Chapter 2

FIELD STORAGE OF AMMUNITION

The purpose of field storage is to provide ammunition to Army tactical units. Unlike permanent, magazine storage, ammunition assets in field storage are most often stored on the ground on unimproved surfaces. Munitions are placed in field storage categories separated from each other by appropriate minimum field storage quantity distances (QD), which are based on total gross tonnage per individual storage unit (see Appendix C for a DODIC conversion chart). This chapter describes field storage areas, storage categories, site selection for field storage facilities, and storage systems and storage planning.

FIELD STORAGE AREAS

There are four areas where field storage is likely to be used theater storage areas (TSA), corps storage areas (CSA), ammunition supply points (ASP), and ammunition transfer points (ATP).

THEATER STORAGE AREA

The TSA is in the communications zone (COMMZ) where the reserve stocks are stored. It should have direct access to rail networks or be within short line-haul distance from them. In peacetime, the TSA could consist of permanent storage facilities, igloos, or bunkers. In combat environments, the TSA may be open storage.

CORPS STORAGE AREA

Located in the corps rear area, the CSA normally stores up to 10 days of ammunition. Being in the rear, it is more fixed than the forward combat ammunition supply points (ASP) it supports. For this reason, it can have more permanent storage facilities; however, this depends on the tactical situation.

AMMUNITION SUPPLY POINT

ASPS are in the corps forward area. They provide direct support to the combat division or portions of the division and must store about 3 days of ammunition. The tonnage stored varies depending upon the type of unit supported. Based on their mission, forward ASPS are usually temporary. This means ammunition is not stored in igloos or bunkers.

AMMUNITION TRANSFER POINT

The ATP is a transfer point in the brigade rear. The division ammunition officer (DAO) has control of all division ATPs. ATPs stock high-tonnage, high-usage items. Since this is a transfer point, common field storage principles addressed in this manual do not apply. For the purposes of this manual, the ASP will be spoken of most often because it is the most common of the areas.

THEATER OF OPERATION STORAGE

Storage in a theater of operation, field storage, follows as nearly as possible the principles for storage in the Continental United States (CONUS). Such conditions as mobility requirements, scarce facilities, or enemy air power vary a great deal in theaters of operation. Thus the ideal of CONUS storage, including safety, cannot be fully met or maintained. Even so, explosives and ammunition may be satisfactorily and safely stored in the theater if CONUS regulations are adapted to field conditions. Detailed information on these adaptions is in TM 9-1300-206.

STORAGE CATEGORIES

Storage categories are the primary groups into which ammunition is segregated for storage in the field. The groupings are based on:

- How desirable it is to store components of complete rounds in adjacent stacks.
- The hazards of spreading explosions.

- The range of fragments.
- The spread of fires.
- Chemical contamination.

Conventional Ammunition. For storage, conventional ammunition is divided into categories A through G as follows:

- ***Category A.*** Fixed and semifixed artillery ammunition, except incendiary and chemical.
- ***Category B.*** Propelling charges, fuzes, primers, flash reducers, and separate loading artillery projectiles including high explosives (HE) and armor piercing (AP) but not 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 filled rockets; gas, smoke, and incendiary bombs; gas and smoke artillery ammunition; incendiary and chemical grenades; smoke pots; VX-filled mines; and bulk-packed incendiary and small-arms tracer cartridges.
- ***Category E.*** All demolition explosives, antitank and antipersonnel mines (except VX loaded), and components such as blasting caps, firing devices, detonating cord, and safety fuses.
- ***Category F.*** Rockets, rocket motors, and rifle grenades, except chemical.
- ***Category G.*** The following items of US Air Force Class V supply, all unfuzed high-explosive bombs, aircraft mines, aircraft torpedoes, and

fragmentation bombs; fuzes and/or primer-detonators for the above items; and fragmentation bomb clusters, fuzed or unfuzed. The remainder of Air Force Class V items must be stored in other proper categories.

Special Ammunition. For storage, special ammunition is divided into the following general categories:

- Inert material such as missile and large (heavy) rocket bodies (less rocket motors) and test and handling equipment for nuclear ordnance items.
- Missile and rocket fuels.
- Oxidizers.
- Solid propellants.
- HE material such as detonators, HE warheads, and HE components of explosive nuclear weapons.
- Nuclear material.

SAFETY

Storage categories help provide the basis for safety procedures for ammunition storage. Four of the most important follow.

- Ammunition items with the same storage risks are grouped together in the same storage category.
- Within each storage category, QD tables (see Table 2-1) are the guide for the maximum quantity of ammunition to be stored within each stack and within each field storage unit (FSU) and the minimum distance between stacks, FSUs and categories.

- Most often, only one kind of ammunition is stored in a stack. If more than one kind is stored in a stack, use the storage compatibility mixing chart in TM 9-1300-206 (Chart 5-2). Be sure ammunition is stacked so it is easy to inventory and inspect. Where camouflage is necessary (see more on camouflage later in this chapter), step stacks in towards the top (terraced or pyramid stacking) to cut down shadows. Store components of complete rounds within the same FSU when practical.
- Small arms ammunition may be stored with any category with one exception. Bulk packed incendiary and tracer cartridges must be stored in category D.

SITE SELECTION

There needs to be a primary site and an alternate site planned for.

Primary Site. When selecting a primary site, the following criteria are important. Try to incorporate as many of them into the site as possible. They are listed in order of importance.

