TRAINING SUPPORT PACKAGE (TSP)

TSP Number/Title	55B40C01 Ammunition/Explosive Storage Standards
Task Number(s)/ Title(s)	None
Effective Date	21 August 1998
Supersedes TSP(s)	MP-01/C 645-55B40
TSP User	USAOMMCS, Redstone Arsenal, Alabama and Accredited Ordnance TASS Battalion
Proponent	US Army Ordnance Missile and Munitions Center and School, Munitions Training Department, Redstone Arsenal, AL 38597-6970
Comments/ Recommen-dations	Send comments and recommendations directly to: US Army CASCOM Training Directorate ATTN: ATCL, AO (Mr. Roy King) Bldg. 1109, 401 First Street Fort Lee, VA. 23801-1713 (e-mail Kingr1@Lee-dns1.army.mil) DSN: 539-1129, Commercial: 804-765-1129
Foreign Disclosure Restrictions	If Allied students are scheduled to attend this class, coordination with Security Division (ATSK-AS) is required to determine if the information can be released to Allied students.

Preface

Purpose

This training support package provides the instructor with a standardized lesson plan for presenting instruction for:

LESSON TITLE:	Ammunition/Explosive Storage Standards
CONDITIONS:	In a classroom environment given TM 9-1300-206, TM 43-0001-28, and DOD Consolidated Catalog.
STANDARD:	Demonstrate an understanding of the essential elements necessary to comply with the Army's conventional Class V storage standards by correctly answering written problems with 70 percent accuracy.

This TSP Contains

TABLE OF CONTENTS

(Effective Date)

SECTION I. ADMINISTRATIVE DATA

All Courses Including this Lesson

COURSE NUMBER(S)	COURSE TITLE(S)
645-55B40	Ammunition Specialist, ANCOC

Task(s) Taught or Supported

TASK NUMBER	TASK TITLE
None	

Reinforced Task(s)

TASK NUMBER	TASK TITLE
None	

Academic Hours

The academic hours required to teach this lesson are as follows:

	ADT HOURS/METHOD
Small Group Instruction	9.0 / SGI
Practical Exercise	7.0 / PE2
Total Hours	16.0

Test Lesson Number

	Hours	Lesson No.
Testing:	3.0 TE2	55B40C07
Review Of Test Results:	1.0 CO	55B40C08

Prerequisite Lesson(s)

LESSON NUMBER	LESSON TITLE
55B40A01 through 55B40B11	

Clearance and Access

Unclassified - If Allied students are scheduled to attend this class, coordination with Security Division (ATSK-AS) is required to determine if the information can be released to Allied students.

References Required

Number	Title	Date	Additional Information
TM 9-1300-206	Ammunition and Explosives Standards	30 AUG 73	with changes 1-10
TM 43-0001-28	Army Ammunition Data Sheets, Artillery Ammunition Guns, Howitzers, Mortars, Recoilless Rifles, Grenade Launchers, and Artillery Fuzes	28 APR 94	
N/A	DOD Consolidated Catalog		

Related

None

Student Study Assignments

None

Instructor Requirements

One instructor

Additional Support Personnel Requirements

None

Equipment Required

Overhead Projector

Materials Required	INSTRUCTOR MATERIALS: References listed above. Viewgraphs 55B40C01, VG#01 - VG#51 STUDENT MATERIALS: TM 9-1300-206, TM 43-0001-28, DOD Consolidated Catalog
Classroom, Training Area, and Range Requirements	One 30-person classroom
Ammunition Requirements	None
Instructional Guidance	Before presenting this lesson, instructors must thoroughly prepare by studying this lesson and identified reference material.

Proponent Lesson Plan Approvals

Name	Rank	Position	Date

SECTION II. INTRODUCTION

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 0.1 hours

Motivator

Good morning/afternoon, class. I am _____. I will be your primary instructor for this lesson. The material presented during this lesson is critical to all 55B noncommissioned officers in their day-to-day supervision of munitions storage area operations. The efficiency and safety of these procedures are dependent upon your ability to provide technical guidance and enforce safety standards during Class V operations.

Terminal Learning Objective

Note: Inform the students of the following terminal learning objective requirements.

At the completion of this lesson, you (the student) will:

ACTION:	Identify the essential elements necessary to comply with the Army's conventional Class V storage standards required by TM 9-1300-206.
CONDITIONS:	In a classroom environment and given TM 9-1300-206, TM 43-0001-28, and DOD Consolidated Catalog.
STANDARD:	Demonstrate an understanding of the essential elements necessary to comply with the Army's conventional Class V storage standards by correctly answering written problems with 70 percent accuracy.

