refer to the latest publication.

The words "he," him," "his," and "men," when used in this publication, represent both the masculine and feminine genders unless otherwise stated.

TERMINAL LEARNING OBJECTIVE

TASKS: Identify basic standards for the safe storage of ammunition and explosives, including quantity-distance, compatibility, types of facilities and barricade requirements.

CONDITIONS: You will have access to extracts of TM 9-1300-206, and AR 385-64. You may work with or without supervision.

STANDARDS: Upon completion of this subcourse, you will be able to answer questions on the storage requirements and standards for military ammunition and explosives in, accordance with TM 9-1300-206.

TABLE OF CONTENTS

LESSON

AMMUNITION AND EXPLOSIVE STORAGE STANDARDS

Soldier's Manual Task: 093-400-4124

OVERVIEW

TASK DESCRIPTION:

In this lesson you will identify basic standards for the safe storage of ammunition and explosives, including quantity distance, compatibility, types of facilities, and barricades.

LEARNING OBJECTIVE:

ACTIONS: Learn the requirements that must be met to safely and properly store various explosives and ammunition.

CONDITIONS: You will have access to extracts from TM 9-1300-206, and AR 385-64. Complete this subcourse working independently or in a group.

STANDARDS: Upon completion of this subcourse, you will be required to answer questions on the storage requirements and standards for military ammunition and explosives in accordance with TM 9-1300-206, and AR 385-64.

REFERENCES: The material contained in this lesson was derived from the following publications:

AR 385-64
TM 9-1300-206

INTRODUCTION

As an Ammunition Specialist, MOS 55B40, another of your many tasks is to ensure the safe and compatible storage of military explosives and ammunition. As you know, not all types of munitions can be stored together. In this lesson, you will learn how to separately store the various types of munitions, and where to find the necessary information for this purpose.

PART A - AMMUNITION STORAGE AREAS

1. Outdoor Storage.

The primary purpose for ammunition and explosive storage is to maintain sufficient stock levels for research and development, defensive, and offensive military action. There are several hazards involved in the storage of ammunition and explosives. By design, explosives may be fatal to personnel, or destroy property and equipment when detonated. Explosives and ammunition are sensitive to shock, heat, friction, and other materials. Explosives must be handled carefully and protected from contact with certain other materials during cleaning, or filling of containers. This subcourse teaches storage standards for ammunition and explosives.

a. Ammunition and Explosives Can be Stored Indoors and Outdoors.

(1) Outdoor storage is neither desirable nor recommended. It is a field expedient method and should be used in emergencies only. When it becomes absolutely necessary to store ammunition and explosives outdoors, the maximum amount of ammunition should be covered by rain and fire resistant tarpaulin over a sturdy frame.

(2) A Priority List should be developed based on local security conditions and storage area contents. Certain items of ammunition and explosives are sensitive to exposure to water or direct sun. When your Ammunition Supply Point (ASP) has the following items and no indoor storage (magazine), these items should be covered in the order listed.

- Fuzes, Primers, Boosters.
- Pyrotechnics.
- Propelling Charges.
- Demolition Priming Devices.
- Illuminating and other Rounds with Black Powder Explosive Charges.
- Chemical Ammunition.
- Rocket Ammunition.
- Small Arms Ammunition.
- Grenades.
- Mines.
- Demolition Items.
- Fixed and Semifixed Ammunition (smallest caliber first).

- Separate-Loading Projectiles.

- Bombs.

(3) Outdoor storage sites should be level, well-drained, and free from flammable material. At least three inches of dunnage must be used to keep the ammunition and explosives off the ground. Keep the stacks separated, and allow free-air circulation. An air space of at least 18 inches is needed between the top of the stack and the overhead cover.

(4) Perform frequent inspections to detect trash or unstable stacks. When putting up stacks of munitions, ensure that dunnage awaiting immediate use is located at least 50 feet away from the stacks. Excess dunnage in the immediate work area may become a fire hazard. At another point in this lesson, firefighting equipment and fire symbols are discussed.

b. Special Requirements for Outdoor Storage.

Munitions maintained in unbarricaded open storage must be treated as above-ground storage, at least as far as quantity-distance separation is concerned. They can be temporarily erected between earth-covered magazines, provided:

- Adjacent earth-covered magazines are 400 feet apart.

- Sites are barricaded and separated from the barricaded side of the nearest magazine by 185 feet.

- Sites do not extend beyond the front or rear of magazines in the same row.

2. Quantity-Distance (QD) Requirements.

Quantity-distance requirements were developed to provide certain levels of protection for nearby communities, public railroads, highways, and plant facilities from the effects of explosions that might occur within an ammunition storage area.

a. Listed below are some quantity-distance terms and definitions with which you need to become familiar. Your may refer back to this list any time during the lesson to keep them fresh in your mind.

(1) INTRALINE DISTANCE: The minimum distance permitted between any two buildings within one operating line.

(2) INHABITED BUILDING DISTANCE: The minimum permissible distances which may be expected to protect buildings from substantial structural damage and their occupants from death or serious injury.

(3) PUBLIC TRAFFIC ROUTE DISTANCE. The minimum distance permitted between any public street, road, highway, navigable waterway or passenger railroad and an ammunition storage facility.

(4) MAGAZINE DISTANCE: The minimum distance between magazines that is expected to prevent the propagation of explosion from one magazine to another. Distance required is determined by the type of magazines and also the type or quantity of ammunition or explosives stored therein.

(5) STORAGE COMPATIBILITY: The ability of ammunition of different types to exist unchanged in storage under certain conditions of temperature and moisture, when in the presence of each other. If this condition exists, the two materials are said to be compatible.

(6) QUANTITY-DISTANCE SITING CRITERIA: The method of calculation used to determine the total quantity of explosive authorized in a magazine, operation building, or explosive site.

b. The term quantity-distance is the Net Explosive Weight (NEW) of ammunition, or explosive items that may be stored at one location based on the characteristics and hazards which they present. It also includes how near this storage location may be to buildings and other areas used by the local people and other ammunition or explosive storage sites. To put it another way, quantity-distance requirements protect persons and property near or around storage areas. They reduce to a minimum the possibility of an explosion in a given storage location.

c. See Figure 1 for Quantity-Distance Requirements. A numerical figure in parentheses placed to the left of the division designators 1.1 through 1.3, such as (18) 1.1, (08) 1.2, and (06) 1.3 is used to indicate the minimum separation distance (in hundreds of feet) for protection of inhabited buildings, public traffic routes, and personnel in the open from ammunition and explosives.

AMMUNITION CLASS AND DIVISION	MAXIMUM POUNDS OF HE	MINIMUM INTERSITE DISTANCE (FEET)
1. 4	No Limit	400
(04) 1. 2	100,000	400
(08) 1. 2	100,000	800
(12) 1. 2	100,000	1200
(18) 1. 2	100,000	1800
1. 1	100,000	400*
*or fragment distance (if appropriate) whichever is greater.		

Figure 1. Open Storage Earth Covered Magazine Intersite Distances.

(1) Sites not located between earth-covered magazines cannot be closer than 1200 feet to any above ground magazine. If the open storage contains class (08) and (12) 1.2, then it cannot be placed closer than 800 and 1200 feet to open storage sites containing class (18) 1.1 munitions.

(2) In addition to the above, open storage sites not located between earth-covered magazines must be within the limitations as indicated below in Figure 2.

AMMUNITION CLASS AND DIVISION	MAXIMUM POUNDS OF HE	MINIMUM INTERSITE DISTANCE (FEET)
1. 4	No Limit	100
(04) 1. 2	No Limit	400
(08) 1. 2	500,000	800
(12) 1. 2	500,000	1200
(18) 1. 2	100,000	1800
1. 1	100,000	280 (barricaded)*
	100,000	510 (unbarricaded)*
	250,000	380 (unbarricaded)*
	250,000	695 (unbarricaded)*
*or fragment distance (if appropriate) whichever is greater.		

Figure 2. Open Storage Intersite Distances.

(3) For both circumstances above, normal inhabited building distances, and public traffic route distances will be maintained around outdoor sites.

3. Quantity-Distance Hazard Classifications.

a. There are five Quantity-Distance classes and divisions. They are broken down as follows:

CLASS 1.1 - Mass detonating.

CLASS 1.2 - Nonmass detonating.

CLASS 1.3 - Mass fire.

CLASS 1.4 - Moderate fire.

CLASS 6.1 - Toxic Chemical.

b. Ammunition and explosives are Hazard Class 1. Ammunition without explosive components that contains toxic chemical agents is included in Class 6. Containers of toxic chemical agents in bulk are also included in Class 6. Class 1 is divided into divisions based on the character and predominance of the associated hazards and of the potential for causing personnel casualties or property damage. Items of ammunition and explosives which have a similar effect, or provide a similar hazard in the event of accidental ignition or detonation are grouped together into quantity-distance classes. However, this does not imply that the items may be stored together, it merely refers to the effect from accidental ignition or detonation.

CLASS 1.1 - Items include those that are expected to mass detonate. (When distance is not given, the distance is 1,250 feet.)

CLASS 1.2 - With a (04), (08),(12) or (18) before the 1.2 items, are those which have principal hazards of fragmentation and blast. The number in parentheses multiplied by 100 is the expected lethal fragment distance.

CLASS 1.3 - Items which have a mass fire hazard associated with them.

CLASS 1.4 - Items with a moderate fire and no blast hazard.

CLASS 6.1 - Munitions and containers which are filled with toxic chemical agents, e.g. VX, GB, GB2, HD, etc.

PART B - AMMUNITION STORAGE STRUCTURES

Ammunition and explosives can be stored outdoors in two ways, barricaded and unbarricaded. Each has its own special requirements.