- The area is easy to get to by the units supported.
- The area is near the main supply route (MSR) with access roads into the ASP.
- A roadnet within the site allows vehicles to travel under all weather conditions and requires little or no maintenance.
- The ground is as level as possible. It must be able to support the weight of the ammunition as well as be able to drain off quickly. This also

Table 2-1. Quantity Distance Table by Category.

Category	Gross Tons		Minimum Distance Between (in Feet)				
			Stacks		FSU		
	Per Stack	Per FSU	Unbarricaded	Barricaded	Unbarricaded	Barricaded	Categories
(A, B, or D)[1, 2]	Less than 10	400	40	30	300		750
	10-20 max.	400	50	40	300		750
C[3]	Less than 10	300	75	60	300		900
	10-30 max.	300	105	75	300		900
E[3]	Less than 5	50	75	60	300		900
	5-10 max.	50	105	75	300		900
F	20 max.	20	150	75	230	75	1500
	20 max.	30	150	75	230	90	1500
	20 max.	40	150	75	265	99	1500
	20 max.	50	150	75	295	101	1500
	20 max.	60	150	75	330	120	1500
	20 max.	80	150	75	390	135	1500
	20 max.	100	150	75	455	150	1500

G (Class V)[4]		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

Notes:

1. If desirable, fixed and semifixed smoke ammunition, except WP, may be stored in category A.
2. The minimum distance between a stack of propelling charges and any other stack must be 100 feet whether barricaded or unbarricaded.
3. Whenever storage space is limited, category C ammunition may be combined with category E.
4. 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.

makes it easier for MHE to operate. More on MHE later in this chapter.

- There should be natural barricades that can separate FSUs and categories.
- The site should be isolated from hospitals and important military installations.
- The site should be unpopulated and downwind of any populated areas if any hazardous chemicals are stored.
- There should be an adequate water supply for fire fighting and bivouacking.
- There should be a minimum of flammable vegetation.
- There should be features, including natural concealment, that make the site easy to defend against enemy ground attack.
- The area should be large enough to spread out ammunition stocks. This protects them against artillery or air attack and makes it easy to expand.

Because of tactical conditions and other influencing factors, an ASP site may not have all ideal features. In fact, higher headquarters may dictate where an ASP will be.

Alternate Site. Pick an alternate ASP site close to the primary one, because there maybe some other unit already in the primary site. Another consideration: the enemy may attack with artillery, mortar fire, or chemical agents as soon as the primary ASP is set up, and the unit may have to evacuate fast. Finally, some units have used their alternate sites as

regular ASPs when their stockage objective expanded-far more than they expected.

STORAGE SYSTEMS

After the site is selected, consider what system to use. There are several basic methods for storage of ammunition in the field. Consider the following:

- The physical characteristics of the site.
- Where hostile forces, uniformed or clandestine, are.
- What the weather is expected to be.
- The time and resources available.
- The expected life of the ASP.
- The space available and what type operation will most easily allow following QD requirements.
- Free movement of vehicles throughout the storage complex. Vehicles must be able to pass other vehicles being loaded or unloaded. There should be no dead-end roads requiring backing or turning around.
- The roads should be stabilized to withstand traffic up to fully loaded 40-ton trailers.

AREA STORAGE

In this system, the area is divided into three sections and subdivided into FSUs and stacks. Ammunition is stacked and is spaced to meet QD requirements, ending up looking like a checkerboard. This system provides efficient use of the total area, but it may require a lot of road and pad construction and stabilization of the earth.

ROADSIDE STORAGE

This system allows ammunition to be stored in stacks along the edges of existing roadways. FSUs and sections are spaced according to QD requirements. Effective use of this method requires a large road network and a total area much larger than the area system needs. However, little construction is necessary. A variation of roadside storage, known as "storage in depth," is very useful if the existing road network is limited. In this method, one or more additional stacks of ammunition are stored behind the roadside stack, away from the road. The use of this system is restricted in wet climates or if there are poor soil conditions or heavy forests. Under these conditions, the stacks of ammunition would not be easy to reach.

AREA AND ROADSIDE STORAGE

A combination of area and roadside storage is often used to lessen the bad aspects of both systems. It allows the most effective use of the existing road network in a limited area. But, while the combination does not require as much land as roadside storage does, it does involve some road and pad construction.

BARRICADED ABOVE-GROUND MAGAZINES

This system is designed for larger ASPS and depots in the theater of operations. It is two or more storage blocks of barricaded above-ground magazines in various sizes, separated from each other by at least 122 meters. Items stored on an individual pad must be compatible (see TM 9-1300-206).

The amount of explosives per pad must meet the net explosive weight (NEW) limitations of TM 9-1300-206.

MODULAR STORAGE SYSTEM

This is a field storage system for conventional ammunition stored on pads within earth-barricaded areas called cells. These cells are joined to form modules, which may, in turn, be arranged to form module blocks (Figures 2-1 and 2-2). Security, real estate, or operational requirements may force the use of this storage system. Unlike the other field storage systems, with modular storage, NEW rather than gross tonnage is used in determining the maximum quantity of ammunition that maybe stored in each cell or module.

Before deciding to use the modular system, consider the advantages and disadvantages over the other field storage systems. Some of the advantages are reduced real estate requirements, improved security with available forces, reduced danger from direct fire on ammunition stocks in small barricaded areas, reduced transportation needs in the ammunition area, and reduced internal roadnet needs. Some of the disadvantages are the possibility of fire or explosion spreading from cell to cell because of heat or fragment dispersion, increased danger to stock from indirect fire and aerial bombs, and the need for more engineer support for initial construction.