Safety Requirements

None

Risk Assessment Level

Low

Environmental Considerations

None

Evaluation	On a written examination, the student must score a minimum of 70 percent to achieve a GO.
Note:	**Show VG01 (Title Slide).**
Instructional Lead-in	This lesson is designed to provide you with an in depth look at the essential elements necessary to comply with the Army's conventional Class V storage standards required by TM 9-1300-206.

SECTION III. PRESENTATION

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1. Learning Step/Activity 1: The instructor will facilitate a discussion on the basic requirements for munitions/explosive storage standards. (Reference TM 9-1300-206, Chapter 2)

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 1.5 hours
Media: Viewgraphs

Note: Instructor will present a 10-minute lecturette on the basic requirements concerning munitions and explosives standards.

Assign each group of students a paragraph or series of paragraphs in Chapter 2 on which to lead a discussion.

Note: **Show VG02 (General Basic Requirements).**

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a. General. All personnel engaged in operations in which munitions or other hazardous materials are involved shall be thoroughly trained in explosive safety (AR 385-10 and AR 385-64) and be capable of recognizing hazardous explosive exposures. Safety must become a firmly established habit when working with, or in the vicinity of items having explosive, flammable, or toxic hazards.

(1) Improper, rough, and careless handling of munitions may not only result in malfunctioning but also cause accidents resulting in loss of life, injury, or property damage. The history of accidents which have occurred in the use, handling, shipping, and storing of munitions shows that in many instances where the cause was determined, the accidents were due to human error and the circumstances were avoidable.

(2) Munitions will be handled under the direct supervision of competent personnel who thoroughly understand the hazards and risks involved, and have been trained in explosive safety.

(3) Operations will always be based upon minimum possible exposures consistent with efficient operations.

(4) The absence of a safety requirement in TM 9-1300-206 does not necessarily indicate that no safeguards are needed. If hazardous conditions present immediate danger to life and property, operations will not be continued until the hazard has been corrected.

Note: **Show VG03 (Personnel and Explosives Limits).**

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b. Personnel and Explosives Limits. All operations involving explosives will be analyzed with a view toward reducing the number of personnel and the quantity of explosives that could be subjected to an incident.

(1) **Personnel Limits.** A minimum number of personnel will be exposed for a minimum time to the smallest quantity of explosives consistent with safety and efficiency. However, at least one personnel should be available near the hazard area during explosive operations (such as disposal or testing) to give warning and assist in rescue activities in the event of an accident. The following will apply in establishment of personnel limits:

(a) Tasks not necessary to the explosive operations will be prohibited within the immediate vicinity of the hazard.

(b) Unnecessary personnel will be prohibited from visiting the operation.

(c) Where it is essential to perform concurrent operations in a single building or field site, the layout of operations will be planned to separate dissimilar operations to prevent propagation of fire or explosion. Such operations shall be protected by dividing walls, barricades, or other means to minimize personnel exposure.

(d) The maximum number of operators, supervisors, and visitors (casuals) permitted at any one time in the immediate working areas, room, cubicle, or building containing explosives will be effectively publicized by conspicuously placed posters or placards.

(2) **Explosive Limits.** Limits for munitions, explosives, and pyrotechnic materials will be determined by a careful analysis of all facts, including operation timing, transportation methods, size of the items, and the chemical and physical characteristics of the materiel. More stringent limits will be used for the more sensitive or hazardous materiel.

(a) Limits shall be established for each operation, rather than on an overall basis, so that each worker will be charged with responsibility of not exceeding the established limit. Limits may be expressed in units of weight, trays, boxes, pallets, or any other unit which may be more easily observed and controlled.

(b) Except for storage buildings, explosive limits shall not be established on the basis of the maximum quantity of explosives permitted by explosives safety (Q-D) separation when smaller quantities will suffice for the operations. The maximum amount of explosives, expressed by weight and units of munitions as applicable, permitted in each room, cubicle, or building containing explosives will be conspicuously posted in each such area.

(c) Except for operational necessity, supplies exceeding approximately a 4-hour work requirement should be kept in a service storage building located at intraline distance from operating buildings based on the quantity of explosives in the service storage building.

Note: **Show VG04 (Protection of Personnel).**

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c. Protection of Personnel. In accordance with AR 385-32, suitable personnel protective clothing, equipment, and devices will be provided to protect personnel against hazards inherent in specific jobs. Required items of protective clothing and equipment, use of which is prescribed during handling of chemical munitions or during renovation, for example, are covered as required in TM 9-1300-206.

Note: Refer students to Appendix B for a discussion on detailed information of protective clothing and safety equipment.

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d. Munitions and Explosives Handling. Munitions and explosives will be handled carefully. Bale hooks will not be used. Nails will not be driven into shipping and storage containers containing munitions except to close the container in accordance with approved drawings or specifications.