1. Barricade Requirements.

Properly constructed barricades that are either of the separated artificial type or the substantial natural type are effective means of protecting structure or operations. General rules concerning barricades are as follows:

a. Barricades shall not be used to reduce distance for fire hazard materials such as class 1.3 propellants and fragment producing items such as class 1.2 ammunition.

b. Protection is considered effective when a line drawn from the top of any sidewall of the explosives building to all parts of the other location will pass through the intervening barricade.

c. For railroads and highways to be considered barricaded, such a line (as above) must pass 12 feet above the center of the highway or railroad.

d. A barricade must be separated from the building it is to screen, and the building containing the hazard.

e. Barricades may be natural or artificial earth mounds having natural sloping sides, or single revetted with either wood or concrete, with an earth mound of a minimum width of 3 feet at the top, and having a natural slope on one side.

f. Existing double revetted artificial barricades of a minimum width of 3 feet at the top, with sides sloped, and with proper anchorage to give stability against overturning forces are approved for reducing quantity-distance requirements for a maximum of 50,000 pounds of high explosives.

2. Barricaded Open Storage Modules.

A storage module is a barricaded area of not more than eight hard surfaced cells separated from each other by earth barricades. It is designed for mass detonating munitions only. It is possible that you will be involved in the construction of one or more modules in the event of a mobilization. A typical module is shown below in Figure 3.

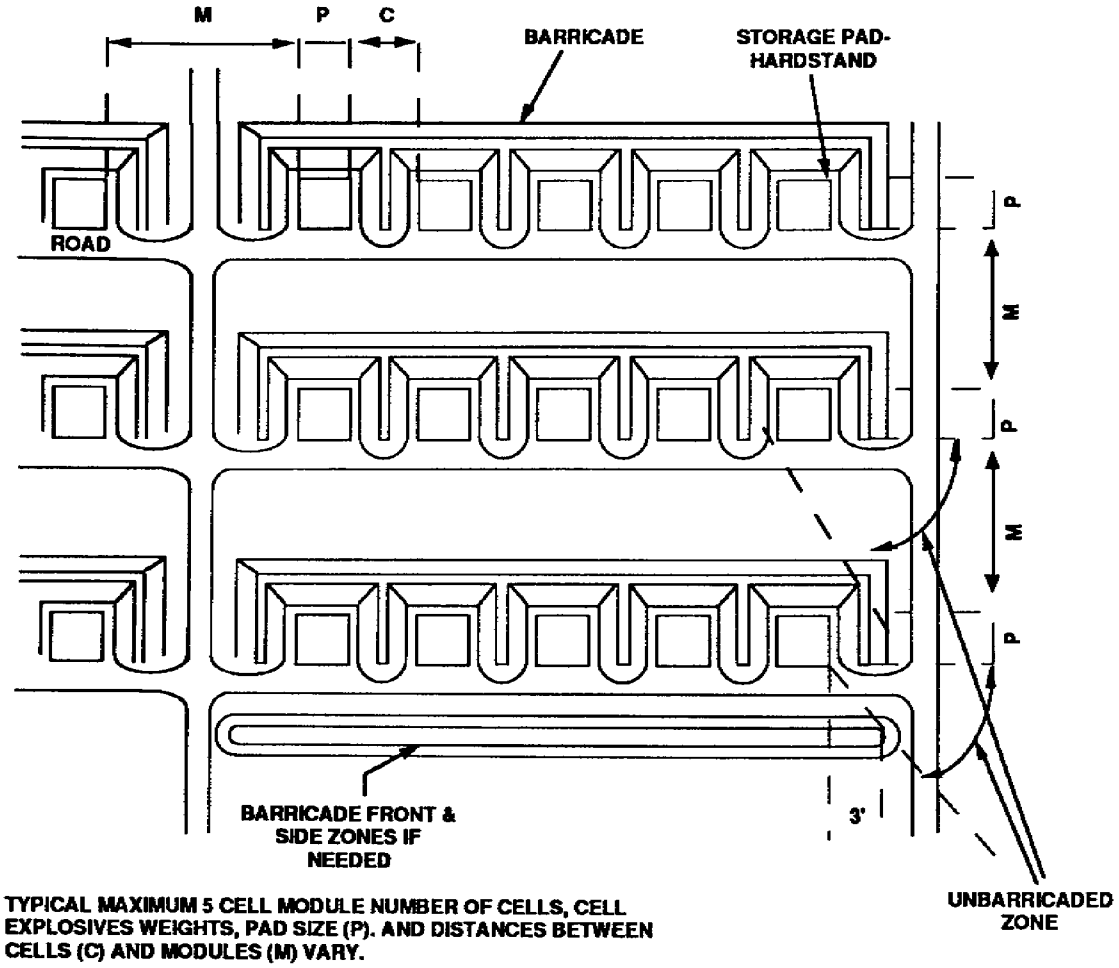


Figure 3. Storage Modules

a. The maximum amount of explosives authorized for storage within a cell and a module, as well as the type of explosives authorized are:

- Cell capacity - 250,000 pounds.
- Module capacity (8 cells) - 2,000,000 pounds.
- Type explosives - HE bombs and similar cased Class 1.1 ammunition only.
- Items must be compatible in each module.

b. If you are required to supervise the construction of modules, there are certain minimum requirements that must be met. Whenever possible, you should take advantage of natural barriers in the vicinity of the module site. Requirements include:

- Barricade height.
- Barricade width, top and bottom.
- Barricade length.
- Barricade material.

c. Although storage modules are not normally used in the United States, they do have certain advantages and disadvantages.

(1) Some of the advantages are:

- Greatly reduced real estate requirements.
- Greatly improved security with comparable forces.
- Reduced vulnerability to direct fire because of smaller area and barricades.
- Reduced transportation requirements within the area.
- Greatly reduced internal road net.

(2) The disadvantages of storage modules are:

- Possibility of explosion or fire moving from one cell to others due to heat generation or indirect fragmentation.
- Increased vulnerability to indirect fire and bombs due to concentration.
- Additional engineer support compared to open unbarricaded storage or roadside storage.

d. Detailed Requirements for Modular Storage Structures (cells).

Storage modules and cells must meet the requirements in Chapter 4, TM 9-1300-206, and AR 385-64. The paragraphs below are based on these references.

(1) The size of the cell is variable. The minimum size of the hardstand in the cell is shown in Figure 4. If possible, the barricade height should be increased 3 to 5 feet. This increase in height should stop most of the fragments that could cause an explosion from cell to cell.

INTERMAGAZINE SEPARATION FOR BARRICADE STORAGE MODULES FOR MASS-DETONATING EXPLOSIVES

Net pounds of explosives	Minimum explosives-to-explosives distance in feet (barricaded) between		Barricade height based upon storage pad size	
	Cells D=1.1 W1/3	Modules D=2.5 W1/3	Cell storage pad size (width or depth), in ft.	Minimum height of barricade above top of stock in feet
COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5
50,000	40	90	30	2
100,000	50	115	30	2
125,000	55	125	30	2
150,000	60	130	30	2
175,000	60	140	30	2
200,000	65	145	30	2
200,000	65	145	40	2 1/2
225,000	65	150	40	2 1/2
250,000	70	160	40	2 1/2
250,000	70	160	50	3

1 The barricade height above the explosives stack shown in shown in Column 5 will be increased 6 inches for each 10 foot increase in width or depth of the pad size shown in Column 4.

Figure 4. Minimum Distances/Sizes.

(2) When the barricade is constructed, the slope should be a minimum of 1 1/2 foot in width to every 1 foot in height. It is preferred that the slope be two feet wide for every 1 foot in height.

(3) For minimum effective protection, the crest of the barricade must be three feet wide, and higher than the top of the stored ammunition. This height is determined as shown below. A line is drawn from the top of the far edge of the stack to be protected at a 2 degree angle above the horizontal. This line must pass through the entire 3 foot width of the top of the beam. Where feasible, barricade heights should be 3 to 5 feet higher than shown in Figure 5. This increased height is based on a line drawn at an angle of 5 degrees above the horizontal.

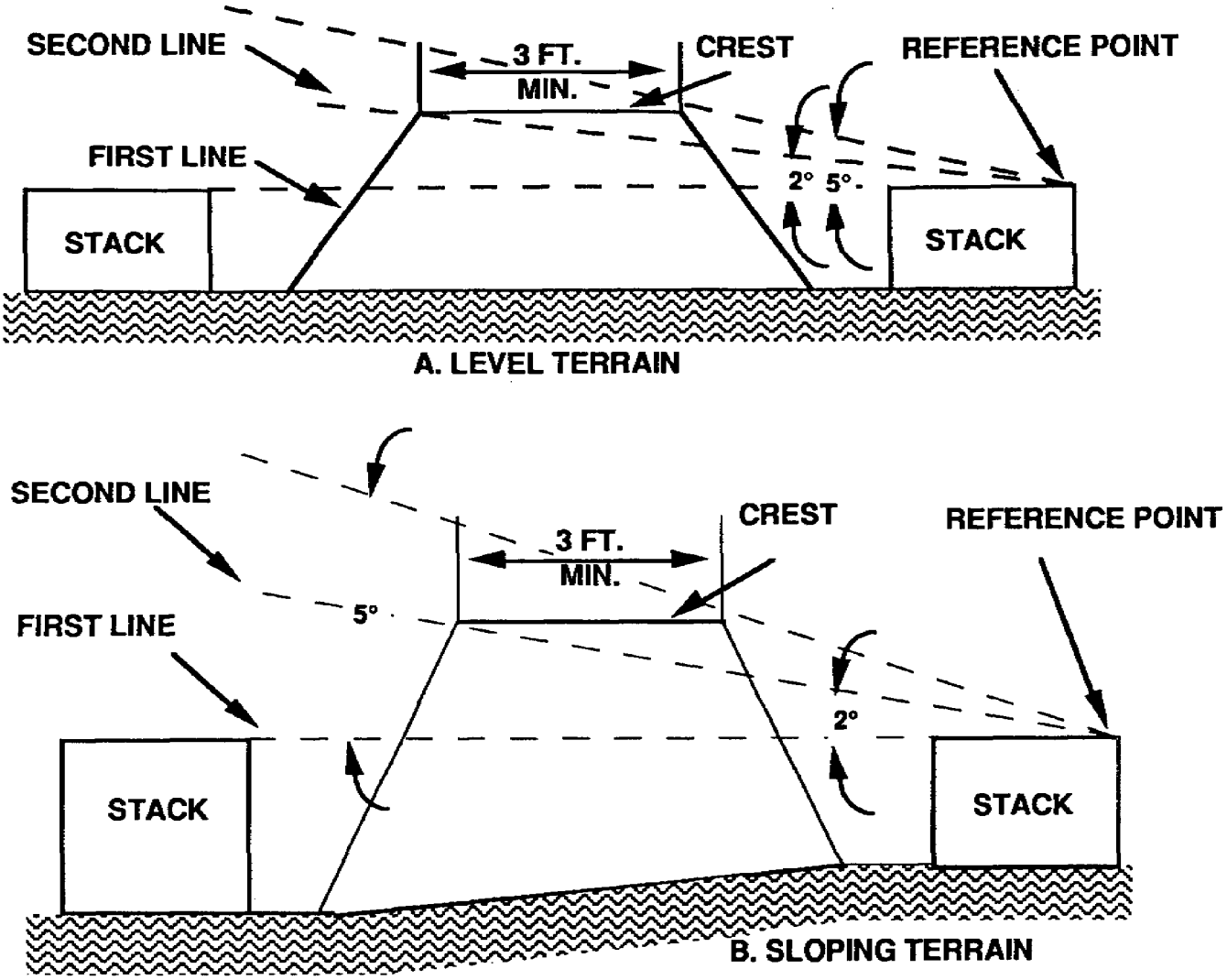


Figure 5. Determination of Barricade Height.