The modular method should only be used if the QD requirements of the other field storage systems cannot be met due to security, real estate, or operational limitations.

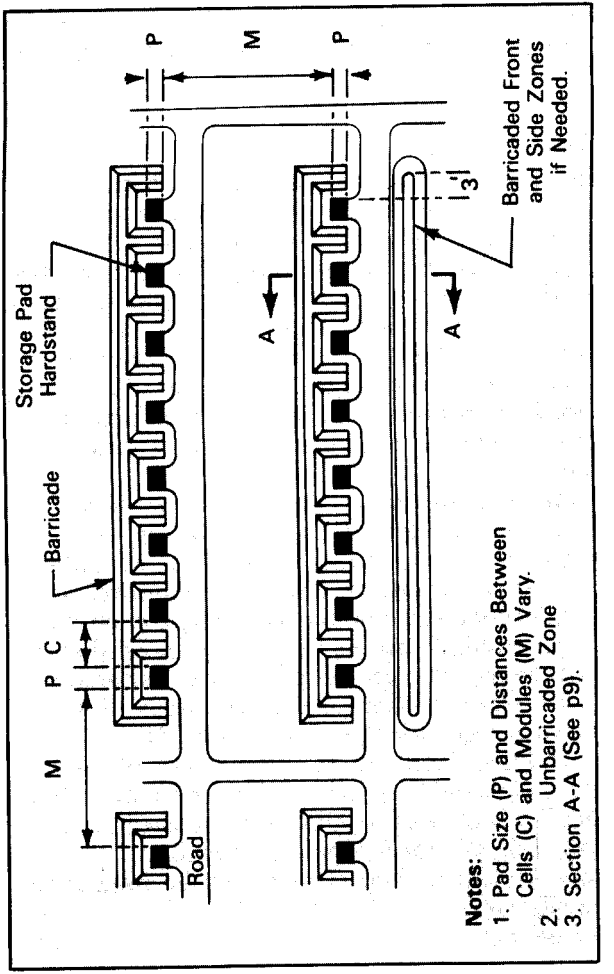

Figure 2-1. Aerial View of a Typical 8-Cell Module Storage Plan.

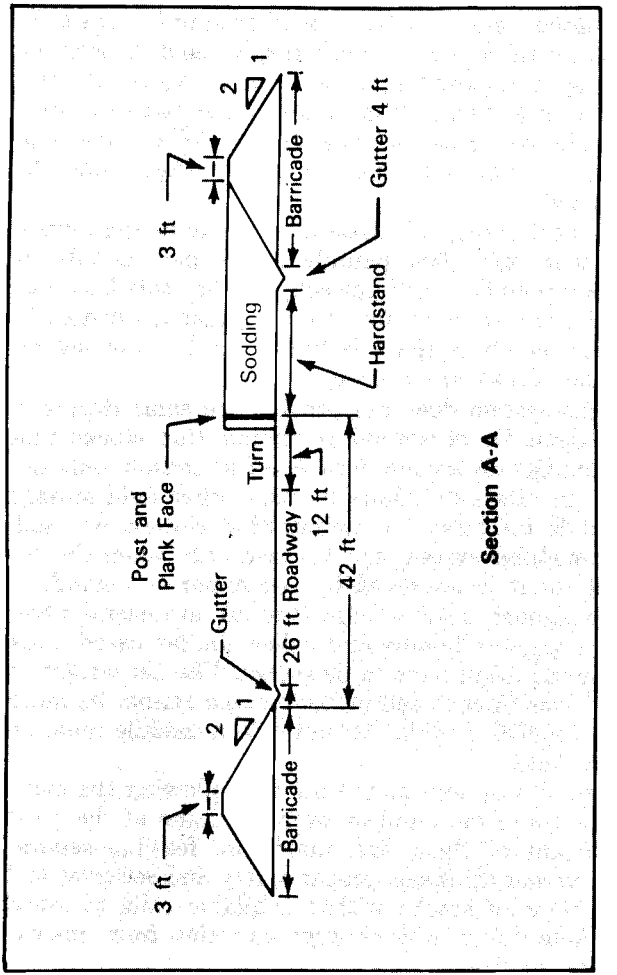

Figure 2-2. Cross Section of a Typical 8-Cell Module Storage Plan.

Where and How To Use Modular Storage. In a theater there may be limited space and/or security, making it impossible to store ammunition as prescribed in QD and compatibility regulations for area, roadside, and area/roadaide storage. When this happens, a modular system of storage may be preferred.

In most cases, this system will only be used when less than 2,000,000 pounds NEW per module or 250,000 pounds NEW per cell, will be stored. It may also be the solution for storing larger quantities in rear areas where space is limited and where several module blocks are needed.

This system does not provide the same degree of protection for personnel or ammunition stocks that normal QD dispersion does. For this reason, only use it as an alternate solution when other field storage methods for class 1.1 ammunition cannot be used. The modular system can be used only when the request for it is approved by the major command.

Barricaded open storage modules are useful when high explosive bombs and other similar cased class 1.1 ammunition have to be stored. The net weight of explosives in each cell of the module cannot be more than 250,000 pounds. All items in a module must be compatible.