(1) Containers will not be tumbled, dropped, dragged, thrown, rolled, or walked. However, munitions packaged in approved containers designed to permit dragging or towing may be moved accordingly. Unfuzed bombs equipped with shipping bands also may be rolled, if care is exercised. When it is necessary to lift palletized munitions, forklifts or properly used slings will be employed.

(2) Conveyors and forklifts may be used, except where such use could cause initiation or create hazards. Sectionalized roller conveyors used to move munitions will be substantially supported and the section interlocked or secured. Boxes of munitions will not be used to support conveyors.

(3) Loose detonators, initiators, squibs, electrically actuated devices, blasting caps, and the like will not be carried in pockets of clothing, in tool kits, etc. Suitable containers will be used to provide adequate protection.

(4) General information relative to the properties applicable to military explosives are found in TM 9-1300-214, and may be used as a guide in the formulation of safety standards.

Note: **Show VG05 (Safety Hand Tools).**

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e. Safety Hand Tools. Safety hand tools are constructed of wood; non-sparking or spark-resistant materials such as bronze, lead, or beryllium alloys; and "K" Monel metal which, under normal conditions of use, will not produce sparks. Properly maintained, nonferrous hand tools shall be used for work in locations containing exposed explosives or hazardous concentrations of flammable dusts, gases, or vapors. Authorized hand tools or other implements used in the vicinity of hazardous materials must be handled carefully and kept clean.

(1) If the use of ferrous metal hand tools is required because of strength characteristics, the immediate area and equipment shall be free from exposed explosives and other highly combustible materials.

(2) Non-sparking or spark-resistant tools of lead or beryllium alloys that require sharpening or shaping shall be replaced rather than ground down, unless adequate exhaust ventilation is available on the grinder being used for this purpose.

Note: **Show VG06 (Personnel Responsibilities).**

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f. Personnel Responsibilities. Personnel working with munitions are required to observe the following precautions:

- Do not carry fire- or spark-producing devices into munitions and explosive storage areas unless authorized in writing.
- Do not smoke, except in authorized areas. After smoking, ensure that burning tobacco is completely extinguished.
- Do not have fires for heating or cooking, except in authorized areas.
- Do not allow the accumulation of litter, packing material, dunnage, dry leaves, grass, or twigs, etc., within firebreak areas.
- Pick up any debris within the storage area.
- Do not accumulate oily rags or other material subject to spontaneous combustion, except in a covered metal box. Have such material collected daily and removed from the area.
- Do not conduct operations without approved Standing Operating Procedures (SOPs) and proper supervision.
- Use only permissible lighting at munitions storage sites.
- Do not become careless by reason of familiarity with munitions.

- In case of fire, sound the alarm immediately. Be ready to show the location of the fire to fire-fighting personnel.
- Ensure that each operator knows what to do in case of fire within the storage area.
- The person in charge should instruct all personnel on the existing fire plan to aid firefighting crews and to prevent the loss of life and property in case of an accident.
- Do not carry firearms, cameras, or camera flashing equipment in munitions and explosive facilities unless authorized in writing.

Note: **Show VG07 (Fencing, Placarding, and Admittance to Explosive Areas).**

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g. Fencing, Placarding, and Admittance to Explosive Areas. An explosive area will be placarded at each entrance. Unauthorized personnel will not be permitted to enter. Authorized personnel must enter and leave munitions areas at designated points. The placard will require personnel, before entering the area, to present proper credentials and turnover all prohibited articles to the guard on duty, or place them in containers provided for that purpose.

(1) An explosives area will be separated from administration, residential, and entirely unrelated inert and warehouse areas by fences. Fencing (excluding that installed for security reasons only) should not be placed closer to magazines than magazine distance nor closer to explosives operating buildings than intraline distance. Reservation boundaries should be fenced. In certain cases, topography and/or other physical conditions may make fencing impossible or impracticable.

(2) Security measures will be accordance with AR 50-6 and AR 190-11. The boundary of each explosives area will be posted at 500-foot intervals to warn against trespassing in accordance with AR 380-20.

Note: **Show VG08 (Guard Protection).**

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h. Guard Protection. Magazines and/or storage areas in which there are explosives and munitions will be afforded appropriate security at all times. Entrances to these areas will be locked unless protected by guards.

(1) Guards, and others in charge of explosives and munitions will be thoroughly instructed in emergency firefighting procedures, hazards due to fire and explosions, and safety precautions to be taken.

(a) Alarms will be given with the greatest possible speed so as to start action instantly. Serious fires and explosives have been avoided by prompt action of the guards.