(4) The intended size of the stack can be predetermined by the storage officer. He can base it on message traffic stating what ammunition is coming, how much, and how packed.

(5) The use of the 2 degree (or 5 degree) line works on ammunition and explosives stacked on either level or sloping pads. See Figure 5. Note the increase in height necessary with the 5 degree line. Remember also, when you increase the height, you must increase the width.

(6) The barricade width is determined by extending the barricade (not counting the end slope) 3 feet beyond a line from the extreme edges of two stacks of ammunition or buildings to be protected. This is illustrated below in Figure 6. Note that the 3 feet is at the crest of the barricade. It does not include the end slope.

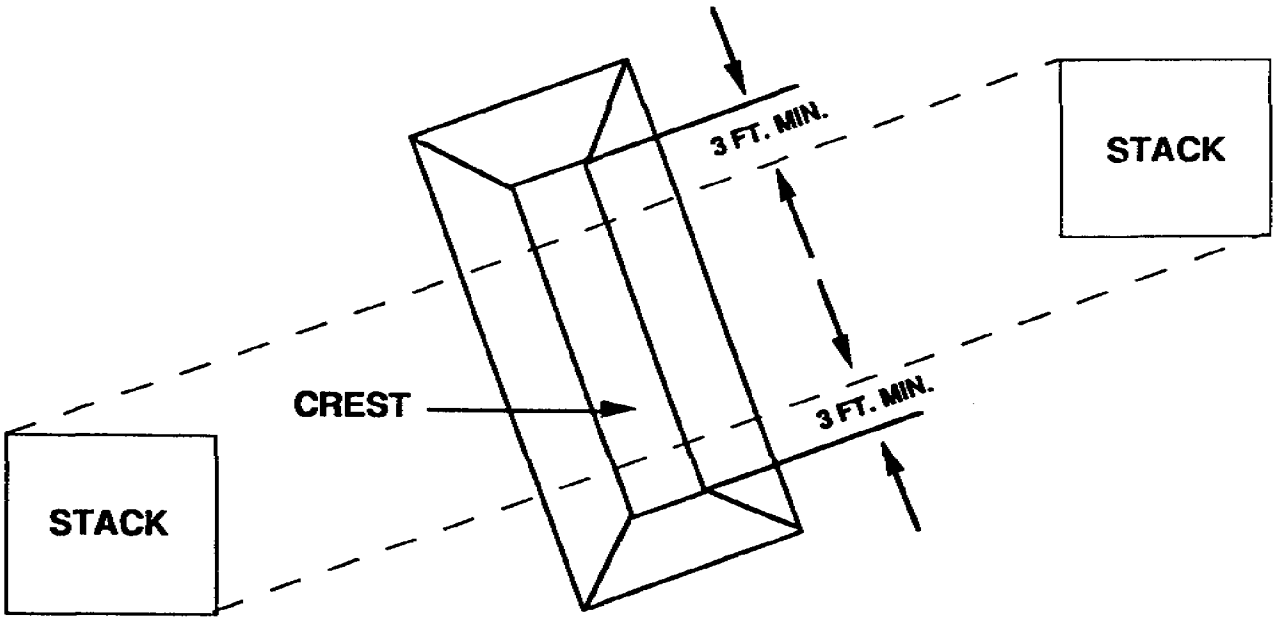


Figure 6. Determination of Barricade Length.

(7) You can modify barricade requirements by substituting a retaining wall on one side. Preferably the retaining wall is constructed of concrete.

(8) Barricades should be made of reasonably cohesive soil. The soil should be free of organic matter, trash, debris and stones heavier than 10 pounds or larger than 6 inches in diameter. In sandy soil the barricade should be finished with a suitable material to assure structural integrity.

e. Detailed Requirements for Siting a Module.

No restrictions are imposed upon the arrangement of cells within a module, or on the arrangement of groups of modules. Cell openings will not be faced towards each other unless barricaded, or they must meet the standard QD for unbarricaded, above ground magazines.

2. Magazine Storage.

The storage of ammunition in the zone of the interior (ZI) means in the 50 United States. Ammunition storage in the ZI is governed by different standards than ammunition storage in the theater of operations. For the remainder of this lesson, we will be concerned with ammunition storage in the ZI.

a. Earth-Covered Magazines.

Earth-covered magazines are preferred for the storage of ammunition. Ammunition items stored in

these magazines are better protected from outside sources of exposure than in above ground types of outdoor storage. They provide temperature control and are particularly desirable for the storage of propellants and pyrotechnics. There are three types. (See Figure 7.)

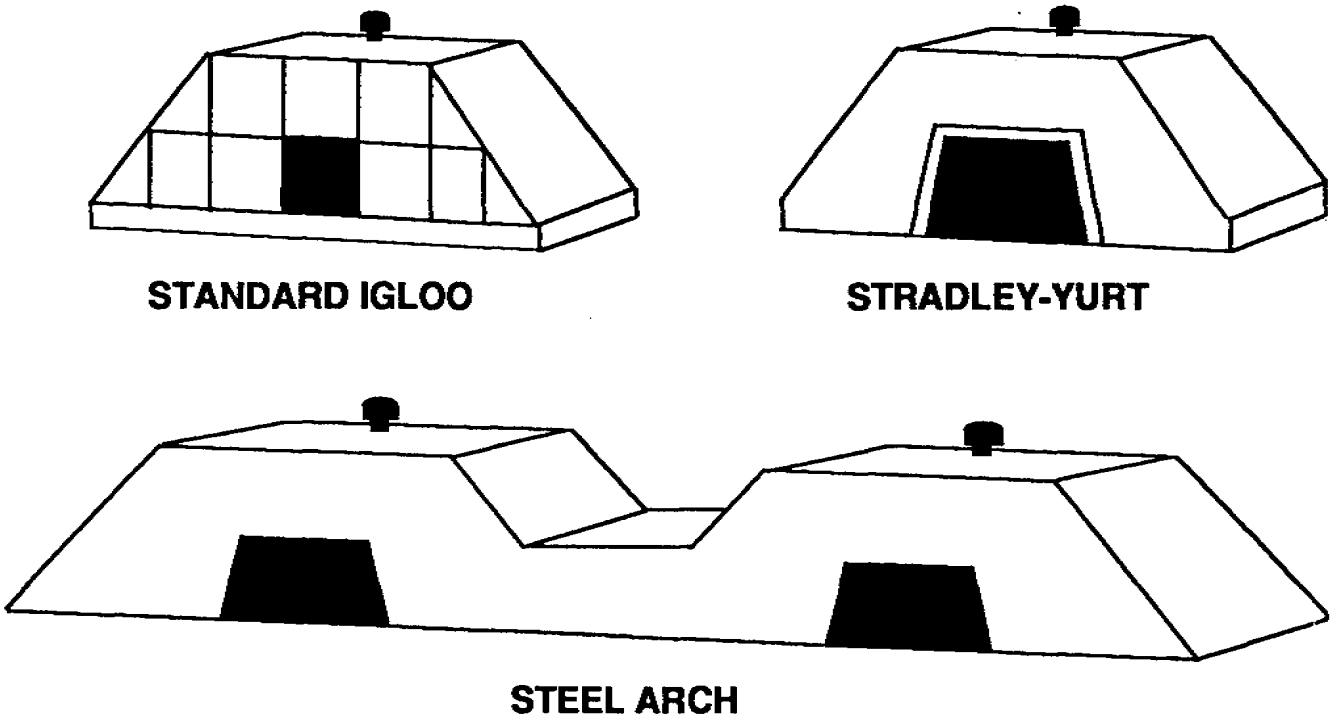


Figure 7. Earth Covered Magazine.

(1) STANDARD IGLOO is an older design. They are not practical for storage of large missiles and rockets in this age of palletized and containerized packaging. The door is too small to admit entrance of a standard 40 by 48-inch pallet moved by a forklift. This type of magazine is obsolete and has been, or is being replaced by the newer type magazines.

(2) STEEL ARCH magazine has the same inside round walls as the igloo magazine. The inside looks like the inside of a Quonset hut. It has semicylindrical metal walls and ceiling, a concrete floor and a door wide enough to handle pallets. Missile containers can be moved into these magazines.

(3) STRADLEY-YURT magazines are built of reinforced concrete with a wide door or double door to accommodate the present day ammunition packaging. Forklifts can easily go in and out with pallets and missile containers. Because of the straight side design of the Stradley-Yurt, it can be used to store nearly 25 percent more ammunition than standard igloo or steel arch type magazines of similar size.

(4) The sizes of earth-covered magazines vary, but some common specifications are listed below. Remember, earth-covered magazines provide the BEST storage for ammunition.

