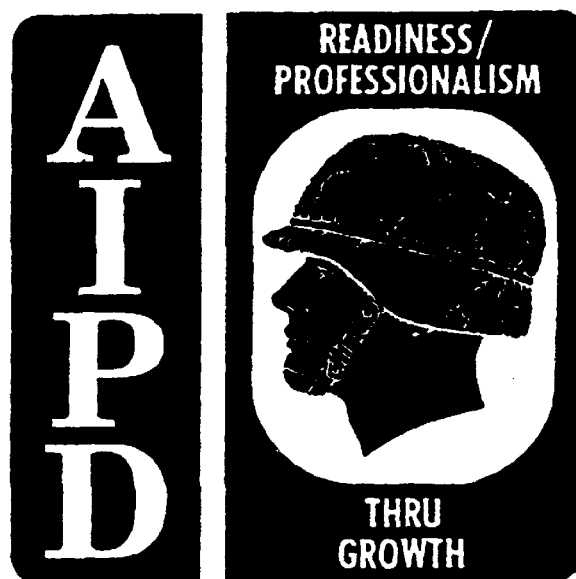


SUBCOURSE
MM0150

EDITION
A

MAGAZINE STORAGE AREA
QUANTITY-DISTANCE AND COMPATIBILITY



THE ARMY INSTITUTE FOR PROFESSIONAL DEVELOPMENT
ARMY CORRESPONDENCE COURSE PROGRAM

MAGAZINE STORAGE AREA QUANTITY-DISTANCE AND COMPATIBILITY

Subcourse Number MM0150

EDITION A

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

3 Credit Hours

Edition Date: August 1992

SUBCOURSE OVERVIEW

This subcourse is designed to provide you with the information and procedures required to determine the quantity-distance (QD) requirements and storage compatibility for Class V items to be stored in the Magazine Storage Area (MSA).

There are no prerequisites for this subcourse.

This subcourse reflects the doctrine which was current at the time it was prepared. In your own work situation, always refer to the latest official publications.

Unless otherwise stated, the masculine gender of singular pronouns is used to refer to both men and women.

TERMINAL LEARNING OBJECTIVE:

ACTION: You will learn to determine the QD requirements and the storage compatibility for Class V items to be stored in the MSA.

CONDITION: You will require only the material contained in this subcourse.

STANDARD: To demonstrate competency of this task, you must achieve a minimum of 70%, on the subcourse examination.

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LESSON

MAGAZINE STORAGE AREA QUANTITY-DISTANCE AND COMPATIBILITY

MQS II Critical Task: 03-4010.01-0002

OVERVIEW

LESSON DESCRIPTION:

In this lesson you will learn to determine the QD requirements and storage compatibility for Class V items to be stored in the Magazine Storage Area.

TERMINAL LEARNING OBJECTIVE:

- ACTION:** Determine MSA quantity-distance and compatibility requirements.
- CONDITION:** With the information provided, you will be required to determine the QD and compatibility of selected ammunition and explosive items.
- STANDARD:** To demonstrate competency of this task, you must achieve a minimum of 70% on the subcourse examination.
- REFERENCES:** The material contained in this lesson was derived from the following publications: AMC-R 385-100 and TM 9-1300-206.

INTRODUCTION

As a conventional ammunition management officer, you are responsible for the safe and efficient storage of ammunition and explosive materials at US Army and/or Department of Defense (DOD) ammunition storage facilities in the United States and overseas. To accomplish this mission, you must have a thorough understanding of the magazine storage area (MSA) quantity-distance (QD) and storage compatibility requirements.

Each type of munitions item stored at US Army/DOD activities is assigned to an appropriate storage compatibility group (SCG) and a quantity-distance (QD) hazard class/division. The factors that determine ammunition and explosives SCGs and hazard classes are evaluated based on technical data obtained from ammunition drawings, net explosive weight (NEW), and from testing during the research, development, testing and evaluation (RDTE) of these items.

Safety Considerations. As always, safety is a major function of the conventional ammunition management officer. Safety will be discussed throughout this subcourse, because in the magazine storage area, quantity-distance and storage compatibility mean safety.

Quantity-Distance (QD). The QD requirements were developed to protect nearby communities, inhabited buildings, public roadways, railroads, and other facilities from the effects of explosions that might occur within a magazine storage area (MSA). When using the term quantity-distance, we are talking about the net explosive weight (NEW) of ammunition and/or explosive items that might be stored at one location. QD is based on the characteristics of given munitions and the hazards they present. QD also includes the minimum distance these facilities must be separated both from buildings and areas used by the local population, and from other ammunition/explosive sites.

LESSON

1. Ammunition and explosives are classified (into hazard class/category) on the basis of their reactions to a specified or external initiating influence, such as heat, spark, shock, or friction. These actions/reactions may be natural or manmade. The grouping of ammunition and explosives into hazard classes is designed to assist in developing proper quantity-distance planning for the MSA.
2. Hazard Classes. TB 700-2 is the basis for the DOD storage classification.
 - a. Class 1.1 — Mass-detonating explosives.
 - b. Class 1.2 — Non mass-detonating, fragment producing.
 - c. Class 1.3 — Mass fire producing.
 - d. Class 1.4 — Moderate fire, no blast.
 - e. Class 6.1 — Toxic chemical items.
3. Protection afforded. The following actions are based on target/magazine hardening, net explosive weight limits, and the establishing of proper safety distances. They include:
 - a. Hardening of the target building or construction of the source and/or target building that is designed to reduce the required safety distances.
 - b. Ensuring that the net explosive weight limits never exceed the authorized level.
 - c. Ensuring that established safety distances reflect the acceptable and/or reasonable safety requirements compatible with the risk of accidental explosions.
4. Quantity-Distance safety factors.
 - a. All QD safety distances are based on the permissible exposure of structures and personnel to blast overpressures.
 - (1) The principal effects of the explosive's output to be considered are blast overpressures, fragments and debris, thermal hazards, and chemical hazards.
 - (2) The blast overpressure relates to the violent release of energy from a detonation. The energy release gives rise to a sudden increase in gas pressure. This sudden increase is the blast or shock wave. Table 5.0 of TM 9-1300-206 (shown as Figure 1) lists the probable effects of blast overpressure on structures and personnel.
 - b. Quantity-Distance separation. The following QD types are based on how the facility is to be used and/or where it is to be located. Ammunition safe separation distances are contained in Table 5-1, TM 9-1300-206.

(1) Inhabited building distance (IBD). See Figure 2. This includes all buildings and facilities which are occupied by human beings. It is based on the minimum permissible distance between an inhabited building and the ammunition/explosive location. Included in IBD are schools, churches, PX, hospitals, and billets. IBD also applies:

(a) Between explosive locations and administration areas/buildings.

TM 9-1300-206 Table 5-0. Probable Effects of Blast Overpressures				
Blast over-pressure (PSI)	Equivalent QD	Eng (calc*)	Estimated damage to structures	Personnel
0.9-1.2	Inhabited Building Distance	40-50W 1/3	5-10%	Minor Injuries may be caused by fragmants or debris
1.7-2.3	Public traffic route	24W 1/3	10-25%	Moderate to minor
3.5	Unbarricaded Intraline	18W 1/3	25-50%	Moderate to serious
8	Unbarricaded Aboveground Magazine	11W 1/3	50-100%	Serious-blast, fragmants or debris, translation
12	Barricaded Intraline	9W 1/3	75-100%	Serious blast, fragmants or debris, translation
27	Barricaded Magazine Distance	6W 1/3	<u>Total</u>	<u>Major</u> , death by blast, debris, fragmants

As calculated mathematically
 * Distance = $K \cdot W^{1/3}$ where Distance = QD, K equals constant W = NEW (net explosive weight)
 5-2 Change 7

Figure 1. Extract of Table 5-0, TM 9-1300-206

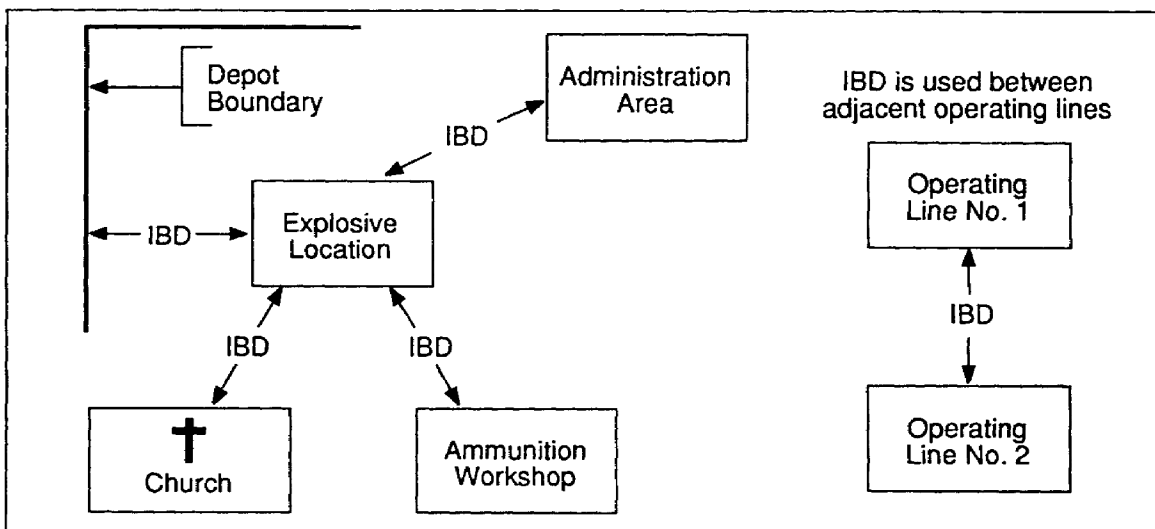


Figure 2. Inhabited building distance (IBD)

- (b) Between adjacent operating lines.
 - (c) Between explosive locations and other explosives.
 - (d) Between ammunition/explosives locations and the boundaries of US Army facilities.
 - (e) For ammunition and explosives which are not mass-detonating, the IBD is based on the most severe hazard involved.
- (2) Public Traffic Route (PTR) distance. See Figure 3. Applies to any public street, roadway, navigable stream or passenger railroad.