(b) After giving the alarm, guards will fight the fire with every available means; however, if the fire involves explosive materials or is so large that it cannot be extinguished with the equipment at hand, the personnel involved shall evacuate and seek safety.

(c) If the fire occurs in a closed magazine, no personnel will attempt to enter the magazine.

(2) Guards will be instructed to make a prompt report of the following:

- Any unusual occurrence in or near a storage area.
- Grass or forest fires in areas adjacent to the storage area.
- Dangerous practices of personnel working in magazines or storage areas in which there are explosives (smoking, drinking, etc.).
- Unauthorized use of fire equipment, or tampering with munitions or electrical equipment.
- Unlocked magazine doors or shutters, defective telephone and electric wires, or openings in fences.
- The presence of suspicious personnel.

(3) Generally, shotguns are recommended for guard purposes. Many explosives are not initiated by low-velocity projectiles, but any bullet striking explosives may cause a serious fire and/or explosion. Guards protecting explosives or munitions will be instructed regarding the dangers of firing in the direction of a magazine.

Note: **Show VG09 (Housekeeping Within an Explosives Area).**

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i. Housekeeping Within an Explosives Area. Buildings and magazines within an explosives area will be kept clean and orderly at all times.

(1) **Waste Materials.** Oily rags, combustible and explosives scrap, and paper will be kept separate from each other. Each type of waste should be placed in self-closing, non-combustible containers properly marked and preferably located outside the buildings.

(2) **Cleaning.** A regular cleaning program will be carried on as frequently as required for maintaining safe operations. Extensive cleaning should not be conducted while an explosives operations is being performed.

(3) **Sweeping Compounds.** Hot water or steam should be used wherever practicable for cleaning floors in buildings containing exposed explosives. Sweeping compounds which are nonabrasive and compatible with the explosives involved may be used where the use of steam or hot water is not practicable. Such compounds may be combustible but will not be volatile (closed cup flash point will be more than 230° F). Sweeping compounds containing wax will not be used on conductive flooring. Since nitrated organic explosives may form sensitive explosive compounds with caustic alkalies, use of cleaning agents containing caustic alkalies is prohibited where nitrated organic explosives are involved.

(4) **Explosives Recovery and Reuse.** All loose explosives recovered as sweepings from floors of operating buildings will be destroyed.

Note: **Show VG10 (Standing Operating Procedures (SOPs)).**

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j. Standing Operating Procedures (SOPs). A written SOP will be prepared before operations involving munitions and explosives begin. The SOP will include safety requirements, personnel, explosive limits, quality control and quality assurance procedures, and descriptions of work to be accomplished, designation of equipment to be used, and location and sequence of operations.

(1) The SOP will contain the action to be taken in the event of electrical storms, utility or mechanical failures, etc., occurring during the handling or processing of hazardous materials.

(2) When indigenous personnel are employed in operations involving explosives, the SOP will be in English and in the language the employee understands.

(3) The SOP will be approved by the commander or by a qualified member of his staff whom he has delegated to review and approve procedures. The SOP will also be approved by personnel designated as being responsible for performance of an operation. No change to an SOP will be permitted unless approved in writing by the approving authority.

(4) All personnel having operational duties or supervision thereof will enforce the SOP requirements for their particular operation and have ready access to the SOP for reference purposes.

(5) Applicable portions of the approved SOP shall be conspicuously posted convenient to all stations involved in the operation for guidance of all personnel.

Note: **Show VG11 (Procedure in Event of Electrical Storms).**

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k. Procedure in Event of Electrical Storms. Whenever an electrical storm approaches the establishment, personnel shall be evacuated from locations at which there is a hazard from explosives which could be initiated by lightning. Such locations include the following:

- Operating buildings or facilities without approved lightning protection systems, that contain explosives or explosive-loaded munitions, and locations at less than inhabited building distance from such facilities.

- Buildings containing explosives, dust, or vapors, whether or not equipped with approved lightning protection systems, and locations at less than inhabited building distance of such buildings.

- Magazines, open storage sites, or loading docks that are not equipped with approved lightning protection systems; vehicles and railroad cars containing explosives and explosive-loaded munitions on ungrounded tracks; and locations at less than inhabited building distance of such structures, sites, vehicles, or cars.

- Locations (with or without lightning protection) where operations involving electro-explosive devices are being performed and all facilities within inhabited building distance of such locations.

(1) When personnel are to be evacuated from explosive operations, the operations should be shut down, windows and doors closed, and electric switches thrown to the "off" position.

(2) A responsible and qualified person should be empowered to make the final decision on the necessity for evacuation. Where operations are of such nature as to require advance warning of shutdown, volunteer observers or an electronic static detector may be used.