Use this system as the others, following the same principles of ammunition storage. Some of the most important of those are, maximum feasible separation, proper drainage, proper safety and security, and dispersion of stocks within available cells to avoid complete loss of a single type munition from one explosion or fire.

Modular System Construction Characteristics. A module is a barricaded area with not more than eight cells separated from each other by barricades. The unbarricaded openings of modules and cells must not face each other. One-cell modules may be built if required, but maximum flexibility of stockage and internal movement should be maintained. A module has tonnage and explosive weight limitations specified by the major command that authorized its use. Normal maximum limits are 2,000,000 pounds NEW per module or 250,000 pounds NEW per cell. See Table 4-5, TM 9-1300-206, for construction dimensions of cells and storage pads.

All barricades are standardized earth mounds. If possible, use natural barricades such as hillsides or steep slopes. Carefully check the earth for large rocks or boulders. Make sure there are none because each increases the missile hazard. The slope of the barricade should not be steeper than 1.5 to 1, and the crest should be at least 3 feet wide. Make barricades tall enough that a straight line drawn from the far top edge of the stack (away from the barricade) at an angle 2 degrees above a horizontal line drawn along the top of the stack will pass through the entire width of the barricade crest. See Figure 2-3.

Locate the center-line of barricades between cells of the module midway between adjacent storage pads. Put back and end (outside) barricades the same distance from the pads as those between the cells.

Make sure the distances between stacks of munitions in adjacent cells and between adjacent modules

follow TM 9-1300-206. Where NEWs are different from those listed in TM 9-1300-206, determine the required separations as follows:

- The footage between stacks in adjacent cells is 1.1 times the cube root of the net weight of most hazardous explosives in the module as determined by the largest required QD separation.
- The footage between adjacent modules is 2.5 times the cube root of the net weight of the most hazardous explosives in either module as determined by the largest required QD separation.

> Note: Contact a civilian or military ammunition inspector for assistance if needed.

The distance between a module and a standard concrete arch or steel arch igloo magazine must be not less than 185 feet barricaded. All straight lines drawn between the module and the igloo must pass through the module barricade and igloo earth cover. The distance from unbarricaded door of an igloo facing a barricaded module must not be less than 360 feet.

Separation distances between a modular storage area and other supply areas, inhabited areas, or roads are the same as required for any other field storage systems (TM 9-1300-206).

Compatibility in Modular Storage. Store only ammunition items of one field storage category (TM 9-1300-206) in a cell. Different kinds of ammunition within one field storage category should be stored in

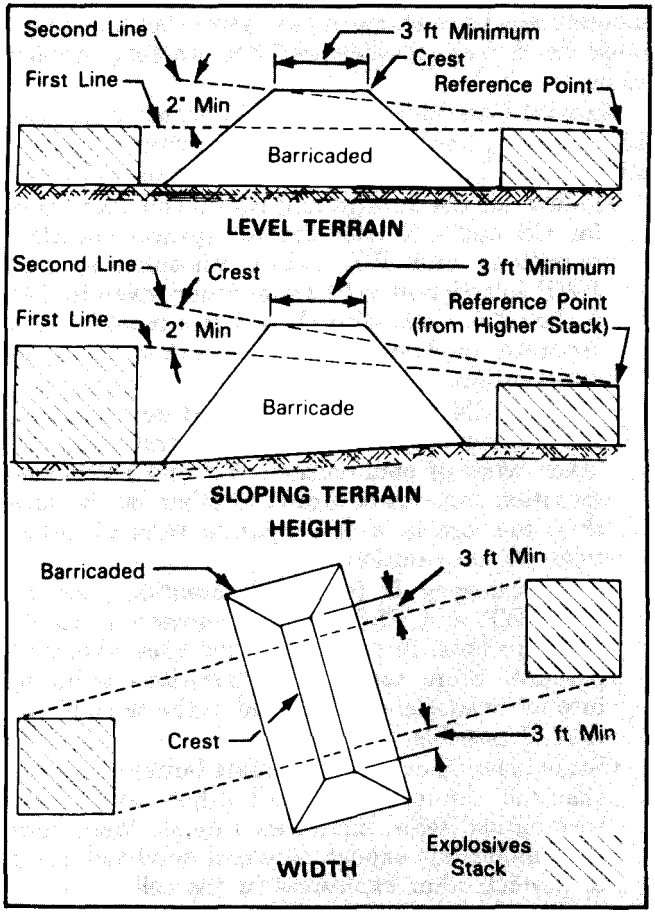

Figure 2-3. Barricade Dimensions Between Explosives Stacks.

separate stacks if stored in the same cell and separated as far as possible without wasting storage space.

Special Considerations for Modular Storage. The following items require special storage considerations when in a modular storage system.

- Follow all the storage and safety considerations for CS and CN (riot control agents) chemical munitions and WP (white phosphorus) and PWP (plasticized WP) ammunition given in TM 9-1300-206. Cells with these items must be in a separate module, away from other types of ammunition.
- CS and CN munitions can be stored together, but be sure they are in a cell separate from all other types of ammunition. WP and PWP ammunition can also be stored together, but be sure they, too, are in a cell separate from all other types of ammunition.
- Store category D (chemical munitions, except WP/PWP and CS/CN) and category F munitions (rockets) in end cells of modules whenever possible. Store category F munitions pointing into barricades and all pointed in the same direction, if possible.
- Store blasting caps in a separate bunker built inside the cell containing all other category E (demolition items, mines, etc.) items. Make sure the bunker has enough side and overhead cover to protect other explosives in the cell.
- Store category B (propellant charges) in a separate module. The module may have one or more cells, depending on the required stockage.