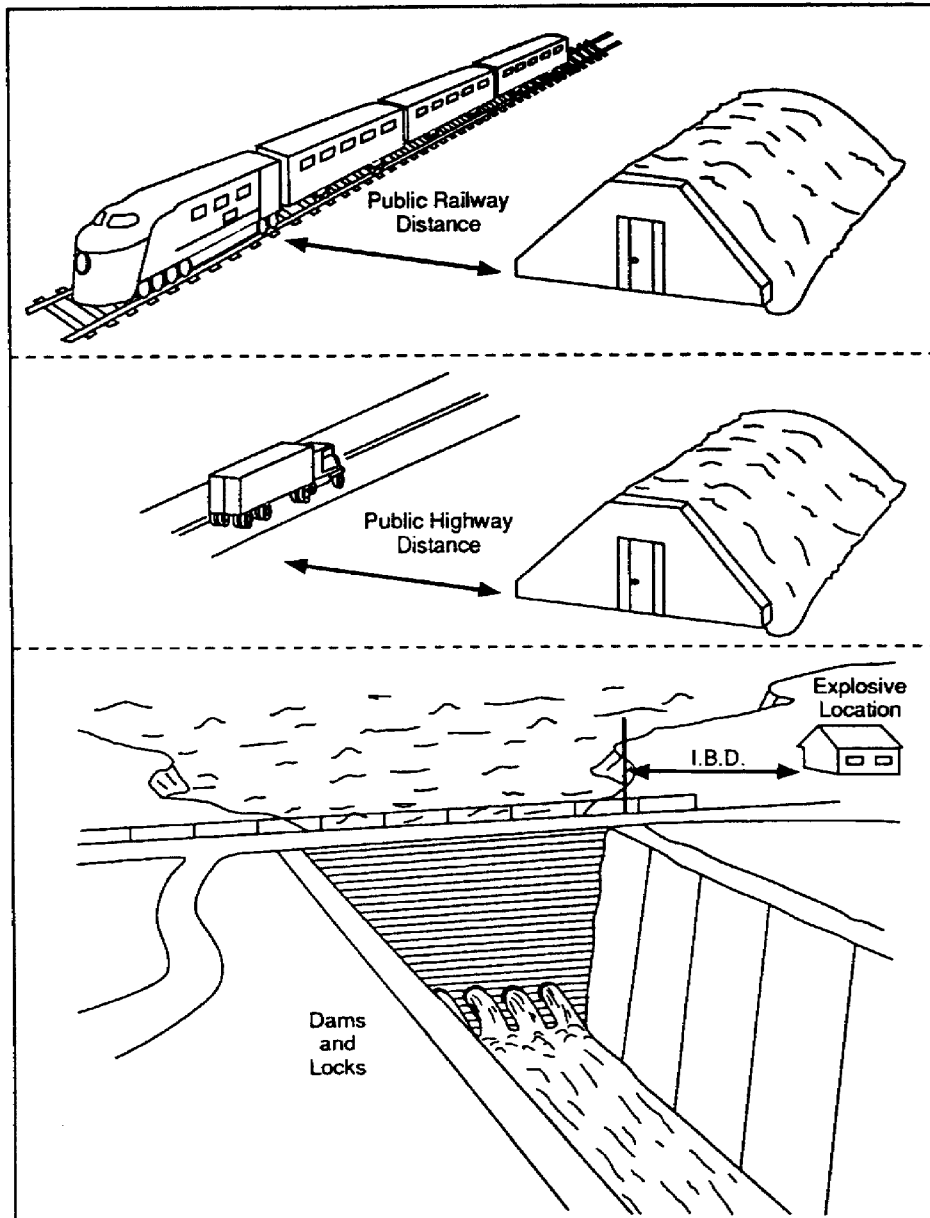


Figure 3. Public railway distance, public highway distance, and navigable stream distance

- (a) The PTR distance is the distance required between PTRs and explosive hazards.
 - (b) Motor vehicles and rail cars are considered safe from blast effects at the PTR distance. This equates to approximately 60 percent of the IBD.
 - (c) The fragment distance for PTR with classes 1.1 and 1.3 may also be reduced 60% of the minimum fragment distance for the explosive source under consideration, but never less than that required by the class 1.1 and 1.3 QD Table. See Table 5.4 of TM 9-1300-206 (subcourse Figure 7) for additional information.
- (3) Intraline Distance (ID). This is the minimum distance permitted between any two buildings within one operating line. See Figure 4. ID is also used:
- (a) For separating certain areas, buildings and locations even though actual line operations are not involved.
 - (b) With all unpackaged ammunition and explosives except class 1.3 and 1.4. In such a line they are considered class 1.1.
 - (c) Intraline distance is expected to protect buildings from the propagation of explosion due to blast effects and missile hazards.
 - (d) Buildings separated by ID will probably suffer substantial structural damage.
 - (e) A service type magazine shall be located at ID, based on the quantity of explosives in the magazine, from the nearest operating building. Service type magazines will be separated from each other by ID.
 - (f) Separate facilities (excluding service magazines) may be less than ID, but not less than prudent fire distance from operating buildings and ID from other explosive buildings. Such facilities include low pressure heating boilers and paint storage buildings.

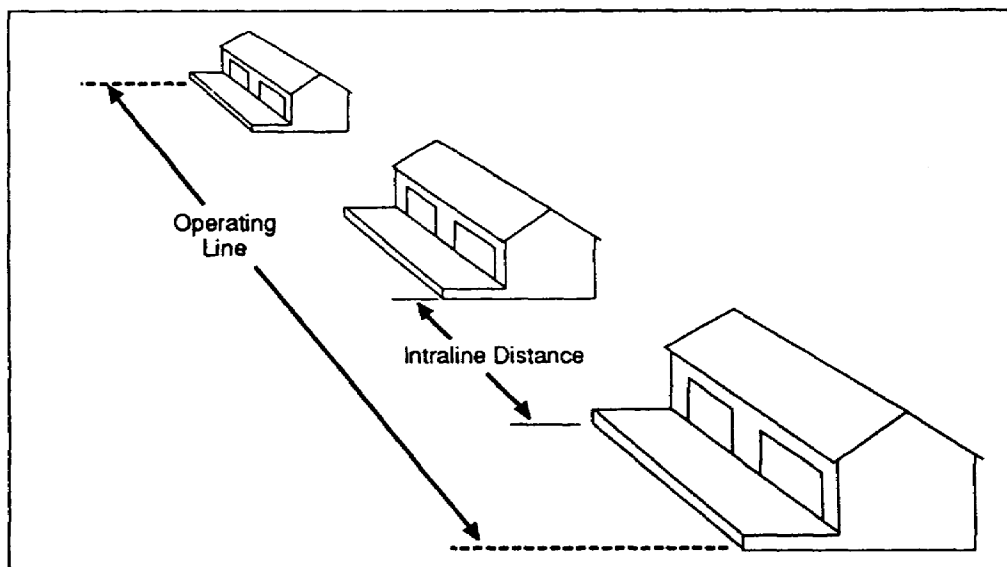


Figure 4. Operating line/intraline distance

- (4) Magazine Distance (MD). See Figure 5. This is the minimum distance permitted between any two storage magazines. MD is determined by the type of magazine and the type and quantity of explosives stored therein. MD is designed to prevent propagation of explosion from one magazine to another from the effects of blast, and to provide a reasonable degree of protection from fragments.