(3) In an operating line, evacuated personnel shall be retired to approved suitable protective shelters located at intraline distance form operating buildings or other hazardous locations. In a magazine area, evacuated personnel should be retired to such approved shelters at magazine distances from magazines or hazardous locations, or to empty, earth-covered magazines. When such shelters are not available, personnel shall be withdrawn to places at inhabited building distances from the hazardous locations or to other shelters that have been designed and constructed to afford category 1 protection with respect to the explosive hazards.

(4) Personnel in direct charge of railroad trains and motor trucks containing explosives should, when possible, move the equipment to a predesignated location, but in no case less than approved magazine distance before retiring to facilities located or constructed as specified above.

Note: **Show VG12 (Open Storage of Ammunition/Explosives).**

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l. Open Storage of Munitions/Explosives. Open storage is a temporary expedient and should not be used in lieu of standard methods for long-term storage.

(1) Earth covered (igloo) storage should be used wherever possible. In comparison with other methods, it provides a higher degree of protection and safety for the munitions and surrounding targets, greater physical security, and reduced maintenance of the munitions.

(2) Examples of permitted open storage of munitions are:

- Bombs slated for demilitarization stored in riveted pads between igloos.
- Items whose size or quantity precludes their storage in magazines.
- Material located in outside storage at time of suspension for issue, movement, and use (SIMU).

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2. Learning Step/Activity 2: The instructor will facilitate a discussion on the storage of specific types of munitions and explosives. (Reference TM 9-1300-206, Chapter 3)

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 2.0 hours
Media: Viewgraphs

Note: Instructor will present a 10-minute lecturette on the storage of specific types of munitions and explosives.

Assign each group of students to lead a discussion on a paragraph or series of paragraphs in Chapter 3.

Note: **Show VG13 (Elements of a Written Fire Plan).**

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a. Elements of a Written Fire Plan. A written fire plan must be prepared to include a list of communications or alarm signals to be made. Although details may vary to suit the individual installation, the overall plan must identify responsible individuals and alternates, specify their organizations and training, and describe the emergency function of each department or outside agency.

Responsibilities of personnel spelled out in the plan include the following:

- Reporting the fire.
- Directing the orderly evacuation of personnel.
- Notifying personnel in nearby locations of impending dangers.
- Activating means of extinguishing or controlling the fire.
- Meeting the firefighters and reporting details of the fire up to the time of their arrival.

Note: **Show VG14 (Fire Prevention Measures/Requirements).**

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b. Fire Prevention Measures/Requirements. Matches or other flame- or spark-producing devices are not permitted in any magazine area or explosives area except by written authority of the commanding officer or his designated representative. When such authority has been received, a metal carrying device, too large to fit into the pockets, should be used for matches, lighters, and similar materials. Using or even carrying "strike anywhere" (kitchen) matches is prohibited.

(1) Smoking in areas containing explosives, munitions, highly combustible materials, or flammable strategic items must be strictly regulated and controlled. Where it is believed that smoking can be safely regulated, specifically designated smoking locations, approved by the commander or his designated representative, must be established. Smoking is not permitted in vehicles passing through such areas.

(2) All flashlight or storage-battery lamps used in buildings containing munitions, explosives, or flammable vapors must be of a type approved by the U.S. Bureau of Mines or by a similarly recognized testing laboratory for that specific kind of exposure.

(3) Vegetation (grass, undergrowth, weeds, or the like) that is or may become a fire hazard will be controlled by weed killer; by mowing, plowing, or cutting; by livestock grazing under supervised conditions; or in calm weather and with proper control, by burning.

(a) Weed killers must not contain chlorates or other substances that may ignite spontaneously under hot, dry conditions. Cut vegetation and undergrowth should be removed.

(b) Burning should not be permitted within 50 feet of any earth-covered magazine containing explosives or munitions or within 200 feet of any above-ground magazine or outdoor storage site (or pad) containing explosives and munitions. During burning operations, all windows, doors, and ventilators must be closed firefighting equipment must be available at the site.

(4) Reserve supplies of dunnage should not be stored haphazardly inside the magazine area. In no case should it be stored within the 50-foot firebreak around the magazine.

(5) A firebreak at least 50 feet wide and free from flammable material must be maintained around each above-ground magazine and each outdoor storage pad containing munitions or explosives.

(a) The earth adjacent to and extending over earth-covered magazines must be cleared of dry debris. Any temporary magazine of fire-resistant construction in which the combustible framing, plates, or sills are exposed must be protected by a 50-foot firebreak (in all directions) that contains no materials or vegetation capable of supporting combustion.

(b) Erosion must be prevented to the extent possible by means of diversion terraces, drop inlets, and lines channels.