- Standard Igloo - 26 feet 6 inches wide by 12 feet 9 inches high by 40, 60, or 80 feet in length.
- Steel Arch - 25 feet wide by 10 feet high by 40 or 64 feet in length.
- Stradley-Yurt - 20 feet wide by 14 feet high by 40, 60, or 80 feet in length.

b. Above Ground Magazines (Standard Magazines).

Standard magazines (Figure 8) are made with steel and concrete frames and have hollow tile walls filled with sand. They have concrete floors sometimes covered with sparkproof topping. The largest standard magazines are about 51 feet wide by 218 feet long. The magazines were designed to store fixed and separate loading projectiles. For future use, they should be restricted to storage of classes 1.2, 1.3, and 1.4.

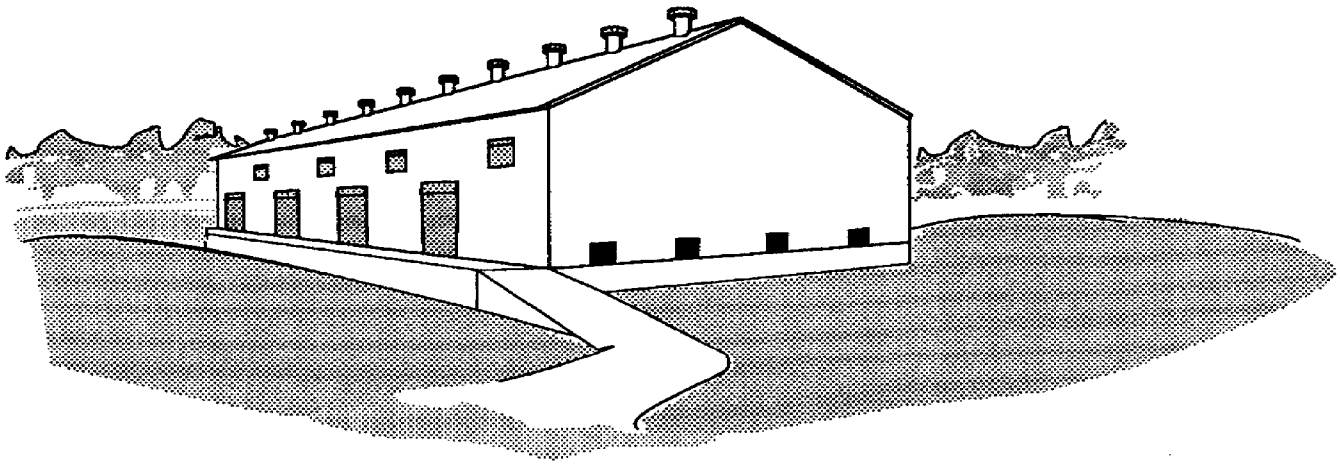


Figure 8. Standard Above Ground Magazine.

(1) High explosive or black powder magazines (Figure 9) are used to store bulk explosives, such as TNT and black powder. They are about 27 feet wide by 45 feet long and are spaced 800 feet apart. Should one blow up, the next magazine will not be affected.

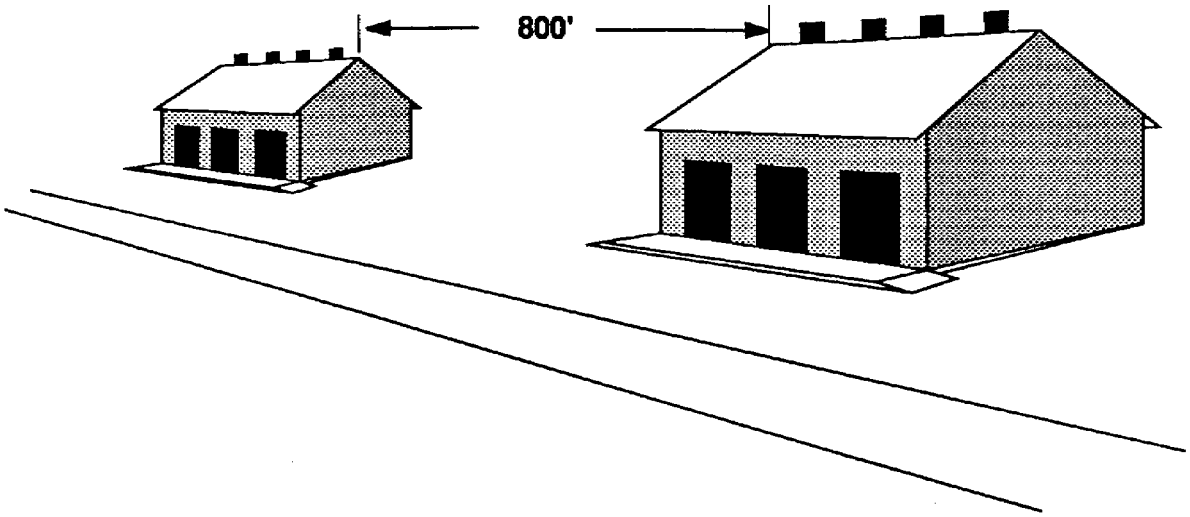


Figure 9. High Explosive Black Powder Magazine.

(2) Primer or fuze magazines (Figure 10) are exactly the same as high explosive magazines, that is, the same construction and dimensions. The difference is in the spacing; primer or fuze magazines are spaced 300 to 400 feet apart. Less spacing is required because primers and fuzes contain much less explosives than bulk explosives.

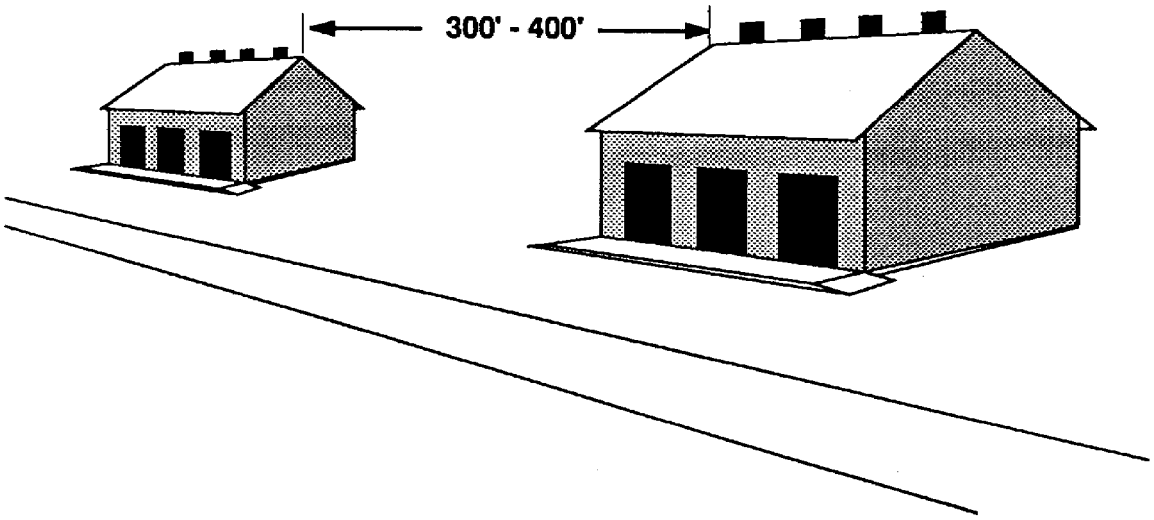


Figure 10. Primer or Fuze Magazine.

(3) Earth covered magazines are the best and safest type of storage. They should be used for separate loading and bulk high explosives if there is enough storage space available.

Standard above ground magazines, today and in the future, will have small arms ammunition, firing devices, and other less explosive or hazardous items stored in them. These items will be stored here regardless of the original design ideas.

(4) All magazines will have DA Label 85 (Figure 11) posted near or on the door inside of the magazine. These general instructions apply to magazine storage. Study the instructions carefully.

STORAGE AND CARE OF EXPLOSIVES
(MAGAZINE PLACARD)

General Instructions

1. Always handle explosives and ammunition carefully.
2. Remove dirt, grit, and foreign materials from containers and ammunition before placing in storage.
3. Do not store explosives and ammunition in damaged containers.
4. Keep all containers in magazine effectively closed so that the contents cannot be handled, examined, or removed.
5. Store each lot separately. Make the stacks stable. Provide for a free circulation of air to all parts of the stack. Raise containers and ammunition off the floor by dunnage.
6. Do not open, repair, pack or repack containers in or within 75 feet of magazine except as permitted by TM 9-1300-206.
7. Do not keep empty containers, tools, or other materials in the magazine.
8. Absolute cleanliness and order must be maintained.
9. Use only approved electric lights, lanterns or flashlights in magazines.
10. Do not smoke, or bring matches into magazine.
11. Do not allow unauthorized persons in or near magazine.
12. Keep magazine spark tight, with ventilators well screened, and no openings around doors or foundations.
13. Keep doors locked when magazine is unattended. Close doors when vehicle is approaching platform unless vehicle is equipped with spark arrestor on exhaust.
14. Keep the 50 foot cleared space around above ground magazines free from combustible material.
15. Two or more doors, when available, must be open when personnel are working in a magazine containing explosives or ammunition.
16. Post conspicuously one or more copies of these rules in the magazine.
17. See TM 9-1300-206 for detailed instructions.

DA Label 85

Figure 11. Magazine Placard (DA Label 85).

c. Operational Regulations for Magazine Storage.

(1) Vegetation around ammunition storage sites must be controlled; usually a 50-foot firebreak is required.

(2) Components or loose rounds (not boxed or palletized) should not be stored in the same magazine with properly packaged items.

(3) Conveyors, pallet jacks, equipment, tools, empty boxes, and so forth will not be stored in a magazine with ammunition or explosives.

(4) Doors and locks on magazines must be kept in good working condition.

(5) Magazines will be kept locked at all times except when personnel are working in them.

(6) The door(s) of a magazine must be kept open when a crew is working inside. The number of crews must not exceed the number of doors.

(7) Ammunition will be placed or stacked in a magazine according to the applicable drawings.