- Store improved conventional munitions (ICM) alone in a separate module. The module may have one or more cells, based on the required stockage objective.
- Store unserviceable, hazardous ammunition awaiting destruction and captured enemy ammunition in a separate module. The module may have one or more cells, based on the requirements.

Review all other provisions of TM 9-1300-206 regarding safety, storage, handling, etc.

STORAGE PLANNING

After the site and the system of storage is known, lay out the site, draw up a storage plan and a destruction plan, and write SOPs for each ASP operation. (See AMC Reg 385-1 and TM 9-1300-206, Chapter 2) A good plan makes a smooth-flowing, safe operation possible.

Organize the ASP into areas with specific functions. This makes it easier to do the mission and isolate hazards, Figure 2-4 is a typical layout and shows the areas most likely needed. Table 2-2 is a list of the ASP areas with important information needed to develop plans.

STORAGE PLAN

Make sure the storage plan agrees with the area layout plan. Use the following checklist when creating the storage plan.

- What is the maximum tonnage expected to be in each storage category?

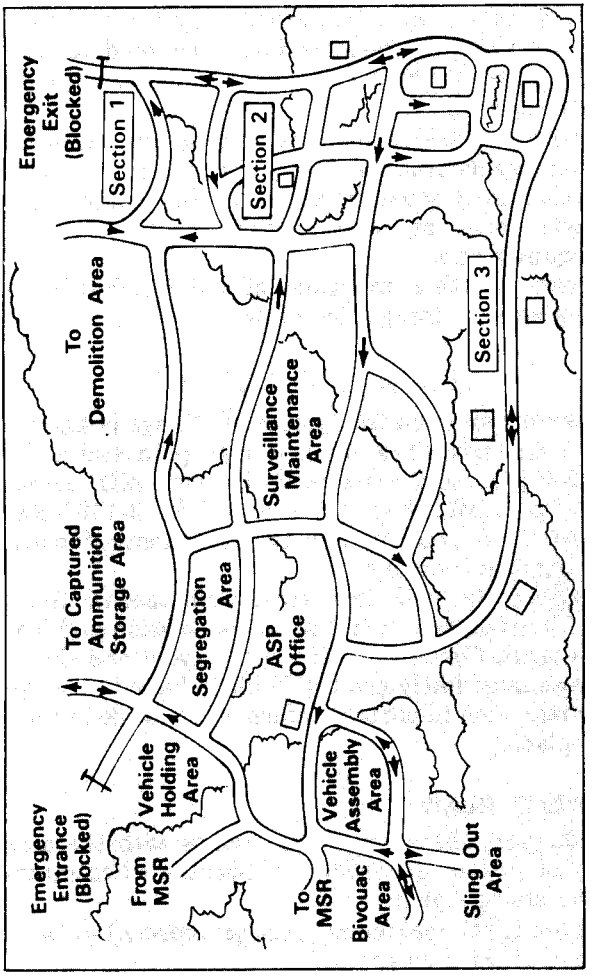

Figure 2-4. Typical ASP Layout.

Table 2-2. ASP Layout Areas.

Area	Minimum Safety Distances	Purpose	Notes
ASP		The Operations Center for the ASP.	Located at main entrance to ASP for maximum control and service to supported units.
Vehicle Holding Area	Transit area, no QD applied.	A parking area for vehicles waiting to be served. Reduces traffic congestion in your storage sites.	Located near the ASP office where vehicles will not interfere with the flow of traffic.
Segregation Area	Required quantity. distances for ammo storage.	A temporary storage area for segregating hazardous ammo and ammo in mixed lots. Also used to inspect unit turn-in when not possible to inspect at time for receipt.	Unserviceable ammo should be stored by item, lot, and category and a minimum of 700 m from nearest stack of serviceable ammo.
Ammo Storage Area	Required quantity distances	For storing serviceable ammo with respect to its field storage category.	The storage area is divided into storage sections by no., FSUs by letter, and stacks by no. Example: 2D1 is Sec. 2, FSU-D, Stack 1.
Demolition Area	700 m from other areas.	For destroying unserviceable ammo.	Choose an area unusable for other purposes and cleared of vegetation.
Salvage Area	No quantity distance requirement.	For storage of nonexplosive Class V material.	An inert area for boxes, brass, etc.
Assembly Area	Transit area, no QD applied.	A parking area for loaded vehicles being assembled for a convoy.	It may have to be consolidated into the vehicle holding area.
Ammo Sling-out	550 m from ammo storage and bivouac areas.	Provides capability of limited aerial resupply.	Located so aircraft will not pass over storage or bivouac areas: should be at least 25 m square having a stabilized base of PSP matting, etc., which will support the weight of stocks and MHE.
Bivouac Area	700 m from ammo storage or other ammo operations.	The living area for the ASP personnel.	Should be located as far as possible from storage sites for increased safety and a minimum signature.
Survl & Maint Area	IAW TM 9-1300-250, SB 742-1, and other applicable SBs.	To perform ammunition inspection, repack, and minor maintenance.	Depending on the life expectancy of the ASP this area may not be included.