(c) Magazines with a fire-resistant exterior covering that completely covers the combustible framing, plates, and sills, and outdoor munitions storage pads containing munitions more resistant to fire (such as heavy case HE bombs) must be protected by a firebreak beginning at the magazine or pad and extending 50 feet in all directions. This firebreak need not be clear of vegetation, but the vegetation must be controlled by mowing or grazing to prevent rapid transmission of fire to the magazine or pad.

(d) Excess vegetation and dry debris on earth-covered magazines, and shrubs, sprouts, and trees whose weight or root system may damage the magazine must be removed. A clear space must be maintained by mowing or clipping around earth-covered ventilators in a manner that will prevent rapid transmission of fire and provide visibility of the ventilator flag from ground level.

(e) Firebreaks around the entire magazine area, such as along railroad tracks, must be maintained wherever necessary. Plowed or bladed firebreaks may be used only where exceptional fire hazards exist and must be protected from erosion by wind or water by means of approved soil-conserving measures.

(6) Gasoline or other highly flammable liquids may not be used for cleaning purposes. Dry-cleaning solvent (Stoddard solvent) should be used where solvents are required for cleaning. Dry-cleaning solvent is flammable, differing principally from gasoline in having a higher flash-point. Since many of the industrial organic solvents have pronounced toxic properties, particularly in vapor form, care must be taken in the selection of degreasing substances and apparatus.

(a) To minimize health hazards, less toxic solvents should be substituted for the more toxic ones where possible. Carbon tetrachloride should not be used unless its use is absolutely necessary and has been approved by local medical personnel under careful control, which must include ventilation, respiratory protection, and protection against skin contact.

(b) Other solvents such as toluene and benzene are both toxic and flammable and should likewise be controlled. TB MED 502 should be consulted. Adequate ventilation must be provided.

(7) Munitions boxes, containers, dunnage, and lumber in the vicinity of explosives renovation, handling, or storage operations must be stacked neatly. Stacks of such combustible materials must be limited to small areas between firebreaks in order to limit the probability of fire.

(a) Under average conditions, solid stacks of such materials should be limited to 1,500 square feet, separated from other similar areas by 50-foot line breaks in which vegetation has been cut and is to be controlled.

(b) Bulk stacking of such materials should not be closer than 100 feet to magazines or other buildings containing high explosives, except that working quantities within practicable limits may be stacked in the vicinity of explosive magazines but not closer than 50 feet.

(8) The above-listed requirements may be supplemented by additional standards the commander deems necessary to secure adequate protection against fires.

Note: **Show VG15 (Firefighting Facilities).**

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c. Firefighting Facilities. A small fire involving explosives or munitions may rapidly become an intense conflagration or an explosion. It is, therefore, important to extinguish a small fire immediately. Immediate use of authorized hand equipment and extinguishers must be made; however, personnel must not be exposed to the hazards of an imminent explosion.

(1) Water barrels, pails, sand boxes, and shovels provide a recognized means of combating incipient fires in explosives and munitions storage areas where the combustible material consists principally of grass, wood, dunnage, munitions boxes, etc. Where used, at least one water barrel and two pails or two water-type extinguishers, winterized when necessary and treated to repel mosquitoes, should be available for immediate use by workers in and around magazines.

(2) Under normal conditions, water barrels and pails are not recommended in extensive explosives and munitions storage areas if:

(a) Vegetation is controlled.

(b) Working crews in the magazine area are equipped with two water-type hand extinguishers, preferably of the 2½-gallon capacity, pressurized anti-freeze type and the 4-gallon back pack hand pump type, or with multipurpose dry chemical extinguishers with a minimum classification of 3A. Locomotives operating regularly in the magazine area must be equipped with either the fire extinguishers described above or suitable brush-beaters (fire swats).

(c) The installation has a firefighting plan and an organized firefighting force equipped with pumpers or brush trucks, tanks trucks, and other necessary equipment to combat grass and brush fires. Provision should be made for rapid movement of the equipment to the scene of the fire.

(d) A fire map is maintained at the fire stations, and a copy is kept in the vicinity of the storage area indicating the location of each storage site, magazine, etc., and indicating the general hazard at each location or site. The fire map is a valuable tool in determining quickly what the firefighters may require in the line of equipment as well as the type of hazard involved. As changes are made in the sites, they should be so noted on the map.

(3) Two hand fire extinguishers should be ready for immediate use when munitions or explosives are being handled or work is being done in the immediate vicinity of them. They need not be permanently located in a magazine, although this should be done if practicable. The extinguishers must be in an accessible location and be properly maintained. Serious fires may be avoided by the prompt use of hand fire extinguishers. They are required primarily for use during the early stages of a fire involving grass, dunnage, or other combustibles which, if not extinguished, might reach explosives. Personnel other than the one using the extinguisher should seek safety immediately, reporting the fire route.