(8) The lot number and marking must be placed so that they can be read without moving boxes or climbing stacks.

(9) At least 2 inches of dunnage is required under and between boxes for magazine storage.

(10) Always stack ammunition from the back to the front, large lots first.

(11) When more than one lot is stored, all items of a lot should be stored together and a clear line of separation between lots must be indicated.

d. Storage Sites Between Earth-Covered Magazines.

Earth-Covered magazines are usually authorized in depots, and provided certain requirements are met, they can be spaced 400 feet apart. You can have a storage site between the two magazines provided the sites are barricaded. They must be separated from the barricaded sides of the nearest magazine by 185 feet.

(1) No outdoor storage site shall be located within 1200 feet of above ground magazines.

(2) All magazines or open barricaded sites in the magazine area, may be used for the storage of ammunition related inert items. These inert items could include fuze wrenches, eyebolt lifting plugs, grommets for artillery projectiles, dummy or training ammunition, and so forth.

(3) In some cases where a storage area is not available, motor vehicles, tanks artillery pieces, and so forth, may be stored in the open in an ammunition storage magazine area. The equipment must be parked at least 800 feet from magazines or open storage sites containing ammunition.

(4) Bulk solid propellants, bagged propellants, pyrotechnics, bulk high explosives, and critical items must not be stored outdoors. Critical items could include hand grenades of the fragmentation type, claymore antipersonnel mines, and antitank weapons such as the shoulder-fired Light Antitank Weapon (LAW). This type of ammunition could be stolen and in the wrong hands become very dangerous.

e. Spacing Between Cells in a Module.

Spacing between cells in a module is determined by considering each cell a potential explosion site. The minimum separation between adjacent cells is determined by the explosive content of the cell requiring the greatest distance.

(1) This separation is measured from the nearest edge of one stack in one cell to the nearest edge of the stack in the adjacent cell.

(2) Figure 4 lists spacing requirements between cells for specific quantities of explosives. If the cells in question will hold explosive weights other than those shown, then you will use the following formula to determine separation distances:

distance = 1.1 times the cube root of the net explosive weight (NEW) in pounds.

or

d = 1.1W 1/3

(3) The spacing required between modules and between stacks in each cell and the nearest stack in an adjacent module is determined by use of the formula:

distance = 2.5 times the cube root of the net explosive weight in pounds.

or

d = 2.5W 1/3

PART C - FIELD STORAGE CATEGORIES AND GROUPINGS

Ammunition in the field is segregated into groups called Field Storage Units (FSUs). Ammunition items having the same storage risks are placed in the same category.

1. Field Storage Categories.

Within each category, the maximum amount in each stack and in each FSU, the minimum distance between FSUs, and the categories are shown in Figure 12. Small-arms ammunition can be stored in any category, unless it is bulk packed incendiary or tracer rounds. If that is the case, then it must be stored in Category D.

Category A, B, or D

Gross Tons Per Stack	Gross Tons Per FSU	Minimum Distance In Feet Between			
		Stacks Unbarricaded	Stacks Barricaded	FSU Unbarricaded	Categories
Less than 10	400	40	30	300	750
10-20 maximum. . .	400	50	40	300	750

NOTE 1. If desirable, fixed and semifixed smoke ammunition, except WP., may be stored in category A.
NOTE 2. The minimum distance between a stack of propelling charges and any other stack must be 100 feet whether barricaded or unbarricaded.

Category C

Gross Tons Per Stack	Gross Tons Per FSU	Minimum Distance In Feet Between			
		Stacks Unbarricaded	Stacks Barricaded	FSU Unbarricaded	Categories
Less than 10	300	75	60	300	900
10-30 maximum. . .	300	105	75	300	900

NOTE : Whenever storage space is limited, category C ammunition may be combined with category E.

Category E

Gross Tons Per Stack	Gross Tons Per FSU	Minimum Distance In Feet Between			
		Stacks Unbarricaded	Stacks Barricaded	FSU Unbarricaded	Categories
Less than 5. . .	50	75	60	300	900
5-10 maximum. . .	50	105	75	300	900

Category F

Gross Tons Per Stack	Gross Tons Per FSU	Minimum Distance In Feet Between			
		Stacks Unbarricaded	Stacks Barricaded	FSU Unbarricaded	Categories
The maximum allowed gross weight per stack will be 20 tons.	See note below-	20	200	75	1500
		30	230	90	1500
		40	265	99	1500
		50	295	101	1500
		60	330	120	1500
		80	390	135	1500
		100	455	150	1500

NOTE : The minimum distance between barricaded stacks will be 75 feet. The minimum distance between unbarricaded stacks will be 150 feet.

Category G Class V

Gross Tons Per FSU	Minimum Distance In Feet Between		
	FSU Unbarricaded	FSU Barricaded	Categories
20	200	75	1500
30	230	90	1500
40	265	99	1500
50	299	101	1500
60	330	120	1500
80	390	135	1500
100	455	150	1500

NOTE : Under normal conditions, the Department of the Air Force will store and issue all class V supplies; however, depot commanders should always be prepared to handle these supplies in emergencies.

Figure 12. Quantity-Distance For Field Storage.

a. All ammunition and explosives are placed in one of seven categories. They are:

CATEGORY A - Fixed and semifixed artillery ammunition (except incendiary and chemical).

CATEGORY B - Propelling charges, fuzes, primers, separate-loading projectiles, and flash reducers, but excluding incendiary and chemical projectiles.

CATEGORY C - Mortar ammunition and hand grenades (except incendiary and chemical).

CATEGORY D - Pyrotechnics and chemical ammunition of all types including chemical rockets, chemical mines, gas, smoke and incendiary bombs, artillery projectiles, grenades and mortars, smoke pots, and bulk packed incendiary and tracer small arms ammunition.

CATEGORY E - All demolition explosives, AT and AP land mines (except chemical loaded), and components such as blasting caps, firing devices, detonating cord, and safety fuse.

CATEGORY F - Rockets, rocket motors, guided missiles and rifle grenades, but excluding chemical.

CATEGORY G - Unfuzed high explosive bombs, aircraft mines, aircraft torpedoes, fragmentation bombs, fuzes, primer-detonators and fragmentation bomb clusters. All other Air Force munitions are stored in the appropriate categories.

b. It must be remembered that modular storage of explosives and ammunition is for use in "combat zones", and must be approved by the theater commander; otherwise you should make maximum use of approved concrete and steel arch, earth covered igloos.

(1) The Air Force will normally handle their own ordnance and explosives, but Army ASPs must be prepared to store these items in an emergency.

(2) Bomb components such as fins, fuzes, locking lanyards, adapters and primer-detonators can be stored in the space between FSUs.

(3) Fuzed fragmentation bombs will not be stored in an FSU with any other type bomb.

(4) Photoflash bombs are stored in Category F, but must be placed in separate FSU's and separated by category distance.

2. Storage Compatibility Grouping (SCG)

All ammunition and explosives are assigned to an appropriate Storage Compatibility Group for storage at Army activities. Factors which determine ammunition and explosives storage compatibility groupings are evaluated on the basis of data obtained from ammunition drawings, tests required by TB 700-2, and other tests during research and development to determine characteristics.

a. The highest degree of safety in ammunition and explosive storage could be assured if each item or division were stored separately. However, such ideal storage generally is not feasible. A proper balance of safety and other factors frequently requires mixing of several types of ammunition and explosives.

b. Ammunition and explosives will not be stored together with dissimilar materials or items which present positive hazards to the munitions. Examples are mixed storage of ammunition and explosives with flammable or combustible materials, acids, or corrosives. Different types, by item and division, of ammunition and explosives may be mixed in storage provided they are compatible. Ammunition and explosives are assigned to an SCG when they can be stored together without increasing either the probability of an accident or, the magnitude of the effects of such an accident. Considerations which were used in developing the storage compatibility groups included but were not limited to the following:

- Chemical and physical properties.
- Design characteristics.
- Inner and outer packaging configuration.
- Quantity-distance division.
- Net explosive weight (NEW).
- Rate of deterioration.
- Sensitivity to initiation.
- Effects of deflagration, explosion, or detonation.

c. Figure 13 is an extract of a storage compatibility chart and nine notes contained in TM 9-1300-206. This chart is used to determine which groups may be combined in storage and which groups must be stored separately.

Notes:

1. The marking "X" at an intersection of the chart indicates that these groups may be combined in storage. Otherwise, mixing either is prohibited or restricted according to note 2, below.
2. The marking "Z" at an intersection of the chart indicates that , when warranted by operational considerations or magazine nonavailability and when safety is not sacrificed, logical mixed storage or limited quantities of some items of different groups may be approved. These relaxations involving mixed storage shall be approved by the DOD component and are not considered waivers. Combinations that violate the principles of paragraph 5-18, require justification by a waiver or exemption. Examples of acceptable combinations of Class 1 are:
   a. Division 1, Group A, initiating explosives with Division 1, Group B, Fuzes not containing two or more independent safety features.
   b. Division 3, Group C, Bulk propellants or bagged propelling charges with Division 3, Group G, Pyrotechnics, without their own means of initiation.
3. Equal numbers of separately packaged components of complete rounds of any single type of ammunition may be stored together. When so stored, compatability is that of the assembled round; i.e., WP filler in Group H, HE filler in Groups D, E, or F, as appropriate.
4. Group K requires not only separate storage from other groups, but also may require separate storage within the group. The controlling DOD component shall determine which items under Group K may be stored together and those which must be stored separately.
5. Ammunition items without explosives that contain substances properly belonging to another Hazard Class may be assigned to the same compatability group as items containing explosives and the same substance, and be stored with them.
6. DOD components may authorize ammunition designated "Practice" by Federal Stock Number (FSN) and Nomenclature to be stored with the fully loaded ammunition it simulates.
7. DOD components may authorize the mixing of compatibility groups, except items in Group A, K, and L, in limited quantities (Generally 1000 lb or less).
8. For purposes of mixing, all items must be packaged in approved storage containers. Items shall not be unpackaged at storage locations.
9. Articles of compatibility Group B and F shall each be segregated in storage from articles of other compatibility groups by means which are effective in the prevention of propogation to those articles.