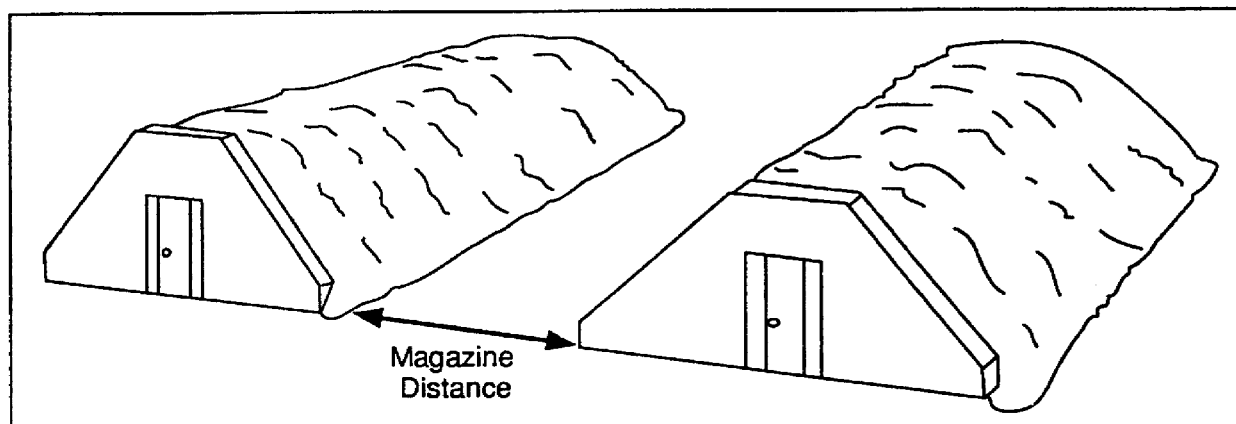


Figure 5. Magazine distance

- (5) Fragment Distance (FD). The fragment distance for a particular ammunition/explosive item is based on the range to which a hazardous fragment might be propelled. The following FD criteria apply:
- The fragment must have an impact energy of at least 58 foot-pounds, with an impact density of one fragment per 600 square feet or less.
 - FDs are applicable to class/division 1.1 through 1.3. They are indicated by numbers in parentheses placed to the left of the class/division designator. For example, (18) 1.1 means the minimum fragment distance for these items is 1800 feet. Others are: (08) 1.2; and (06) 1.3; as required to indicate the FD in hundreds of feet.
 - A minimum distance number shall be used for all items in class 1.2. This corresponds to the IBD for the various categories within class 1.2.
 - For items in class 1.1 and 1.3, the minimum distance number may be used where the separation distances are greater than specified by applicable QD for debris, fragments and/or firebrands. This is to protect personnel in the open, installation boundaries, and administration/housing areas.
 - If a minimum distance number for a cased item (projectile, bomb, etc.) is not known for items in class 1.1, the minimum distance will be 1250 feet. This will apply for most other bulk explosives, pyrotechnics and thin-skinned munitions.
 - The rationale for using fragment distances less than 1250 feet for class 1.1 will be included in all ammunition storage site plans and safety reviews. See Chapter 5 of TM 9-1300-206 for additional information.

5. QD separation of other areas.
 - a. Operating lines and other storage areas. These lines should be:
 - (1) Separated from each other and from inert areas by appropriate IBD.
 - (2) Ammunition workshops are located at IBD. This is based on the greater NEW in the workshop or the magazine.
 - (3) Guard shelters, field offices, surveillance buildings, bombproof and other personnel shelters should be at MD.
 - (4) Operating lines should be at the 1.1 ID or 1.2 thru 1.4 MD.
 - b. Change houses, lunchrooms, shipping buildings, dunnage preparation buildings, and lumber storage areas should be at ID from magazines.
 - c. An individual sentry post does not require QD, but should be located at a prudent fire distance from the explosive facility.
 - d. Classification yards. These are separated from other explosive sites by MD.
 - e. Holding yards. These are classified as aboveground magazines, and require appropriate MD. This includes:
 - (1) A 250,000 pound NEW limit per group of railcars.
 - (2) The railcars may contain more than 125,000 pounds NEW if they don't exceed the area limits.
 - f. Interchange yards. No QD required when they are used exclusively for the interchange of explosives-carrying vehicles or railcars between the commercial carrier and the military installation.
 - g. Suspect car spur track. When inspection of a railcar loaded with ammunition or explosives indicates that it may be in a hazardous condition, it should be moved at once to a suspect car spur track or an isolated section of track. The distance between the spur and other facilities should be the inhabited building distance.
 - h. Loading docks. This includes docks, pads, container transfer sites, and other facilities used to transfer explosives and ammunition from vehicles and railcars.
 - (1) The dock should not exceed 250,000 pounds NEW per dock.
 - (2) For loading dock to loading dock, the aboveground magazine distance applies.
 - (3) For loading dock to magazine, use the magazine distance.
 - (4) For an operating line or ammunition workshop serviced by the dock, use the intraline distance.

- (5) For administrative areas, inert areas, and operating lines and workshops not serviced by the dock, use the inhabited building distance.
6. Facilities for containerized munitions.
 - a. Transfer pads used for containerized munitions shall use loading dock QD requirements.
 - b. Container holding sites/transfer pads require the following safety distances:
 - (1) Will be at IBD if the materials are class 1.1 and located near unrelated operations (such as load lines, administrative areas, or indent storage).
 - (2) When the transfer pad is located adjacent to a magazine containing class 1.1 materiel, use the aboveground magazine distance.
 - (3) If the storage area is located adjacent to a site with materiel other than class 1.1, use the IBD, based on materiel stored (such as (12) 1.2, etc.).
7. QD for gasoline and other POL handling and storage facilities.
 - a. Underground facilities (tanks and pipelines):
 - (1) A minimum of 100 feet is required for class 1.4.
 - (2) 300 feet is required for all others.
 - b. Aboveground facilities, including fixed dispensing pumps.
 - (1) A minimum of 450 feet for class 1.4.
 - (2) For classes 1.1 thru 1.3, a minimum of 1800 feet or IBD, whichever is less, with a minimum of 450 feet.
 - c. Mobile units (500 gallon capacity) should be located at least 90 feet from the explosives location.
8. Spacing of ammunition and explosives on conveyors. Ammunition and explosives that are being transported on conveyors from one operating building to another, or from one operating bay to another within a single operating building, shall be separated by distances established by AMC safety information letter, dated October 1986.
9. Application of QD classification and tables.
 - a. The QD classification system is designed to identify and/or anticipate hazards; and identify the required QD criteria applicable to the development, manufacture, testing, maintenance, storage, and shipment of ammunition and explosives.
 - b. These requirements are designed to provide specified levels of protection for nearby civilian communities, public railroads, highways, and workshop or storage facilities.
 - c. The grouping of ammunition and explosives into the several hazard classes does not necessarily mean that the different items in a class may be stored together.

- d. The maximum amount of explosives permitted in any location is specified in the QD tables in Chapter 5 of TM 9-1300-206.
- e. Local limits may be established for amounts no greater than those consistent with safe and efficient operations.
- f. Hazard classes for ammunition and explosives.
 - (1) Class 1 hazardous materials are subdivided into the following divisions based on their principle hazard:
 - (a) 1.1 Mass-detonating (blast).
 - (b) 1.2 Non-mass detonating, fragment producing.
 - (c) 1.3 Mass fire.
 - (d) 1.4 Moderate fire, no blast.
 - (2) Class 1, Division 1 (blast, mass-detonating items).
 - (a) Ammunition items in this division are those of which an instantaneous explosion or detonation of virtually all of the items can be expected.
 - (b) These items produce high blast pressures with possible primary and secondary fragments. See Figure 6 for example 1.1 items, and Figure 7, page 10 for QD (IBD and PTR).

TM 9-1300-206	Table 5-3. Items in Class 1, Division 1
<p>Class 1.1 Adapter booster* Ammonium nitrate (not in original shipping containers or equivalent) exposed to detonation hazards at less than intraline distances. Ammonium perchlorate (particle size 15 microns or less). Ammonium perchlorate (particle sizes over 15 microns) not in original shipping containers or equivalent, exposed to detonation hazards at less than intraline distance. Ammonium picrate (Explosive D). Ammunition, HEP. Ammunition, pentolite loaded. Ammunition, 40mm, HE, RDX, loaded. Ammunition, 40mm, HEDP. Ammunition, 57mm HEAT, 75mm HEAT, and 105mm HEAT, M341. Bangalore Torpedoes. Baratol. Benite. Black powder, bulk. Blasting caps. Boosters.* Boosters, auxiliary. Bombs, demolition. Bombs, fragmentation. Bombs, general purpose.</p>	
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Figure 6. Extract of Table 5-3, TM 9-1300-206