- What are the expected average daily receipts and issues?
- What is the time available before first shipments of ammunition arrive?
- What is the expected lifetime of the ASP?
- What is the system of storage that will be used?
- What are the physical characteristics of the terrain that can be used as natural barricades, or that deny or restrict using certain areas?
- What natural cover and concealment are there?
- What engineer construction and other required support is available and necessary?
- What are the area security problems and requirements?
- What are the special security requirements needed for classified ammunition?
- What section, FSU, and stack numbering sequences are needed to be sure placement and retrieval of stocks is fast and accurate?

While the storage plan is being prepared, make sure all storage areas are clearly marked. Make sure signs are posted showing traffic direction, entrances, and exits. Make up and have reproduced a map of the storage areas. Use it to direct customer units to the proper storage area.

To reduce customer waiting, group ammunition by combat arms. Name roads to describe the ammunition stored along them, for example, Artillery Row or Tanker Road.

Prepare and maintain enough directional signs, fire symbols, and FSU stack signs for two ASPS.

ASP Planning. Some guidance based on field experience is given below. Be familiar with it when planning an ASP.

In laying out an ASP, locate the office far enough from the entrance so a convoy can park until the trucks are directed to various stacks. Make a map of the area showing the location of each stack, what items should be stored there, and the amount to be stored. Make sure there is enough dunnage near proposed storage locations to save time when ammunition receipts arrive.

Be sure that traffic flow is smooth. Have one-way traffic wherever possible, few turn-arounds, parking areas at entrances and exits so ammunition can be issued fast, and vehicle holding areas and vehicle assembly areas. Do not allow trucks to back up without a ground guide. Make sure there is a large parking area in case several trucks arrive at once.

Stack Location. Ammunition stacks should be far enough back from the road to allow trucks to be loaded or unloaded without interfering with traffic. Do not jam containers together; stack containers so the markings are plainly seen.

Standard Identifiers. Some units use a standard layout system both as a standard layout practice wherever they are and as a way to identify and locate ammunition. With this system, there are either lettered or numbered locations that always contain certain types of ammunition. Subdepots are designated by letter; storage sections, by number FSUs, by letter; and stacks, by number. For example, if ammunition is stored in subdepot A, section 1, FSU-A,

stack 1; it can be labeled A1A1. Each time a new ASP is established and similar stocks are required, they are placed in the same relative positions as the old ASPS. Of course, ground features must be similar to the old site. There needs to be at least one long road through the area as a reference point before a standard identification system can be used.

Lot Number Storage. All ammunition must be stored by lot number, and each lot number must be separated from other lot numbers. See Appendix D. Ammunition is numbered by lot when it is made. The lot number helps identify the ammunition and is vital for accountability, issue, and storage. Be sure individual lots are marked with tags or signs and each lot is segregated in its storage location—away from other lots.

Protection from the Weather. Basically, four things are necessary to protect ammunition from the weather: adequate shelter, enough dunnage, good drainage, and good ventilation. Tarpaulins (tarps) over stacks help (see Figure 2-5), but unless the tarps are raised clear of the stack (18-in minimum), they will be useless. Tarps can also be used as improvised shelters for VT fuzes and pyrotechnics.

In most areas, stacks have to be at least 4 to 6 inches off the ground. If they are not, the ammunition gets wet and air does not circulate. Rounds get rusty and become unserviceable. Lumber on the ground beneath containers acts as dunnage to raise them the appropriate distance. If there is no lumber, or trees are not available for dunnage, try using empty ammunition boxes or use ration boxes filled

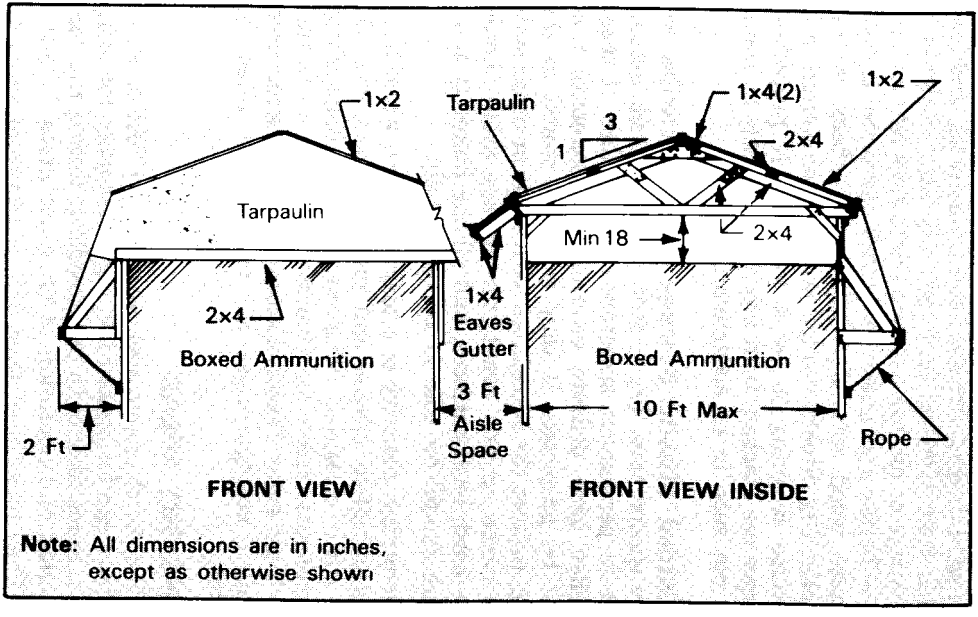

Figure 2-5. Cross Section Details of an A-Frame Ammunition Storage Module.

with sand or dirt. Bricks, wood from crates, and materials from wrecked buildings will also work. Putting strips of lumber between containers lets air circulate better and makes the stack more stable. But because wood rots and falls apart, check it frequently. Dig ditches around stacks of ammunition if drainage is going to be a problem. If propellant charges are stacked, turn lids down slightly so water will not seep in or accumulate.