GROUPS	A	B	C	D	E	F	G	H	J	K	L	S
A	X	Z										Z
B	Z	X	Z	Z	Z	Z	Z					X
C		Z	X	X	X	Z	Z					X
D		Z	X	X	X	Z	Z					X
E		Z	X	X	X	Z	Z					X
F		Z	Z	Z	Z	X	Z					X
G		Z	Z	Z	Z	Z	X					X
H								X				X
J									X			X
K										Z		
L												
S		X	X	X	X	X	X	X	X			X

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Figure 13. Storage Compatibility Mixing Chart.

Ammunition and explosives are assigned to one of twelve storage compatibility groups as follows:

GROUP A Bulk Initiating Explosives. This group is sensitive to heat, friction, and percussion. They are used to initiate elements in an explosive train. Examples are wet lead azide, lead styphnate, wet mercury fulminate, and dry PETN.

GROUP B Detonators and Initiating Devices. This group is used to initiate or continue the functioning of an explosive train. Examples are fuzes, blasting caps, and detonators.

GROUP C This group includes bulk propellants, propelling charges, and devices containing propellants with or without their own means of initiation. Examples are propelling charges and rocket motors containing propellants.

GROUP D This group includes black powder, HE, and ammunition containing HE without its own means of initiation and without propelling charge. This group will, in all probability, explode when it or its components are initiated. Examples are demolition blocks, dynamite, HEAT mines, and separate loading projectiles.

GROUP E This group includes ammunition containing HE without its own means of initiation but with propelling charge or propelling charge or propellant motor. Examples are fixed or semifixed artillery rounds, rockets, and guided missiles.

GROUP F This group includes ammunition containing HE with its own means of initiation and with or without propelling charge. An example is hand grenades.

GROUP G This group includes fireworks, illuminating, incendiary, smoke including hexachlorethane (HC), tear producing munitions (other than water activated or which contains WP, or flammable liquid or gel). In other words, Group G is ammunition that when it functioned resulted in incendiary, illumination, lachrymatory (tear producing), and smoke (except white phosphorous (WP)). Examples are cartridges illuminating, chemical ammunition (tear or smoke producing), riot control grenades, and HC smoke grenades.

GROUP H This group includes ammunition containing WP or plastized white phosphorous (PWP), with or without explosives. Ammunition in this group is filled with WP or PWP. Examples of Group H munitions are a separate loading WP projectile and a WP grenade.

GROUP J This group includes ammunition filled with flammable liquids or gels with or without explosives. These are fillers that are not spontaneously flammable when exposed to water or air. An example is Napalm.

GROUP K This group includes ammunition filled with toxic chemical agents with or without explosives. Toxic chemicals include nerve agents GB and VX, mustard agents H, HD, and HT, choking agents CL and CG, and blood agents CK and AC.

GROUP L This group includes ammunition not included in other compatibility groups. This type of ammunition has characteristics that will not permit it to be stored with other groups. This includes suspected or damaged ammunition of any group, prepackaged liquid fueled rocket engines, the chemical TPA (flammable liquid), fuel-air explosive device (FAE), and chemically activated fuzes.

GROUP S This group includes ammunition with no significant hazard. This includes small arms ammunition, thermal batteries, explosive switches, firing devices and igniters for time fuses. These items are packaged so that an explosive effect is confined. An accident may destroy a single pack, but would not affect other packs nearby.

Note: For additional information on storage compatibility and QD, see OMMCS Subcourse MM3615, Storage Compatibility and Quantity-Distance Requirements.

PART D - STORAGE AREA SAFETY

1. Fire Protection.

Within an ammunition and explosive storage area, whether permanent or temporary, fire protection and posting of fire signs is of primary importance. Fires in an ammunition and explosive area can cause catastrophic damages in an extremely short time.

a. A Fire Plan is one of the first things an explosive storage area needs. The Fire Plan will include the disposition of matches, or other flame/spark producing devices. It tells who can grant authority to carry such devices, (and how they will be carried). The plan tells where smoking areas will be located, and when they may be used; and what type/kind of extinguisher must be available at each location. The plan tells everyone what to do in the event of a fire. The Fire Plan designates responsible individual/alternates, along with their organization. Their responsibilities are defined, and everyone knows exactly who does the following tasks:

(1) Who reports the fire.

(2) Who directs orderly evacuation of personnel.

(3) Who notifies near-by personnel of impending danger.

(4) Who activates the means of extinguishing the fire, or controlling the fire.

(5) Who meets and advises fire fighters as to details of the fire.

b. Fire Prevention in an ammunition storage area is the responsibility of all personnel who work in, or enter the storage area. The storage area must be kept in a condition that will prevent fires from starting, and keep fires from entering from other areas.

(1) Vegetation - Grass, weeds, undergrowth, and other flammables must be kept out of the Ammunition Storage Point (ASP). By controlling the growth of grass, weeds, and underbrush, the possible spread of fire is limited. Weed killer, mowing, animal grazing, plowing, or cutting are methods used to control vegetation. However, proper supervision of personnel is required when the previously listed methods are used.

(2) Burning is not permitted within fifty feet (50') of earth-covered magazines, nor within two hundred feet (200') of above ground magazines or storage pads. All doors, windows, and ventilators must be closed during burning.

(3) Fire breaks will be at least 50' wide, free of flammable material, and maintained around above ground magazines and storage pads.

(4) Dunnage will not be stacked any closer than 50' to magazines, and in no case within the fire breaks.

(5) Diesel and gasoline powered vehicles operating closer than 25' to a structure or magazine will be equipped with properly installed spark arresters.

(6) Heat producing equipment will not be used without a permit from the quality assurances, safety or fire department. The permit will give the location, time, duration, purpose, safety, firefighting equipment and operator's names.

c. Firefighting Facilities are of immediate importance to workers within the ASP. Fighting fires in their beginning stages can prevent a major fire or detonation. Keep in mind that personnel must not be exposed to the hazards of an imminent explosion.

(1) Firefighting equipment will vary depending on the permanency of the facility, types of ammunition stored, and availability of firefighting organizations.

(2) Temporary facilities may have the following: Water barrels, pails, sand boxes, shovels, water-type extinguishers, back-pack pumps, etc.

(3) Permanent facilities may have: Water-type, 2.5 gallon extinguisher, 4 gallon back-pack pumps, multi-purpose dry chemical, pumpers or brush trucks, tank trucks and a fire map.

(4) Both types of facilities should have an adequate supply of brooms, gunny sacks, hoses, grass beaters, and where available, plows, graders, and dozers. Two hand extinguishers should be available for immediate use whenever ammunition or explosives are being handled.

d. Fire Drills involving all personnel available, should be held semi-annually. Unannounced Fire Drills involving motorized emergency vehicles are prohibited.

e. A Fire Alarm should be available to aid in passing the warning, and speeding evacuation. The alarm should be both audible and visual. The alarm must be at least audible.

(1) When evidence of a fire is noticed and the alarm has been given, at least one responsible messenger will be sent in the direction from which firefighters are expected to arrive. This individual will give the responding units the location, nature, and extent of the fire.

(2) Firefighters will not approach fires involving ammunition or explosives unless they have accurate information concerning the hazards and a determination is made that he is justified in doing so.

2. Fire Hazard Markings.

As a guide to firefighters, ammunition and explosives are divided into four classes. There are four Fire Divisions according to the hazards encountered when fighting fires involving the various types of explosives. The four divisions are identified on placards by the numerals 1, 2, 3, and 4. Each placard has a different shape. The different shapes provide improved identification in darkness and at long range.

a. Fire Symbols normally are posted on buildings or storage sites. They are posted in such a manner as to make them easily visible to approaching firefighters at the maximum distance. Placards are not required on earth-covered magazines, or outdoor revetted sites when the sites are limited to classes 1.1, (18) 1.2, (12) 1.2 or (08) 1.2.

(1) In the interest of safety, installation commanders may designate blocks of earth-covered magazines as areas requiring only the placard for the most hazardous materiel present.

(2) Removable placards may be used where the class of explosives is subject to change frequently. For buildings of long dimensions, more than one placard per side may be needed.

(3) Railroad cars and motor vehicles containing ammunition or explosives destined for off-post transportation must have either Fire Symbol Placards or DOT placards. Once off post, rail cars and vehicles must have DOT placards. Transport vehicles holding small-arms ammunition only do not require DOT placarding, but while on installation, they should be treated and marked as Fire Division 4 material.

(4) Each Fire Division placard has a distinctive shape in order to be recognized by firefighters approaching a fire. These shapes and sizes are shown in Figure 14. Half-size placards can be used on doors or lockers inside buildings, on motor vehicles and on railroad cars.