Pounds of explosives		Distance in feet ²	
(Over)	(Not Over)	Inhabited Building	Public Traffic Route
0	1	40	25
1	2	50	30
2	5	70	40
5	10	90	55
10	20	110	65
20	30	125	75
30	40	140	85
40	50'	150	90
50	100	180	115
100	200	235	140
200	300	270	160
300	400	295	175
400	500	320	190
500	600	340	205
600	700	355	215
700	800	375	225
800	900	390	235
900	1000	400	240
1000	1500	460	275
1500	2000	505	305
2000	3000	580	350
3000	4000	635	380
4000	5000	685	410
5000	6000	730	440
6000	7000	770	460
7000	8000	800	480
8000	9000	835	500
9000	10,000	865	520
10,000	15,000	990	595
15,000	20,000	1090	655
20,000	25,000	1170	700
25,000	30,000	1245	745
30,000	35,000	1310	785
35,000	40,000	1370	820
40,000	45,000	1425	855
45,000	50,000	1475	885
50,000	55,000	1520	910
55,000	60,000	1565	940
60,000	65,000	1610	965
65,000	70,000	1650	990
70,000	75,000	1685	1010
75,000	80,000	1725	1035
80,000	85,000	1760	1055
85,000	90,000	1795	1075
90,000	95,000	1825	1095
95,000	100,000	1855	1115
100,000	125,000	2115	1270
125,000	150,000	2350	1410
150,000	175,000	2565	1540
175,000	200,000	2770	1660
200,000	225,000	2965	1780
225,000	250,000	3150	1890
250,000	275,000	3250	1950
275,000	300,000	3345	2005
300,000	325,000	3440	2065
325,000	350,000	3525	2115
350,000	375,000	3605	2165
375,000	400,000	3685	2210
400,000	425,000	3760	2250
13,000,000	14,000,000	12,050	7230
14,000,000	15,000,000	12,330	7400

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Figure 7. Extract of Table 5-4, TM 9-1300-206

- (c) The QD for intraline separations is contained in Figure 8.
 - (d) The intermagazine QD is shown in Figure 9, page 12.
- (3) Class 1, Division 2 (Non mass-detonating, fragment producing).
- (a) Items in this division are those for which the principal hazards are fragments and blast, either individually or in combination.
 - (b) Most fragments produced by detonations of this class/division will fall within one of the four specified minimum distances: 400, 800, 1200, and 1800 feet. These are expressed as (04), (08), (12) and (18), with the class/division—(08) 1.2—to indicate the minimum safe distance of 800 feet.

TM 9-1300-206							
Table 5-5. Class 1.1 Quantity-Distance Intraline Separations							
Pounds of explosives		Distance in feet		Pounds of explosives		Distance in feet	
(Over)	(Not over)	Bar.	Unbar.	(Over)	(Not over)	Bar.	Unbar.
0	50'	30	60	9,000	10,000	195	390
50	100	40	80	10,000	15,000	225	450
100	200	50	100	15,000	20,000	245	490
200	300	60	120	20,000	25,000	265	530
300	400	65	130	25,000	30,000	280	560
400	500	70	140	30,000	35,000	295	590
500	600	75	150	35,000	40,000	310	620
600	700	80	160	40,000	45,000	320	640
700	800	85	170	45,000	50,000	330	660
800	900	85	175	50,000	55,000	340	680
900	1,000	90	180	55,000	60,000	350	700
1,000	1,500	105	210	60,000	65,000	360	720
1,500	2,000	115	230	65,000	70,000	370	740
2,000	3,000	130	260	70,000	75,000	380	760
3,000	4,000	145	290	75,000	80,000	390	780
4,000	5,000	155	310	80,000	85,000	395	790
5,000	6,000	165	330	85,000	90,000	405	810
6,000	7,000	170	340	90,000	95,000	410	820
7,000	8,000	180	360	95,000	100,000	420	840
8,000	9,000	185	370	100,000	125,000	450	900

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Figure 8. Extract of Table 5-5, TM 9-1300-206

Table 5-6. Class 1.1 Intermagazine Distances Application

		Standard earth-covered arch type magazine ¹				Nonstandard earth-covered magazine ²				Above ground magazine (not earth-covered)		Modules		
		Side	Rear	Front unbarricaded	Front barricaded	Side	Rear	Front unbarricaded	Front barricaded	Unbarricaded	Barricaded	Module	Cell	
												Barricaded	Barricaded	
Standard earth-covered, arch-type magazine	Side	4	4	7	7	4	4	8	8	8	8	4	4	
	Rear	4	4	5	5	4	4	8	8	8	8	4	4	
	Front unbarricaded	7	5	9	8	7	5	9	8	9	8	8	8	
	Front barricaded	7	5	8	8	7	5	8	8	8	8	8	8	
Nonstandard earth-covered magazine	Side	4	4	7	7	4	4	8	8	8	8	4	4	
	Rear	4	4	5	5	4	4	8	8	8	8	4	4	
	Front unbarricaded	8	8	9	8	8	8	9	8	9	8	8	8	
	Front barricaded	8	8	8	8	8	8	8	8	8	8	8	8	
Above ground magazine (not earth-covered)	Unbarricaded	8	8	9	8	8	8	9	8	9	8	8	8	
	Barricaded	8	8	8	8	8	8	8	8	8	8	8	8	
Modules	Cell	Barricaded	4	4	8	8	4	4	8	8	8	8	6	6
	Module	Barricaded	4	4	8	8	4	4	8	8	8	8	6	3

Figure 9. Extract of Table 5-6, TM 9-1300-206

(c) Tables 5-9 thru 5-13 of TM 9-1300-206 (shown here as Figure 10 and Figure 11, page 14) contain the items in this class/division.

(4) Class 1, Division 3 (Mass fire).

(a) Items in this division are those which will burn vigorously, with little or no possibility of extinguishment in a storage situation.

(b) Explosions caused by these items normally will be confined to pressure ruptures of the containers, and will not produce shock waves or damaging blast overpressures.

(c) This class/division is a severe fire hazard to other items in the affected area.

(d) Figure 12, page 15 provides QD for class 1.3 items, and lists examples of the items in this class/division.

(5) Class 1, Division 4 (moderate fire, no blast).

(a) These items present a fire hazard with no blast or fragmentation and no toxic hazards beyond the 100-foot zone established for this class/division.

TM 9-1300-206

Table 5-9. Items in Class 1, Division 2

Class (04) 1.2

Ammunition, 20mm, HE, HEI and functional packs containing HE and HEI

Ammunition, 20mm, incendiary and functional packs containing incendiary, except those containing HE or HEI

Ammunition, 30mm, ball and high pressure test

Ammunition, 30mm, HEDP

Ammunition, 40mm, HE, M381, M386, M406, M441, and M463

Ammunition, 40mm, practice, M407A1, M382, and M385

Charge, igniter assembly, for practice hand grenades

Detonator, concussion type, M1

Fuzes (packed in accordance with approved drawings depicting issue package, except box (crate), wirebound packing)—fuzes with boosters assembled thereto of the following series: PD M48, PD M51, PD M52, PD M57, PD M78, PD M81, PD T177, PD M507, PD M508, PD M525, PTSQ M500, MTSQ M501, MTSQ M502, MTSQ M518, MT M43, MT M61, MT M67, MT T315E2, MT M342, MT M522, MT M523 and TSQ M55; artillery-type proximity fuzes with boosters, and other fuzes w/o boosters, except fuzes chemically actuated containing ampoules which may initiate, directly or indirectly, explosives and explosives loaded components, which are assembled in the conventional manner to form the finished explosive fuze

Grenade rifle, WP, M19

Grenades, practice, w/spotting charge

Igniters for rocket motors (e.g., M12, M18, and M20)

Mines, practice, w/spotting charge and/or fuze

Primers, artillery and cannon, percussion and electric

Primer detonators

Class (08) 1.2

Ammunition, 37mm, HE

Ammunition, 37mm and 40mm, TP and AP

Ammunition, 57mm through 81mm, except WP smoke, 57mm HEAT, 75mm HEAT, HEP and blank

Cartridge, illuminating

Cartridge, light mortar, 81mm or less (excluding 81mm M56) except chemical loaded

Cartridge, 90mm, canister, AP

Cartridges, practice, over 40mm

Cartridge, 120mm, APFSDS-T, M829

Catapults, aircraft ejection seat, M3A1

Grenades, WP, except grenade, rifle, WP, M19

Mines, antipersonnel (bounding type)

Class (12) 1.2

Ammunition, fixed and semifixed, 90mm through 106mm, loaded with ammonal, amatol, explosive D, composition B or TNT, except 105mm HEAT, M341

Chemical ammunition, group A, w/explosive components

Chemical ammunition, group B, w/explosive components, designed for toxic or incapacitating effects greater than lachrymation

Chemical ammunition, group B tear or smoke producing, w/explosive components, over 40mm

Chemical ammunition, group C, w/explosive components

Chemical ammunition, group D, fixed and semifixed rounds, containing flammable liquids or gels with explosive components

Chemical ammunition, group D, fixed or semifixed rounds, containing flammable solids, except for TEA or TPA

Chemical ammunition, group D, TEA or TPA, w/explosive components

Projectiles, HE (Explosive D loaded) fuzed or unfuzed

Rockets, HE, 2.75-inch (in LAU-3/A rocket launcher)

Rockets, practice, 3.5-inch

Rockets, toxic chemical agents, complete rounds

Class (18) 1.2

New data being evaluated.

NOTE: Former items in this group reclassified to 1.1 e.g., 155mm, 175mm. Other items e.g., 105mm and 8" being reevaluated.