Guided Missile Storage. Guided missiles require special care. Try to store guided missile assemblies in permanent structures. The bodies of these missiles have delicate electronic components that must be protected. If they must be stored in the open, protect the containers with tarps or other suitable cover. In any event, the storage areas should have hard, level surfaces, and all the humidity indicators should be able to be read easily.

Security. Security is a major concern when handling classified missile and rocket components. Do not store classified components with unclassified components. Keep an accurate check on personnel who must enter classified storage areas or structures. If open storage must be used, there must be guards.

SLING-OUT AREAS

Plan for sling-out areas in or near CSAs or ASPS so there can be limited helicopter resupply for using units. Some factors to be considered during the construction and operation of sling-out areas follow:

- They must be at least 550 meters from ammuni-

tion storage locations, working areas, and inhabited areas.

- Consider prevailing winds because helicopters must come in with the wind and take off into the wind. This is also important in limiting downwind contamination in case there is an accident involving chemical weapons.
- Sling-out areas must be set up where aircraft will never pass over storage locations, inhabited areas, or public roads while coming to the area, landing, taking off, or leaving the storage area.
- Sling-out areas should be at least 25 meters square. They should be made out of the best material available. Perforated steel planking is a good field expedient.
- Have on site only that ammunition to be placed in cargo nets. If the situation dictates, cargo nets may be loaded at the designated stock locations and then transported to the sling-out area.
- Do not use the sling-out area for storing ammunition because compatibility and quantity distances cannot be maintained at the sling-out areas. Clear immediately all incoming shipment and field returns, and store them properly in the storage facility.
- Load and stage cargo nets so aircraft can pick up the load while hovering. Make sure there is a static electricity discharge probe to be used by hookup personnel before they connect the load to the cargo hook. Make sure hookup personnel are properly trained to use the discharge probe.

- Keep MHE clear of the area while aircraft is landing or taking off.
- Make sure there is working fire fighting and other emergency equipment at the area whenever the area is being used.
- Make sure helicopter teams know the proper hook-up procedures and hand and arm signals.

When planning air shipments, be sure to consider the allowable gross weights for military cargo aircraft as shown in Table 2-3.

Table 2-3. Allowable Gross Weights for Military Cargo Aircraft.

Aircraft	Maximum Gross Weight (Pounds)	Payload (Pounds)
C-130	29,000	24,000
C-141	26,500	21,900
C-5A	43,500	38,900

See Appendix B for information on helicopter rearm points.

CAMOUFLAGE

The ASP must be hidden and blended into the countryside. Its location and size must be disguised. Use natural cover and concealment as much as possible. Using camouflage wisely goes a long way toward keeping the ASP from being discovered.

General use of camouflage material is in FM 90-2 and TM 5-200. In ASPs, however, the requirements for camouflage may conflict with the requirements

for firebreaks and ammunition shelters. Commanders must carefully weight their decisions and try to use camouflage as much as possible without violating explosive safety and proper ammunition storage procedures. Camouflaging should not slow the initial or continual operation of the ASP.

MATERIALS HANDLING EQUIPMENT

MHE is equipment that helps ammunition personnel store, handle, and ship ammunition. It makes it possible for vehicles to be loaded or unloaded rapidly upon their arrival and for ammunition to be properly handled. Included are forklift trucks, towing tractors, cranes, pallets, jacks, platform trucks, conveyor systems, etc. The most common of these are described below. Whatever is used, there are two things to consider when planning for MHE: The individual unit pack, size, and weight of the materiel to be shipped; and the type and size of the means of transport. All MHE must be load tested, and date of test stenciled on equipment.

Forklift Trucks. These pick up, carry, and stack unit loads of supplies and equipment and may be powered by gasoline, diesel, liquid petroleum gas, or battery. Under each of these categories, forklift trucks are broken down by lifting capabilities ranging from 2,000 to 15,000 pounds. Electric (battery-powered) forklift trucks are important because they are the only forklift trucks that may operate in the holds of ships transporting ammunition. They can lift from 2,000 to 10,000 pounds and are generally restricted to hard surfaces.

The forklift most commonly used at field storage activities is the rough terrain forklift (RTFL). It is an off-road vehicle with pneumatic tires so it can be used on prepared or unstable surfaces including beaches and other deep sand and can be used for loading and unloading flatbed trailers, landing craft, or other similar small cargo vessels. RTFLs can perform the functions of three types of MHE, a forklift truck, a towing tractor, and an RT crane (when the RT crane attachment is installed in place on the work carriage). The RTFL can be used for fording if the water is not over 5 feet (if there are waves, not more than 5 feet to their crest). The RTFL has front and rear -axle steering, so it can move sideways at 20-degree angles and turn with a short radius. It also has 2-wheel and 4-wheel drive so it can go over paved roads, sand, mud, snow, and steep grades with equal ease.