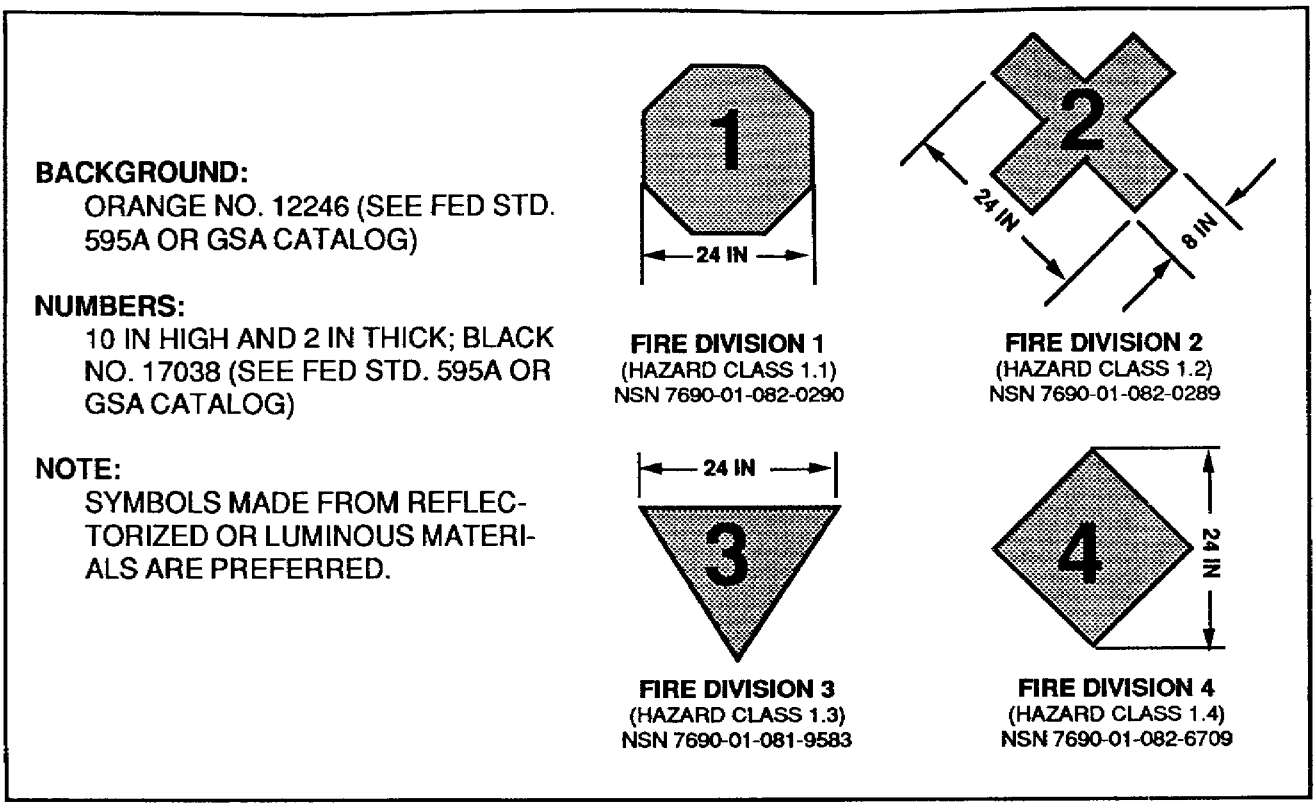

Figure 14. Fire Symbols.

b. Fire Divisions are numbered 1 through 4 and are synonymous with Hazard Classes 1.1 through 1.4. The lower the Fire Division number, the greater the hazard.

FIRE DIVISION 1 - Mass detonation. Examples are: bulk high explosives (TNT, C-4), blasting caps, projectiles, HE, 155 mm.

FIRE DIVISION 2 - Explosion with fragment hazard. Examples are: grenades, WP, hand and rifle, mine, APERS, M16; simulators, M115A2.

FIRE DIVISION 3 - Mass fire. Examples are: grenades, HC, smoke pots, Pershing rocket motors, propellant grains.

FIRE DIVISION 4 - Moderate fire. Examples are: commercial squibs, cartridge igniter M2, small-arms ammunition.

3. Chemical Hazard Symbols.

Chemical Hazard Symbols are used in addition to the Fire Division symbols. Their purpose is to alert firefighters of special hazards. Chemical Hazard Symbols are posted in addition to Fire Division symbols. They indicate added hazards requiring preparation. (See Figure 15.)

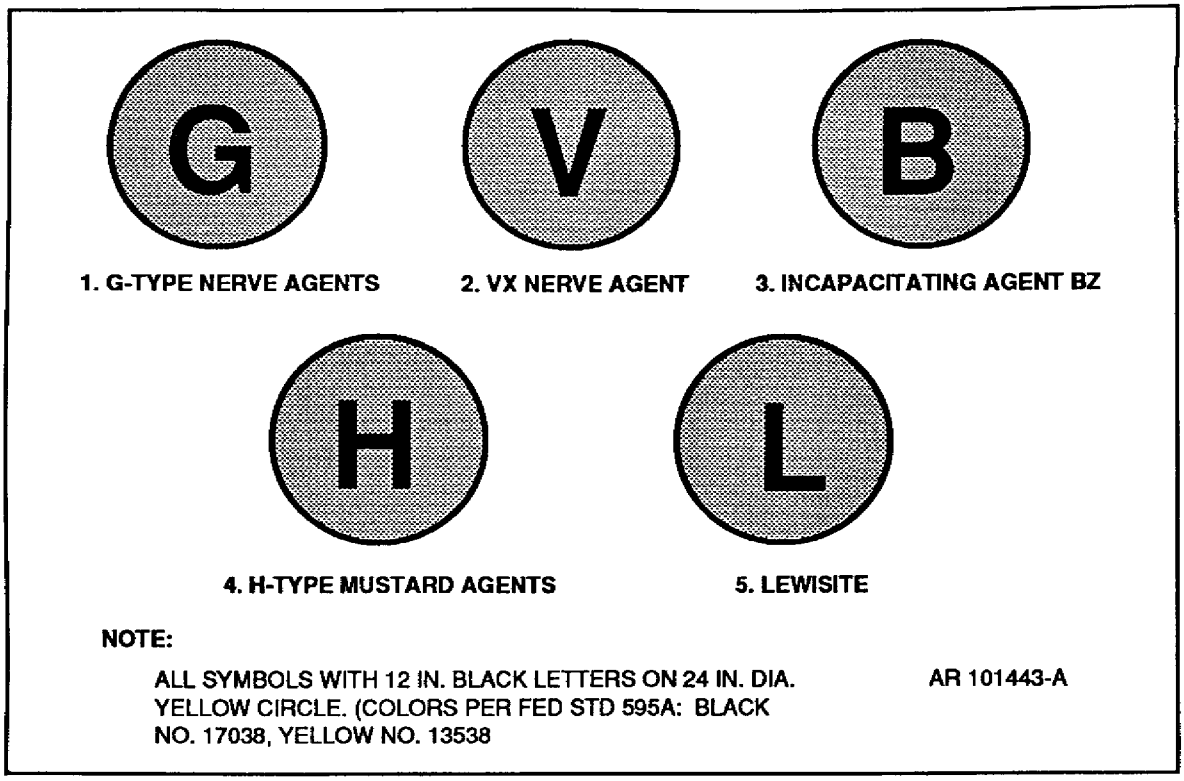

Figure 15. Chemical Hazard Symbols.

a. The Chemical Hazard Symbols indicate the chemical agent stored in the marked location. They are displayed with the Fire Division symbols. When one of the symbols are displayed, an additional symbol will be shown that pertains to firefighting only. Figure 16 lists the chemical agents, protective clothing sets required, and the Chemical Hazard Symbol required.

Chemical Agents and Fillers Contained in Ammunition	Full Protective Clothing			Breathing Apparatus	Apply No Water	G	VX	BZ	H	L
	Set 1	Set 2	Set 3							
GB	x					x				
VX	x						x			
H, HD, HT	x								x	
L	x									x
CL, CG, CK, CN, CNS, CS, BBC, DA, DC, DM, FS, FM		x								
HC				x	x					
BZ		x						x		
WP, PWP			x							
TH, PT				x	x					
IM NP				x						
TEA, TPA			x		x					
Colored Smokes				x						

Figure 16. Chemical Agents and Fillers Contained in Ammunition and the Chemical Hazard Symbols Required in Storage.

b. The Chemical Hazard Symbols shown in Figure 17 tells the firefighters what protective clothing is required. Look closely at Symbol 1, Figure 17. The protective clothing mentioned is indicated by the color of the figure and symbol rim.

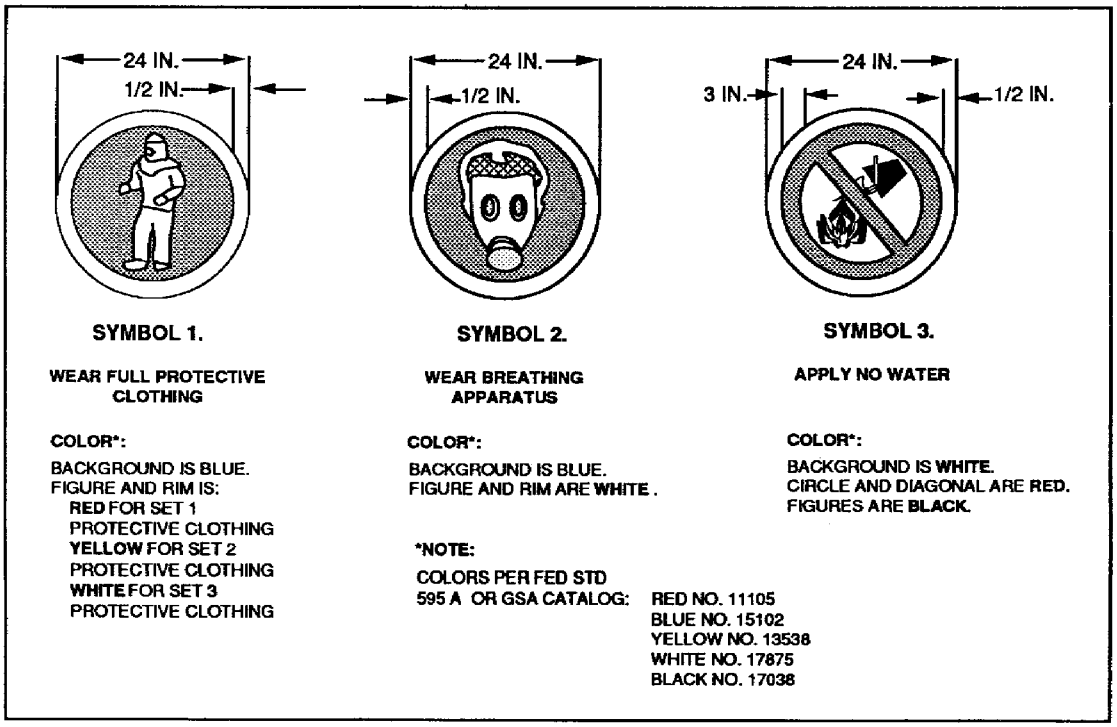

Figure 17. Chemical Hazard Symbols (Firefighting).