Change 9 5-31

Figure 10. Extract of Table 5-9, TM 9-1300-206

TM 9-1300-206		Table 5-10. Category (04), Class 1.2 Quantity-Distance (Ref. Note 2)			
Pounds of explosives	Distance in feet				
	Inhabited building	Public traffic route	Intraline	Above ground magazine	
No limit	400	240	200	200 ¹	
NOTES: ¹ For storage in earth-covered magazines see note 5j, table 5-6. ² Limited quantities of items in this class, for reasons of operational necessity, may be stored in facilities such as hangars, troop buildings, and manufacturing or operating buildings without regard to quantity distance, e.g., small destructors, fuzes, and firing devices.					
		Table 5-11. Category (08), Class 1.2 Quantity-Distance			
Pounds of explosives (Not over)	Distance in feet				
	Inhabited building	Public traffic route	Intraline	Above ground magazine	
No limit	800	480	400 ¹	300 ²	
NOTES: ¹ If the H.E. in (08) 1.2 items at an operating line PES is limited to 5000 pounds, the intraline may be reduced to 200 feet. ² For storage in earth-covered magazines, see Note 5j, table 5-6.					
		Table 5-12. Category (12), Class 1.2 Quantity-Distance (Ref. Note 3)			
Pounds of explosives (Not over)	Distance in feet				
	Inhabited building	Public traffic route	Intraline	Above ground magazine	
500,000 ⁴	1200	720	600 ¹	300 ^{2,3}	
NOTES: ¹ If the H.E. in (12) 1.2 items at an operating line PES is limited to 5000 pounds, the intraline may be reduced to 200 feet. ² Items of this category present a risk of propagation to adjacent above-ground magazines, particularly when packed in combustible containers. Storage in earth-covered magazines is, therefore, preferred. ³ For storage in earth-covered magazines see Note 5j, table 5-6. ⁴ For the purpose of storage capacity, the net explosive weight for fixed, semifixed, or separate loading ammunition will be the high explosives (HE) contents of the rounds, excluding items subject to paragraph 5-12b, page 5-30.					
		Table 5-13. Category (18), Class 1.2 Quantity-Distance (Ref. Note 2)			
Pounds of explosives (Not over)	Distance in feet				
	Inhabited building	Public traffic route	Intraline	Above ground magazine	
500,000 ³	1800	1080	900	300 ^{1,2}	
NOTES: ¹ Items of this category present a risk of propagation to adjacent above-ground magazines, particularly when packed in combustible containers. Storage in earth-covered magazines is, therefore, preferred. ² For storage in earth-covered magazines, see Note 5j, table 5-6. ³ For the purpose of storage capacity, the net explosive weight for fixed, semifixed, or separate loading ammunition will be the high explosive (HE) contents of the rounds excluding items subject to paragraph 12-5b.					

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Figure 11. Extract of Quantity Distance Tables, TM 9-1300-206

TM 9-1300-206		Table 5-14. Class 1.3 Quantity-Distance ^{1,2}			
Pounds (Over)	Distance in feet				
	Pounds (Not over)	Inhabited building	Public traffic route	Intraline and aboveground magazine	
0	1,000	75	75	50	
1,000	5,000	115	115	75	
5,000	10,000	150	150	100	
10,000	20,000	190	190	125	
20,000	30,000	215	215	145	
30,000	40,000	235	235	155	
40,000	50,000	250	250	165	
50,000	60,000	260	260	175	
60,000	70,000	270	270	185	
70,000	80,000	280	280	190	
80,000	90,000	295	295	195	
90,000	100,000	300	300	200	
100,000	200,000	375	375	250	
200,000	300,000	450	450	300	
300,000	400,000	525	525	350	
400,000	500,000	600	600	400	
500,000	1,000,000	800	800	500	

¹No quantity distance requirements apply for items which, by reason of operational necessity, may be stored in limited quantities in or near buildings such as hangars, troop buildings, and manufacturing or operating buildings e.g., small arms ammunition and pyrotechnics for alert or security purposes.
²The minimum separation between privately owned railways over which passengers are not carried, and magazines and storage sites shall be not less than 400 feet unless the public railway distance specified in this table is less. However, the railways must be separated by public traffic route distances from operation buildings.

Table 5-15. Items in Class 1, Division 3

Class 1.3
 Aluminum powder (not in original shipping container or equivalent)
 Ammunition, blank and saluting, cannon
 Ammonium nitrate (not in original shipping containers or equivalent) exposed to fire hazards only or to detonation hazards at more than intraline distance
 Ammonium perchlorate (particle sizes over 15 microns) not in original shipping container or equivalent, exposed to fire hazards only or exposed to detonation hazards at more than intraline distance
 Bombs, photoflash, M122, w/o burster

Zirconium (types I and II, spec. FED 1665), not in original shipping containers or equivalent

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Figure 12. Extract of Quantity-Distance Tables, TM 9-1300-206

- (b) Figure 13, page 16 gives a sample of items in this class/division. Figure 14, page 16 provides the QD.
- (6) Class 6, Division 1 contains toxic and incapacitating chemical agents/munitions. See Figure 15, page 17 for an example of 6.1 items.
 - (a) No QD tables are established for 6.1 items, since these should not have explosives.
 - (b) The major hazard expected from 6.1 items is the toxic effect of the agents if they are involved in an accident or fire.
- (7) QD for underground utilities installations.
 - (a) Permanent government-controlled underground utilities, excluding building service lines, should be separated from explosives locations containing 1.1 and (18) 1.2 items.
 - (b) Privately owned or operated utilities should be separated from explosive locations by a minimum of the appropriate PTRD.

TM 9-1300-206	Table 5-16. Items in Class 1, Division 4
Class 1.4	
Aluminum powder (in original shipping container or equivalent) Ammonium nitrate (in original shipping container or equivalent) Ammonium perchlorate (particle size over 15 microns) in original shipping containers or equivalent Ammunition, small arms, .50 caliber or less Ammunition, 20mm, practice and high pressure test Ammunition, 20mm, API Ammunition, 25mm, with inert projectile Ammunition, 27mm, caseless Ammunition, 30mm, practice and training Ammunition, 40mm, canister, multiple projectile, and practice Ammunition, 40mm, riot control and pyrotechnic loaded, except WP smoke Batteries, thermal or squib activated Cartridge, igniter, M2 Cartridge cases, primed (w/o propellant) Catapults, aircraft ejection seat, M4A1 and M5 Charge, spotting, AP, practice, M8 Chemical ammunition, group B, tear and smoke producing, w/o explosive components Chlorates (in original shipping containers or equivalent) Cutter, reefing line Explosive bellows Firing devices Fuse fighters Fuse, safety	
Zirconium (types I and II, spec. FED 1665), in original shipping container or equivalent	Change 7 5-35

Figure 13. Extract of Table 5-16, TM 9-1300-206

TM 9-1300-206	Table 5-17. Items in Class 1.4 Quantity-Distance ¹			
Pounds of explosives	Distance in feet			
	Inhabited building	Public traffic route	Intraline	Above ground magazine
No limit	100	100	100	100 ²
¹ No quantity-distance requirements apply where facilities and quantities are such that the effects of an incident will be totally contained by the facility, or for the conditions described in Note 1 of table 5-14. ² If storage structure is fire-resistive, 80 feet may be used.				