Towing Tractors. Towing tractors are vehicles that pull trailers. Towing vehicles (truck tractors, etc.) are important for moving ammunition efficiently. To get the most benefit, each tractor should be shuttled so that each can be used with at least two trailers. This reduces the time tractors wait for just one trailer to be loaded or unloaded. There is more information on types and characteristics of towing tractors and trailers in TM 9-500. When ammunition is transported by tractor-trailers, precautions in TM 9-1300-206 should be followed.

Cranes. Cranes raise, shift, and lower heavy weights with a projecting boom, swinging arm, or

other hoisting device that is supported on an overhead track. The crane and the forklift truck equipped with a crane boom both suspend their loads. This makes it unsafe for either to handle a load unless it has been prepared by proper lashing or unless a sling is used, such as a pallet sling for pallets. Cranes in ASPs are used mostly to handle projectiles. Since they can move more than one pallet at a time, they are more efficient than the RTFL, which is limited to one pallet at a time.

Pallets. Essential to the use of MHE are pallets. They are portable platforms of wood or other materials that come in many sizes and are vital to handling, storing, and moving ammunition.

STORAGE SAFETY

Because ammunition is so dangerous, it demands special safety regulations, which are more stringent that those for other classes of supply. Make sure a highly qualified individual has the authority for planning, coordinating, and supervising the ASP safety program. This person must make sure the QD criteria, storage compatibility groupings, are followed. This is the only way to reduce the chance of fire or sympathetic detonation. Consult Chapter 1 for more details on safety programs.

There are times the unit will not be able to observe all these requirements, but it must be kept in mind that, as tonnage is increased and distance reduced, the chance of fires and explosions is increased.

DISPERSION

If assets are dispersed enough, the ASP will not be an inviting target from the air. When possible, store quantities of each type of ammunition in two or three widely separated areas. Then, if the contents of one area are destroyed, the entire supply of any one item will not be lost. When there is not enough space to spread out, it is better to increase the quantity of ammunition in stacks and FSUs than to reduce the safety distances.

INTERSTACK DISTANCE

Interstack distances, the minimum distance between the near edge of adjacent stacks, are setup by appropriate QD tables and help prevent spreading of detonation from blast pressures. Be aware, however, that interstack distances are not always protection from missile fragments resulting from explosions or fire.

Aggressive fire fighting can usually help prevent fire spreading from one stack to another at these distances. In fact, the greater the distance between stacks the less likely fire will spread from stack to stack. With this in mind, try to separate stacks by greater distances than those prescribed. This will help prevent fires and make fire fighting easier.

INTER-FSU DISTANCE

The inter-FSU distance, the distance between the nearest edge of the nearest stacks in adjacent FSUs, also helps prevent fire spreading. When distances cannot be met, use extra care when setting up and maintaining fire protection, fire guards, and fire fighting measures.

INTERCATEGORY DISTANCE

The intercategory distance, the distance from an FSU of one category to the nearest FSU of another category, is based on the hazards of each category of ammunition. This distance cannot be reduced by barricades.

OPTIMUM SAFETY DISTANCE

The optimum safety distance is the limit inside which structural damage from a blast or from missile fragments will be serious. Be sure this distance is considered if ASPS have to be located near gasoline or other storage facilities, hospitals, permanent radio transmitters, railroads, and highways.

BARRICADES

The effect of sympathetic detonation can be reduced if there are sand or earth barricades at least 3 feet wide at the top and 1 foot higher than the stack. Natural barriers of the same dimensions give the same effect. In some cases, barriers can reduce the interstack distance up to 50 percent IAW the applicable QD tables.

CHEMICAL AMMUNITION

Store chemical filled ammunition (Category D) so that each container, item, or bomb can be inspected and easily removed. Keep projectiles containing phosphorus out of the direct sun, and store them with their bases down.

TOXIC AMMUNITION

Store toxic chemical-filled ammunition in the part of the ASP with the lowest elevation and at least 1 mile downwind from inhabited ASP buildings or

other storage areas. Make sure there are no inhabited buildings or storage areas within 2 miles downwind of the storage site. Make sure there is maximum security for this kind of area. Water-filled barrels for immersion of leakers should be placed nearby.

ROCKETS

The safety requirements for storage of rockets are stricter than for most other types of conventional ammunition. Store both small caliber rockets and large caliber, free-flight rockets on the outer edge of the ASP. Point their noses away from all other stored ammunition and from all inhabited areas. Store small caliber rockets so they are pointed into an artificial or natural barrier of sand or earth at least 3 feet thick. Locate the rockets so that there is nothing, other than their own containers, between the rockets and the barrier. Do not make stacks more than one row deep.

CATEGORY G AMMUNITION (BOMBS)

Category G ammunition is usually stored and issued by the US Air Force. However, depot and ASP commanders handle it in emergencies. For this reason, the following restrictions must be studied. The FSU is the smallest storage unit authorized. Fuzed fragmentation bombs in the same FSU may not be stored with other bombs. Components of bombs (fins, fuzes, primer-detonators, etc.) can be stored between the FSUs. If that is done, remember to protect fuzes and primer-detonators from heat and moisture. Category G photoflash bombs can be stored with Category F. If this is done, do not store

them in the same FSU with other Category G-ammunition.

FIREBREAKS

Build firebreaks wide enough (at least 50 feet) to prevent the spread of fire. If they are available, use bulldozers with specially constructed ground clearing machinery. Underbrush and grass can also be burned over. Any burning must be done before ammunition is received.