Note: **Show VG16 (Firefighting Instructions).**

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d. Firefighting Instructions. The following procedures apply when a fire involving munitions or explosives is discovered:

(1) A person who discovers smoke coming from a closed magazine or observes other evidence that a magazine is on fire will give the alarm as quickly as possible and evacuate to a safe distance. He will not enter a burning building or magazine, nor open the building or magazine door if a fire is noticed inside the structure.

(2) If a fire is discovered in grass or other combustible material surrounding a magazine, the alarm should be given immediately and the guard should do all that is possible, using extinguishers, water from nearby water barrels, or grass firefighting tools to extinguish or control the fire until the firefighting forces arrive.

(3) It is important to extinguish grass fires, especially when they are close to magazines. If a fire has actually gained headway in a magazine, firefighting forces should either combat the fire or seek the nearest suitable protection, depending on the type of munitions or explosives within the magazine.

Note: **Show VG17 (Firefighting Hazards).**

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e. Firefighting Hazards. In order to provide a guide for firefighting forces, munitions and explosives are divided into fire divisions in accordance with the relative danger encountered.

(1) The four divisions are identified by the numerals 1, 2, 3, and 4, each displayed on a distinctively shaped placard to be visible at long range.

(2) There is no requirement to post a fire symbol for flammable liquids on an Army post or in an area where munitions and explosives are stored. It is left to the discretion of the commander if he desires to do so.

Note: **Show VG18 (Fire Symbols).**

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f. Fire Symbols. Depending on the type of munitions(s) and storage location(s), fire symbols will be posted as follows:

(1) The fire symbol that applies to the most hazardous material present will be posted on or near all nonnuclear explosives locations. It will be visible from all approach roads. One symbol posted on or near the door end of an earth-covered magazine is normally enough. One or more symbols may be needed on other buildings. When all munitions within a storage area are covered by one fire symbol, it may be posted at the entry control point.

(a) When different class/divisions of explosives are stored in individual multicubicle bays or module cells, they may be further identified by posting the proper fire symbol on each bay or cell.

(b) When facilities containing explosives are located in a row on one service road and require the same fire symbol, only one fire symbol at the entrance to the row is required.

(c) Fire symbols will be placed on entrances to small rooms in buildings that are licensed for storing or holding quantities of explosives. Where the licensed explosives are stored in a locker or similar container, the container will also be marked with the appropriate fire symbol. They are not required on the exterior of the building, providing the building is exempt from Q-D.

(d) Warehouse and other facilities utilized for storing containers from which explosives have been removed, but which have not been decontaminated to remove explosive residue must be placed with a number "4" fire symbol.

(2) All railroad cars and motor vehicles containing munitions or explosives while on Army installations must be identified with the appropriate fire hazard symbols. Installation railroad cars and motor vehicles that are not destined for off-post movement must display at least two fire symbols.

(a) When use of public highways located on installations is anticipated, even though the vehicle will not leave the installation, it must be placarded accordingly. Installation transport vehicles destined for off-post shipment and commercial railroad cars and motor vehicles must have DOT placards displayed in accordance with DOT regulations when they contain munitions or explosives.

(b) Fire symbols and/or DOT placards must be placed on all transport vehicles immediately prior to loading and must be removed from the transport vehicle immediately upon completion of unloading.

1 Where dependence for identification on fire hazards has to be placed on DOT placards, "Explosive A" placarded transport vehicles (rail cars, motor vehicles, and freight containers) must be treated as Fire Division 1.1 and 1.2 hazards

2 "Explosive B" placarded transport vehicles as Fire Division 1.3 hazards.

3 Transport vehicles containing Explosive C and placarded in compliance with DOT regulations are treated as Fire Division 1.4.

4 Transport vehicles containing small arms munitions are not required by the DOT to be placarded; therefore, such vehicles are treated as Fire Division 1.4 and must display the appropriate fire symbol while on the installation.

(c) All on-post munitions shipments should display fire symbols in lieu of DOT placards.

(d) Not all DOT Class B items relate to DOD Hazard Class/Division 1.3 material. Some fielded 1.2 items are classified DOT Class B. They must be identified as DOD Hazard Class/Division 1.2 as soon as they arrive at a military controlled installation.

(3) Buildings in which small laboratory quantities of various energetic materials (Class 1.1, 1.2, 1.3, 1.4, or other) are held/stored in tested and approved containers/operational shields designed to contain or otherwise eliminate blast, fragment, and intense thermal effect hazards to firefighting personnel entering into the area in which these energetic materials are held/stored, may be posted with a locally developed fire symbol in lieu of the standard fire symbols.