Figure 14. Extract of Table 5-17, TM 9-1300-206

TM 9-1300-206		Table 4-2. Storage Information and Shipping classification for Chemical Agents					
Agent symbol	Common name	Action of agent	Visual* ID	Chemical group	Storage compatability group	DOT hazard class	Color coding identification **
GB	Sarin	Nerve agent Nonpersistent	Colorless to amber liquid	Group A Special hazard	Group K	Poison A	GREY base coat. GB in Dark GREEN. One Dark GREEN band.
VX	None	Nerve agent Persistent	Colorless to straw liquid	Group A Special hazard	Group K	Poison A	GREY base coat. VX in Dark GREEN. One Dark GREEN band.
H	Levinstein Mustard	Blister agent	Colorless to pale yellow liquid	Group A	Group K	Poison A	GREY base coat. H in Dark GREEN. One Dark GREEN band.
HD	Distilled Mustard	Blister agent	Colorless to pale yellow liquid	Group A	Group K	Poison A	GREY base coat. HD in Dark GREEN. One Dark GREEN band.
HT	Mustard T Mixture	Blister agent	Clear yellow liquid	Group A	Group K	Poison A	GREY base coat. HT in Dark GREEN. One Dark GREEN band.
L	Lewisite	Blister agent	_____	Group A	Group K	Poison A	GREY base coat. L in Dark GREEN. One Dark GREEN band.
CL	Chlorine	Choking agent	Yellow gas	Group B	Group K	Poison A	GREY base coat. CL in Dark GREEN. One Green band.
CG	Phosgene	Choking agent	Colorless gas	Group B	Group K	Poison A	GREY base coat. CG in Dark GREEN. One Green band.
CK	Cyanogen Chloride	Blood agent	Colorless gas	Group B	Group K	Poison A	GREY base coat. CK in Dark GREEN. One Green band.
AC	Hydrogen Cyanide	Blood agent	_____	Group B	Group K	Poison A	GREY base coat. AC in Dark GREEN. One Green band.
BZ	None	Incapacitating agent	White crystalline solid	Group B	Group K	Flammable Solid	GREY base coat. BZ in VIOLET. One VIOLET band.
CN	Chloroacetophenone	Tear agent Riot control	White crystalline solid	Group B	Group G	Irritant	GREY base coat. CN in RED. One RED band.
CNS	Chloroacetophenone in chloropicrin & chloroform	Tear agent Riot control	Liquid	Group B	Group G	Irritant	GREY base coat. CNS in RED. One RED band.
CS	None	Tear agent Riot control	White crystalline solid	Group B	Group G	Irritant	GREY base coat. CNS in RED. One RED band.
BBC	Bromobenzylcyanide	Tear agent Riot control	Liquid	Group B	Group G	Irritant	GREY base coat. BBC in RED. One RED band.
DA	Diphenylchloroarsine	Vomiting agent Riot control	_____	Group B	Group G	Irritant	GREY base coat. DA in RED. One RED band.
DC	Diphenylcyanoarsine	Vomiting agent Riot control	_____	Group B	Group G	irritant	GREY base. DC in RED. One RED band.
DM	Adamsite	Vomiting agent Riot control	Yellow to green solid	Group B	Group G	Irritant	GREY base coat. DM in RED. One RED band.
FS	Sulphur Trioxide Chlorosulphonic acid solution	Smoke	_____	Group B	Group G	Corrosive Material	LIGHT GREEN base coat. FS & other information in BLACK.
FM	Titanium tetrachloride	Smoke	Heavy colorless liquid	Group B	Group G	Corrosive Material	LIGHT GREEN base coat. FM & other information in BLACK.
HC	Aluminum zinc oxide hexachloroethane	Smoke	_____	Group B	Group G	Flammable solid	LIGHT GREEN base coat. HC & other information in BLACK.
WP	White Phosphorous	Incendiary and smoke	Pale yellow solid	Group C	Group H	Flammable solid	LIGHT GREEN base coat ***. WP & other information in LIGHT RED.
PWP	Plasticized White Phosphorous	Incendiary and smoke	Pale yellow like putty	Group C	Group H	Flammable solid	LIGHT GREEN base coat ***. WP & other information in LIGHT RED.
TH	Thermite or Thermate	Incendiary	Light to dark grey	Group D	Group G	Flammable solid	LIGHT RED base coat. TH & other information in BLACK.
IM	Isobutylmethacrylate with oil	Incendiary Oil compound	_____	Group D	Group J	Flammable liquid	LIGHT RED base coat. IM & other information in BLACK.
NP	Napalm	Incendiary Gel	Light tan to brown jelly	Group D	Group J	Flammable liquid	LIGHT RED base coat. NP & other information in BLACK.
PT	Pyrotechnic material	Magnesium incendiary mixture	Light Grey	Group D	Group G	Flammable solid	LIGHT RED base coat. PT & other information in BLACK.
TEA or TPA	Triethyl Aluminum	Spontaneously flammable	Clear liquid	Group D	Group L	Flammable liquid	LIGHT RED base. TEA or TPA and 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 marking 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 15. Extract of Table 4-2, TM 9-1300-206

- (c) Individual structures should be separated by IBD.
- (d) Figure 16, page 18 provides information on QD for underground service installations.

10. Storage Compatibility.

TM 9-1300-206 Table 5-18. Quantity-Distance Separation for Protection of Underground Service Installations		Table 5-18. Quantity-Distance Separation for Protection of Underground Service Installations-Continued	
Quantity of explosives (not over)	Distance (feet)	Quantity of explosives (not over)	Distance (feet)
100	15	10,000	85
200	20	20,000	85
500	25	50,000	110
1,000	30	100,000	140
2,000	40	250,000	190
5,000	50		

Figure 16. Extract of Table 5-18, TM 9-1300-206

- a. All ammunition and explosive items are assigned to an appropriate storage compatibility group (SCG) for storage at military activities.
- b. The factors which determine ammunition and explosive storage compatibility groups are obtained from ammunition drawings, testing during RDTE, and other data required by TB 700-2.
- c. The highest degree of safety in ammunition and explosives storage could be assured if each item or division were stored separately. However, such ideal storage generally is not feasible.
 - (1) A proper balance of safety and other factors frequently requires mixing of several types of ammunition and explosives in storage.
 - (2) Ammunition and explosives will not be stored with other materials which present potential hazards to the munitions (for example, mixed storage of ammunition and explosive items with flammable or corrosive materials).
 - (3) Considerations used in developing SCGs include:
 - (a) Chemical and physical properties of the item.
 - (b) Design characteristics.
 - (c) Packaging.
 - (d) QD division.
 - (e) Rate of deterioration of item in storage.
 - (f) Net explosive weight (NEW).
 - (g) Sensitivity to initiation.
 - (h) Effects of deflagration.
- d. Compatible ammunition and explosives.
 - (1) The grouping of different kinds of explosives into a compatible storage system is one way to ease the burden placed on the ammunition storage facility. This is accomplished by use of a mixing chart (see Figure 17, page 20) which identifies SCGs permitted in same location.

- (2) The storage compatibility groups consist of 12 lettered groupings ranging from A thru H, J, K, L and S. The groups are explained below.
- (a) Group A - Initiating explosives. These are the most hazardous items due to their sensitivity to heat, shock and/or friction. Group A includes wet lead azide, lead styphnate, mercury fulminate, tetracene and dry PETN. These explosives are used in initiators, detonators, and blasting caps.
 - (b) Group B - Initiating devices and detonators. These items contain Group A explosives and may have Group D explosives in small quantities. Examples are military blasting caps and/or relay/delay detonators.
 - (c) Group C - Bulk propellants and propelling charges. When these items are ignited, they may burn or detonate. Examples are: Single-, double-, triple-base and composite propellants; solid propellant rocket motors; and ammunition with inert projectiles.
 - (d) Group D - Black powder, bulk high explosives, and ammunition containing HE without a fuze or means of initiation. Examples are: Bulk TNT, Comp B, wet RDX and PETN, bombs, projectiles, torpedo warheads, and saluting charges and fuzes with two or more safety features.
 - (e) Group E - Ammunition containing HE without a fuze, but with its propelling charge. This includes artillery ammunition, rockets, and guided missiles.
 - (f) Group F - Ammunition containing HE with its own fuze and with or without a propelling charge. Examples are items initiated by an inline explosive train (fuze), i.e., grenade fuzes, grenades, and sounding devices.
 - (g) Group G - Fireworks, illuminating, incendiary, smoke including HC, FS and lachrymatory (tear gas) munitions, and flammable liquids or gels.
 - (h) Group H - Ammunition containing white phosphorus (WP) or plasticized white phosphorus (PWP), sodium, and other pyrohoric materials. These items are spontaneously ignited when exposed to the atmosphere (air) for WP, water for sodium, and by abrasion for pyrohoric materials (anti-tank, kinetic energy projectiles).
 - (i) Group J - Ammunition containing flammable liquids or gels, with or without explosives. Examples are: fire bombs (thickened fuels) and napalm munitions/agents.
 - (j) Group K - Ammunition containing toxic chemical agents, with or without explosives. This includes all munitions with toxic and incapacitating (CS) agents. The storage containers and bulk chemicals are included in this group. See Figures 14 and 16 for these items.
 - (k) Group L - Ammunition not included in other compatibility groups. Any item having characteristics or properties that do not permit storage with other types of ammunition or explosives. Examples are prepackaged liquid fueled rocket engines, fuel-air explosive (FAE) munitions, TPA and Triethyl Aluminum (TEA), and damaged or suspect ammunition of any group.