(1) PROTECTIVE CLOTHING SET 1, red figure and rim. Set 1 (Toxicological Agents Protective (TAP) Clothing) is used when fighting fires involving G, VX, H and L symbols. The following clothing must be worn:

- MASK, protective or Self-Contained Breathing Apparatus (SCBA).
- SUIT, TAP, M3.
- HOOD, TAP, M2.
- UNDERGARMENTS.
- COVERALLS.
- FOOTWEAR, protective.
- GLOVES, TAP.

(2) PROTECTIVE CLOTHING SET 2, yellow figure and rim. Set 2 is used when fighting fires involving riot control gases, choking gases or FS/FM smoke symbol.

- MASK, protective.
- COVERALLS.
- GLOVES, rubber.

(3) PROTECTIVE CLOTHING SET 3, white figure and rim. Set 3 is used when fighting fires involving White Phosphorus and Triethyl Aluminum (TEA).

- MASK, protective.
- COVERALLS, flame resistant.
- GLOVES, flame resistant.

(4) Notes about PROTECTIVE CLOTHING SETS.

- If firefighters are equipped with normal heat-resistant bunker suits and SCBA, they do not need Protective Clothing Sets 2 and 3.
- Symbol 2, Figure 17 requires that firefighters wear a gas mask or SCBA to combat fires in areas so marked. This usually involves incendiary and other readily flammable chemical agents.
- Symbol 3, Figure 17 means just what is says, "No Water". Use of water on the chemicals so marked could spread the fire or cause an explosion. This usually involves chemicals such as oil based incendiaries, metallic sodium, TEA or Aluminum Zinc Oxide Hexachloroethane (HC) smoke.

c. See Figure 18 for a classification list of chemical agents that you may be required to store and maintain. Be particularly aware of their compatibility grouping and color coding.

Agent Symbol	COMMON NAME	ACTION OF AGENT	Storage Compata-bility Group	DOT Hazard Class	COLOR CODING IDENTIFICATION**
GB	Sarin	Nerve agent Nonpersistent	Group K	Poison A	Grey base coat. GB in Dark GREEN. One Dark GREEN band
VX	None	Nerve Agent Persistent	Group K	Poison A	Grey base coat. VX in Dark GREEN. One Dark GREEN band
H	Levinstein Mustard	Blister Agent	Group K	Poison A	Grey base coat. H in Dark GREEN. One Dark GREEN band
HD	Distilled Mustard	Blister Agent	Group K	Poison A	Grey base coat. HD in Dark GREEN. One Dark GREEN band
HT	Mustard-T Mixture	Blister Agent	Group K	Poison A	Grey base coat. HT in Dark GREEN. One Dark GREEN band
L	Lewisite	Blister Agent	Group K	Poison A	Grey base coat. L in Dark GREEN. One Dark GREEN band
CL	Chlorine	Choking Agent	Group K	Poison A	Grey base coat. CL in Dark GREEN. One Green band
CG	Phosogene	Choking Agent	Group K	Poison A	Grey base coat. CG in Dark GREEN. One Green band
CK	Cyanogen Chloride	Blood Agent	Group K	Poison A	Grey base coat. CK in Dark GREEN. One Green band
AC	Hydrogen Cyanide	Blood Agent	Group K	Poison A	Grey base coat. AC in Dark GREEN. One Green band
BZ	None	Incapacitating agent	Group K	Poison A	Grey base coat. BZ on Violet One VIOLET band
CN	Chloroacetophenone	Tear Agent Riot control	Group G	Irritant	Grey base coat. CN in RED. One RED band
CNS	Chloroacetophenone in chloropicrin & chloroform	Tear Agent Riot control	Group G	Irritant	Grey base coat. CNS in RED. One RED band.
CS	None	Tear Agent Riot Control	Group G	Irritant	Grey base coat. CS in RED One RED band.
BBC	Bromobenzylcyanide	Tear Agent Riot Control	Group G	Irritant	Grey base coat. BBC in RED. One RED band.
DA	Diphenylchloroarsine	Vomiting Agent Riot Control	Group G	Irritant	Grey base coat. DA in RED. One RED band.
DC	Diphenylcyanoarsine	Vomiting Agent Riot Control	Group G	Irritant	Grey base coat. DC in RED. One RED band.
DM	Adamsite	Vomiting Agent Riot Control	Group G	Irritant	Grey base coat. DM in RED. One RED band.
FS	Sulphur Trioxide Chlorosulphonic acid sol.	Smoke	Group G	Corrosive material	LIGHT GREEN base coat. FS & other information in BLACK.
FM	Titanium tetrachloride	Smoke	Group G	Corrosive material	LIGHT GREEN base coat. FM & other information in BLACK.
HC	Aluminum zinc oxide hexachloroethane	Smoke	Group G	Flammable Solid	LIGHT GREEN base coat. HC & other information in BLACK.
WP	White Phosphorus	Incendiary and Smoke	Group H	Flammable Solid	LIGHT GREEN base coat. ***WP& other information in LIGHT RED.
PWP	Plasticized White Phosphorus	Incendiary and Smoke	Group H	Flammable Solid	LIGHT GREEN base coat. ***WP & other information in LIGHT RED.
TH	Thermite or Thermate	Incendiary	Group G	Flammable Solid	LIGHT RED base coat. TH & other information in BLACK.
IM	Isobutylmethacrylate with oil	Incendiary Oil Compund	Group J	Flammable Liquid	LIGHT RED base coat. IM & other information in BLACK.
NP	Napalm	Incendiary Gel	Group J	Flammable Liquid	LIGHT RED base coat. NP & other information in BLACK.
PT	Pyrotechnic material	Magnesium Incendiary Mixture	Group G	Flammable Solid	LIGHT RED base coat. PT & other information in BLACK.
TEA	Triethyl Aluminum	Spontaneously Flammable	Group L	Flammable Liquid	LIGHT RED base coat. TEA & other information in BLACK.

*For additional properties of chemical agents, refer to TM 3-250
**For detailed color specifications, see MIL D 709C. To indicate presence of explosive elements, the following additional markings will be used: HIGH EXPLOSIVES - One YELLOW band. LOW EXPLOSIVES - One BROWN band.
***Separate loading ammunition for use on board ships will be color coded; light green body; WP, PWP, and marking in black and one light red band.

Figure 18. Chemical Agent I.D. List.

This completes the lesson. If you feel that you are ready, take the Practice Exercise beginning on the next page. If you are in doubt, or have any questions, read the lesson again, then complete the practice exercise.

LESSON

Practice Exercise

The following items will test your memory of the material covered in this lesson. There is only one correct answer for each item. When you have completed this exercise, check your answers with the answer key that follows. If you answer any item incorrectly, study that part of the lesson again which contains the portion involved.

Situation: As the Senior Ammunition Specialist at an ASP, you have been directed to prepare portions of a plan for storing ammunition and explosives. You are aware that you do not have sufficient magazine storage space for all the items requiring storage.

1. Which of the following items, require covered storage first?

   A. Projectile, 155 mm HE, M101.
   B. Bomb, GP, 2000 lb, MK84.
   C. Charge, Propelling, M6.
   D. Primer, Igniter Assembly, M10A1 Fuze.

2. What is the minimum air space, in inches, required between the top of an ammunition stack and the overhead cover?

   A. 6
   B. 12
   C. 18
   D. 24

3. What is the minimum distance, in feet, between an open storage site containing class (12) 1.2 munitions, and an above ground magazine?

   A. 800
   B. 1200
   C. 1800
   D. 2400

4. What is the maximum number of cells that can be in a storage module?

   A. 2
   B. 4
   C. 6
   D. 8

5. What is the maximum explosive weight in pounds that can be authorized for storage in a six-cell module?

   A. 250,000
   B. 750,000
   C. 1,500,000
   D. 2,000,000

6. When constructing a barricade around a cell, what is the preferred slope?

   A. 1:1
   B. 1.5:1
   C. 2:1
   D. 2.75:1

7. What is the minimum distance in feet between barricaded stacks for Category F munitions in field storage?

   A. 1200
   B. 500
   C. 250
   D. 75

8. With what other type bombs can fuzed fragmentation bombs be stored in an FSU?

   A. General Purpose HE.
   B. Chemical bombs.
   C. No other type.
   D. Any other type.

9. As a minimum, how many feet wide must fire breaks be around above ground magazines?

   A. 25
   B. 50
   C. 75
   D. 100

10. As a guide to firefighters, ammunition is divided into how many Fire Divisions?

    A. Four.
    B. Three.
    C. Two.
    D. One.

LESSON

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

Item	Correct Answer and Feedback
1.	D. Primer, Igniter Assembly, M10A1 fuze. Fuzes, primers and boosters are sensitive to exposure to water or direct sun. (Page 2, para A. 1. a. (2).)
2.	C. 18. An air space of at least 18 inches is needed between the top of the stack and the overhead cover. (Page 3, para A. 1. a. (3).)
3.	B. 1200. Sites not located between earth-covered magazines cannot be closer than 1200 feet to any above-ground magazine. (Page 4, para A. 2. c. (1).)
4.	D. 8. A storage module is a barricaded area of not more than eight, hard-surfaced cells separated from each other by barricades. (Page 7, Figure 3.)
5.	C. 1,500,000 Cell capacity authorized is 250,000 pounds. Multiplying by six equals 1,500,000 lbs. (Page 7, para B. 2. a.)
6.	C. 2:1. When the barricade is constructed, the slope has to be either 1 1/2 to 1, or (preferred) 2 to 1. (Page 9, para B. 2. d. (2).)
7.	D. 75. (Page 18, Figure 12. Category F, Note.)
8.	C. No other type. Fuzed fragmentation bombs will not be stored in an FSU with any other type bomb. (Page 19, para C. 1. b. (3).)
9.	B. 50. Firebreaks will be at least 50 feet wide, free of flammable vegetation, and maintained around above ground magazines and storage pads. (Page 24, para D. 1. b. (3).)
10.	A. Four. As a guide to firefighters, ammunition and explosives are divided into four classes or fire divisions according to the hazard to be encountered. (Page 25, para D. 2.)