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

NOTES:

- "X" INDICATES THAT THESE GROUPS MAY BE COMBINED IN STORAGE. OTHERWISE, MIXING IS EITHER PROHIBITED OR RESTRICTED ACCORDING TO NOTE #2.
- "Z" 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 MACOM AND ARE NOT CONSIDERED WAIVERS. EXAMPLES OF ACCEPTABLE COMBINATIONS OF CLASS 1 ARE:
 - * DIVISION 1, GROUP A, INITIATING EXPLOSIVES WITH DIVISION 1, GROUP B, FUZES NOT CONTAINING TWO OR MORE INDEPENDENT SAFETY FEATURES.
 - * DIVISION 3, GROUP C, BULK PROPELLANTS OR BAGGED PROPELLING CHARGES WITH DIVISION 3, GROUP G, PYROTECHNICS, WITHOUT THEIR OWN MEANS OF INITIATION.
- COMPLIANCE WITH COMPATIBILITY CRITERIA IS NOT REQUIRED FOR MISSION ESSENTIAL QUANTITIES OF EXPLOSIVES IN CLASS/DIVISION 1.4 OR 6.1 (EXCLUDING TOXIC CHEMICAL MUNITIONS); UP TO 100 LBS NEW CLASS/DIVISION 1.3; AND UP TO 50 LBS NEW CLASS/DIVISION (O4) 1.2. SEE PARAGRAPH 5-5G FOR QD REQUIREMENTS OF SMALL QUANTITIES OF EXPLOSIVES.
- EQUAL NUMBERS OF SEPARATELY PACKAGED COMPONENTS OF COMPLETE ROUNDS OF ANY SINGLE TYPE OF AMMUNITION MAY BE STORED TOGETHER. WHEN SO STORED, COMPATIBILITY IS THAT OF THE ASSEMBLED ROUND; I.E., WP FILLER IN GROUP H, HE FILLER IN GROUPS D, E, OR F, AS APPROPRIATE.
- GROUP K REQUIRES NOT ONLY SEPARATE STORAGE FROM OTHER GROUPS, BUT ALSO MAY REQUIRE SEPARATE STORAGE WITHIN THE GROUP. DA SHALL DETERMINE WHICH ITEMS UNDER GROUP K MAY BE STORED TOGETHER AND THOSE WHICH MUST BE STORED SEPARATELY.
- AMMUNITION ITEMS WITHOUT EXPLOSIVES THAT CONTAIN SUBSTANCES PROPERLY BELONGING TO ANOTHER HAZARD CLASS MAY BE ASSIGNED TO THE SAME COMPATIBILITY GROUP AS ITEMS CONTAINING EXPLOSIVES AND THE SAME SUBSTANCE, AND BE STORED WITH THEM.
- DA MAY AUTHORIZE AMMUNITION DESIGNATED "PRACTICE" BY NATIONAL STOCK NUMBER (NSN) AND NOMENCLATURE TO BE STORED WITH THE FULLY LOADED AMMUNITION IT SIMULATES.
- MACOMS MAY AUTHORIZE THE MIXING OF COMPATIBILITY GROUPS, EXCEPT ITEMS IN GROUP A, K, AND L, IN QUANTITIES NOT EXCEEDING 1000 POUNDS PER STORAGE SITE.
- FOR PURPOSES OF MIXING, ALL ITEMS MUST BE PACKAGED IN APPROVED STORAGE CONTAINERS. ITEMS SHALL NOT BE UNPACKAGED AT STORAGE LOCATIONS.
- 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 PROPAGATION TO THOSE ARTICLES.
- FUZES IN COMPATIBILITY GROUP DA ARE ALSO COMPATIBLE WITH FUZES AND OTHER ITEMS IN COMPATIBILITY GROUP B.

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Figure 17. Storage compatibility mixing chart

- (1) Group S - Ammunition with no significant hazard. These items are designed and/or packed to limit any explosive effect to the package. Examples are thermal batteries, explosive switches, valves, etc.

e. Mixed Storage

- (1) The mixing of SCGs is permitted as indicated in Figure 17. Items in storage compatibility groupings are listed alphabetically in Table 5-19 of TM 9-1300-206 (shown as Figure 18).
- (2) Items from SCGs C, D, E, F, G, and S may be combined in storage, providing the net quantity of explosives does not exceed 1,000 pounds per storage site.
- (3) SCGs H, J and K will not normally be stored with other SCGs except for the explosive bursters and/or fuzing required with these items. Examples: fuzed gas projectiles, WP, and CS grenades.
- (4) In addition to the above, ammunition 30MM and less assigned to hazard class 1.4 in groups C, G or S may be stored without regard to explosive quantity limits.

11. Use of barricades (see Figure 19, page 26).

- a. The use of barricades against high-velocity, low-angle fragments is very effective.
- b. Barricades are ineffective against high-angle fragments.
- c. Only limited protection against blast can be expected in the immediate vicinity.
- d. Properly constructed, separate artificial or natural barricades are effective means for protecting structures and/or operations. The following rules apply:
 - (1) Barricades shall not be used to reduce distances required for fire hazards of class 1.3 materials or IBD.
 - (2) Protection is considered effective if the line from the explosive source is higher than item being protected.
 - (3) For railroads and highways to be considered barricaded, the line must pass 12 feet above the center of the highway or railroad.
 - (4) The barricade must be separated from both the building it is to screen and the building containing the hazard.
 - (5) Barricades may be natural or artificial earth mounds having sloping sides or single revetted with wood or concrete. The width of the barricade should be at least three feet, and it should be three feet higher than the hazard source.
 - (6) The length of the barricade is determined by the size of the structure being protected. It should extend three feet beyond the ends of the structure.

<i>Table 5-19. Storage Compatibility Groups for Explosives and Ammunition</i>	TM 9-1300-206
GROUP A	
Cyclonite (RDX), dry	
HMX, dry	
Lead azide, wet	
Lead styphnate, wet	
Mercury fulminate, wet	
PETN, dry	
RDX (cyclonite), dry	
Tetracene, wet	
GROUP B	
Blasting caps	
Detonators	
Fuzes (except those with 2 or more safing features or chemically-actuated fuzes containing ampoules which may initiate, directly or indirectly, explosives and explosives-loaded components which are assembled in the conventional manner to form the finished explosive fuze)	
Mines, practice, AP, M17	
Percussion elements	
Primer detonators	
GROUP C	
Ammunition, blank and saluting, cannon	
Ammunition, .50 caliber, except API and incendiary rounds	
Ammunition, 20mm, practice and high pressure test	
Ammunition, 25mm, with inert projectile	
Ammunition, 27mm, caseless	
Ammunition, 30mm, ball and high pressure test	
Ammunition, 30mm, practice and training	
Ammunition, 37mm and 40mm, TP and AP	
Ammunition, 40mm, practice, M407A1, M382, and M385	
Benite	
Baron Potassium nitrate	
Cartridge, 90mm, canister, AP	
Cartridges, practice, over 40mm	
Catapults, aircraft ejection seat, M3A1, M4A1, M5	
Charge, propelling, not assembled to projectiles	
Detonating cord (primacord)	
EC powder	
Nitrocellulose	
Fuel (solid), emergency power unit	
Propellant	
Rockets, practice, 3.5-inch	
Rocket motors (solid propellant), M3, M5, M6, M10, M13, M26, M30, M37, M42, M53, M66; Pershing 1st and 2nd stages; Spartan 1st, 2nd, and 3rd stages	
GROUP D	
Adapter booster	
Ammonium nitrate, except in original shipping container or equivalent	
Ammonium perchlorate, except when particle size is over 15 microns and in original shipping container or equivalent when exposed to detonation hazards at less than intraline distance	
Ammonium picrate (Explosive D)	
Bangalore torpedoes	

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Figure 18. Extract of Table 5-19, TM 9-1300-206

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Table 5-19. Storage Compatibility Groups for Explosives and Ammunition-Continued

GROUP D - Continued

Baratol
 Black powder, bulk
 Bombs, demolition
 Bombs, fragmentation
 Bombs, general purpose
 Boosters
 Boosters, auxiliary
 Bursters
 Charge, demolition, snake
 Charge, springing earth rod, blast driven
 Charge, supplementary, HE
 Compositions A, A-2, A-3, A-4, B, B-3, C, C-2, C-3, and C-4
 Cutter, cable M1
 Cyclonite (RDX), wet
 Cyclotol
 Demolition blocks
 Destructor, HE, M10
 Detonating cord (primacord) exposed to detonation hazard at less than intraline distance
 Dynamite
 Ednatol
 Explosive D
 Explosives, cratering
 Fuzes Detonating with 2 or more safing features
 Grenades, rifle, AT (except pentolite loaded)
 HMX, wet
 Mine, APERS, NM, M14 (w/integral fuze)
 Mines, antipersonnel (bounding type)
 Mines, antipersonnel (cast iron block)
 Mines, HEAT
 Nitrocellulose wet 8-30% water exposed to detonation hazards at less than intraline distances.
 Nitroguanidine
 Nitrostarch
 Octol
 PBX

 PETN, wet
 Picratol
 Picric acid
 Projectiles, HE, fuzed or unfuzed
 RDX (Cyclonite), wet
 Rocket heads, HE and HEAT (except pentolite loaded) w/o motors
 Shaped charges
 Tetranitrocarbazole (TNC)
 Tetryl
 Tetrytol
 TNT
 Tritonal
 Torpex

GROUP E

Ammunition, HEP
 Ammunition, 20mm, HE, HEI and functional packs containing HE and HEI

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Figure 18. Extract of Table 5-19, TM 9-1300-206 (Cont.)

Table 5-19. Storage Compatibility Groups for Explosives and Ammunition-Continued

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GROUP E - Continued

Ammunition, 30mm, HEDP
 Ammunition, 37mm, HE
 Ammunition, 40mm, HE, RDX loaded
 Ammunition, 40mm, HEDP
 Ammunition, 40mm, HE, M406, M381, M386, M441, and M463
 Ammunition, 57mm through 81mm, except WP smoke, HEP and blank
 Ammunition, fixed and semifixed, 90mm through 106mm, loaded with ammonal, amatol, Explosive D, composition B or TNT.
 Cartridge, heavy mortar, over 81mm (including 81 mm M56), except chemical loaded
 Cartridge, light mortar, 81 mm or less (excluding 81 mm M56), except chemical loaded
 Redeye guided missiles, packaged 3 complete rounds w/launcher
 Rockets, HEAT, 3.5-inch, complete round
 Rockets, HE, 2.75-inch (in LAU-3/A rocket launcher)

GROUP F

Grenades, hand offensive
 Grenades, fragmentation

GROUP G

Ammunition, 30 and .50 caliber API and incendiary
 Ammunition, 20mm, API
 Ammunition, 20mm, incendiary and functional packs containing incendiary, except those containing HE or HEI
 Ammunition, 40mm, riot control and pyrotechnic loaded, except WP smoke
 Bombs, photoflash
 Cartridge, igniter, M2
 Cartridge, illuminating
 Cartridge, photoflash
 Cartridge cases, primed (w/o propellant)
 Charge, igniter assembly, for practice hand grenades
 Charge, spotting, AP practice, M8
 Chemical ammunition, group B, tear or smoke producing, w/explosive components, over 40mm
 Chemical ammunition, group B, tear or smoke producing, w/o explosive components
 Chemical ammunition, group D, containing flammable solids, except for TEA or TPA, w/o explosive components
 Chemical ammunition, group D, fixed or semi-fixed rounds, containing flammable solids, except for TEA or TPA
 Clusters, incendiary bomb, M31 and M32 (w/o fuzing components)
 Destroyer, file, M4
 Detonation simulator, explosive M80
 Grenade, hand, smoke, HC, M8
 Grenades, hand, CN, M7A1, w/fuze M201A1
 Grenades, hand, CS M7A3, w/fuze M201A1
 Grenades, hand, CN1, ABC, M25A1, w/fuze C12
 Grenades, hand, DM1, ABC, M25A2, w/fuze C12
 Grenades, illuminating and incendiary except WP
 Grenades, practice, w/spotting charge
 Grenades, rifle, smoke, XM48E1 and M22 and M23
 Grenades, smoke (except WP and PWP)
 Grenades, riot control, CS1, M252A2
 Igniter, spotting charge
 Igniter for rocket motors (e.g., M12, M18, M20, and M29)
 Ignition cartridge for trench mortar ammunition
 Illuminating compositions (consolidated in final press operations)
 Mines, practice, w/spotting charge and/or fuze

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Figure 18. Extract of Table 5-19, TM 9-1300-206 (Cont.)

TM 9-1300-206

Table 5-19. Storage Compatibility Groups for Explosives and Ammunition-Continued

GROUP G - Continued

Nuclear fire marker device 11-F2
 Photoflash powder
 Primers, artillery and cannon, percussion and electric
 Projectiles, illuminating
 Rocket, riot control agent, CS, 2.75-inch FFAR, MX99
 Simulators, M110, M115, M116, M117, M118, M119, nad XM142
 Smoke pots
 Spotting charges (cartridge for miniature practice bombs)

GROUP H

Chemical ammunition, group C
 Grenades, WP
 Grenade rifle, WP, M19

GROUP J

Chemical ammunition, group D, containing flammable liquids or gels, with or w/o explosive components
 Chemical ammunition, group D, fixed and semifixed rounds, containing flammable liquids or gels with or without explosive components

GROUP K

Chemical ammunition, group A, with or without explosive components
 Chemical ammunition, group B, with or without explosive components, designed for toxic or incapacitating effects greater than lachrymation
 Rockets, toxic chemical agents, complete rounds

GROUP L

Aluminum powder
 Ammonium nitrate
 Ammonium perchlorate
 Ammunition, pentolite loaded
 Chemical ammunition, group A, w/o explosive components
 Chemical ammunition, group B, w/o explosive components, designed for toxic or incapacitating effects more severe than lachrymation
 Chemical ammunition, group D, TEA or TPA components with or w/out explosives
 Chlorates
 DNT
 Fuzes, chemically-actuated, containing ampoules which may initiate directly or indirectly, explosives and explosives-loaded components which are assembled in the conventional manner to form the finished explosive fuze
 Magnesium powder
 Grenades, rifle, AT (pentolite loaded)
 Nitrates (inorganic), except ammonium nitrate (in original shipping container or equivalent)
 Perchlorates
 Peroxides, solid
 Rocket heads, pentolite loaded, w/o motors
 Rocket motors (Liq. fuel propellant) M5 (Lance)
 Zirconium (types I and II, spec. FED 1665)

GROUP S

Ammunition, 40mm, canister and multiple projectile
 Ammunition, small arms, less than .50 caliber except .30 cal-API
 Batteries, thermal or squib activated, cutter, reefing line
 Explosives bellows
 Firing devices
 Fuse lighters
 Fuse, safety
 Grenade hand Practice M69
 Squibs, commercial
 Thruster, cartridge activated, M25

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Figure 18. Extract of Table 5-19, TM 9-1300-206 (Cont.)

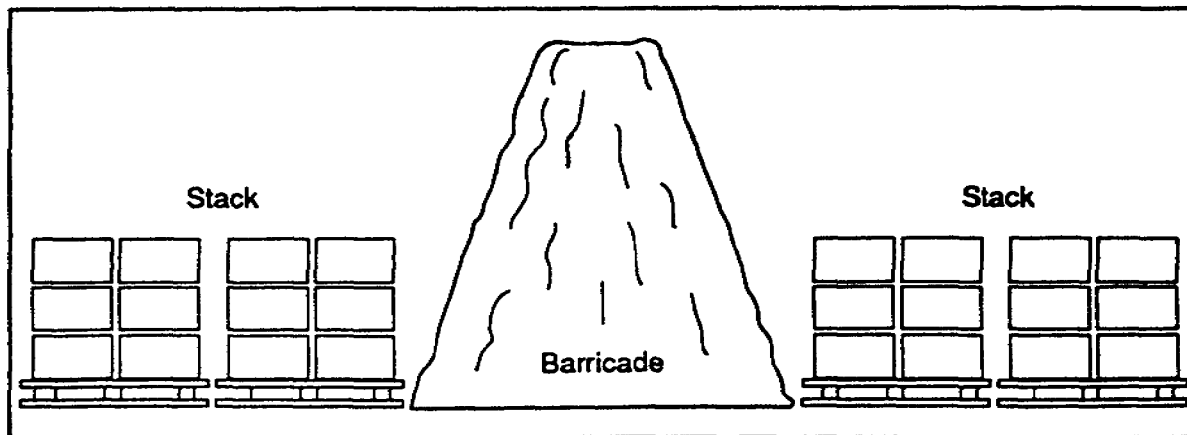


Figure 19. An example of a barricade between stacks

- e. Inspection. Barricades should be inspected periodically to determine their overall condition, degree of settling, and required maintenance. Rocks and other debris larger than 10 pounds or 6 inches long must be removed from the barricade and/or the hazard source. These could become fragments in the event of a detonation. The minimum depth of earth cover over magazines shall not be less than 2 feet.
12. You have completed this lesson. You will now take a Practice Exercise to use the material you learned in the lesson. When you complete the Practice Exercise, proceed to the subcourse Examination.

LESSON

PRACTICE EXERCISE

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

1. Which separation distance is applied between a storage area and a military boundary?
 - A. Magazine distance.
 - B. Inhabited building distance.
 - C. Intraline distance.
 - D. Public traffic route distance.

2. Which separation distance applies to transfer pads for containerized munitions?
 - A. Loading dock.
 - B. Vehicle park distance.
 - C. Interline distance.
 - D. Operating line distance.

3. What is the QD of (08) 1.2 materials?
 - A. 800 x 1.2 pounds NEW.
 - B. 800 meters minimum QD.
 - C. 800 feet (blast).
 - D. 800 feet (fragment).

4. Which separation distance applies between two loading docks?
 - A. Intraline distance.
 - B. Roadway distance.
 - C. Aboveground magazine distance.
 - D. Operating line distance.

5. What is the major hazard of Class 6, Division 1 items?
 - A. Toxic effect.
 - B. Mass detonation.
 - C. Fragments.
 - D. Mass fire.

LESSON

PRACTICE EXERCISE

ANSWER KEY AND FEEDBACK

<u>Item</u>	<u>Correct Answer and Feedback</u>
1.	B. Inhabited building distance. IBD also applies...between ammunition/explosives locations and the boundaries of US Army facilities (page 4, para 4.b.(1)(d)).
2.	A. Loading dock. Transfer pads used for containerized munitions shall use loading dock QD requirements (page 8, para 6.a.).
3.	D. 800 feet (fragment). Most fragments produced by detonations of this class/division will fall within one of the four specified minimum distances: 400, 800, 1200, and 1800 feet. These are expressed as (04), (08), (12) and (18), with the class/division-(08) 1.2- to indicate the minimum safe distance of 800 feet (page 11, para 9.f.(3)(b)).
4.	C. Aboveground magazine distance. For loading dock to loading dock, the aboveground magazine distance applies (page 7, para 5.h.(2)).
5.	A. Toxic effect. The major hazard expected from 6.1 items is the toxic effect of the agents if they are involved in an accident or fire (page 15, para 9.f.(6)(b)).