(a) If these symbols are used, the written fire plan will include instructions to firefighting personnel detailing the location, typical quantities, and type of containment/shielding used for the explosives and any special firefighting procedures to be used.

(b) Familiarization tours of these facilities will be conducted for firefighting personnel.

Note: **Show VG19 (Exceptions on Posting Fire Symbols).**

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g. Exceptions on Posting Fire Symbols.

(1) Fire symbols need not be posted in locations having 1,000 or fewer rounds of Class/Division 1.4 small arms munitions (.50 caliber or less).

(2) Use symbols in this regulation unless host nation symbols differ and, by agreement, host nation symbols are used.

(3) The responsible commander may, for security purposes, remove fire symbols. In such situations, increased emphasis should be placed on giving the fire department prompt and exact information about changes in the status of explosives.

(a) Where fire symbols are not displayed on individual structures or where topography and/or vegetation would prevent seeing a fire symbol until arrival at a storage site, a master list and/or map must be maintained.

(b) The map should indicate storage site locations, fire symbols, chemical symbols, and empty sites if applicable.

(c) This list and/or map must be kept current and must be posted at all access road entrances, control stations, and control points servicing the storage location. This list and/or map shall be furnished to emergency forces, such as the fire department and guard forces.

Note: **Show VG20 (Posting Hazard Symbols).**

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h. Posting Hazard Symbols. If chemical or pyrotechnic munitions are assembled with explosive components, then hazard symbols must be used together with fire hazard symbols. Chemical munitions which do not have explosive components will be identified by the hazard symbol only. Requirements for posting hazard symbols are the same as for fire symbols.

Note: **Show VG21 (Fire Division Numbers).**

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(1) **Description of Fire Symbols.** Fire Divisions 1 through 4 are synonymous with Hazard Classes 1.1 through 1.4. Fire Division 1 indicates the greatest hazard. The hazard decreases with ascending Fire Division numbers as follows:

(a) Each of the four Fire Divisions is indicated by a distinctive symbol that firefighting personnel can recognize as they approach a scene of fire. The applicable Fire Division number is shown on each symbol.

(b) For the purpose of identifying these symbols from long range, the symbols differ in shape, as identified in VG22.

Note: **Show VG22 (Fire Symbols).**

(c) The background color of the fire symbols is orange. The color of each number identifying the applicable Fire Division is black. The color of the symbols is in accordance with the color on DOT labels and placards for Explosives A and S and on NATO, UNO, and IMCO labels for Class 1 material (explosives). Symbols made from reflectorized or luminous materials are preferred.

(d) For application on doors, on lockers inside buildings, on motor vehicles, and on railroad cars, half-sized symbols may be used.

(e) Symbols to indicate special hazards, such as those posed by toxic chemicals, must be used in addition to the firefighting symbols.

(f) Fires involving munitions and explosives will be fought according to their DOD Hazard Class/Division and the state of the fire.

(g) Munitions containing both explosives and chemical agents requires special attention and precautions in firefighting. Such munitions may belong to different Fire Hazard Classes depending on the kind and quantity of explosives they contain. Fires involving munitions containing both explosives and chemical agents will be fought in accordance with their Fire Hazard Class characteristics, taking cognizance of the additional hazards resulting from the effects of the chemical agents and the associated special measures required in the fighting of those fires (e.g., fires of WP munitions).

(h) Special firefighting regulations, including withdrawal distances and times corresponding to the various symbols, must be promulgated according to the needs and circumstances of the facility or installation.

(i) It is the responsibility of the person(s) having charge of storage within the buildings or storage sites containing explosives to change the fire symbol as required by changes in the hazard classification of the contents of the buildings or sites.

Note: **Show VG23 and VG24 (Chemical Hazard Symbols).**

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(2) **Chemical Hazard Symbols.** Chemical agent or agent-filled munitions storage and operational facilities must be identified with appropriate hazard symbols. The type or types of hazard symbols selected for this purpose will depend not only upon the type of chemical agent in the munitions but also on the absence or presence of explosive components in the munitions. Posting of Chemical Hazard and Fire Division symbols must comply with the following:

(a) When magazines or outdoor sites are used for storing different types of chemical agents or agent-filled munitions, each separate magazine or storage pad must have the appropriate hazard markers posted where they are plainly visible at each road of approach or access to the facility.

(b) If a Chemical Hazard Symbol 1 (full protective clothing plus protective mask) is required and posted, the posting of a Chemical Hazard Symbol 2 (breathing apparatus) would be redundant and is not required.

(c) If a Chemical Hazard Symbol 1 Set 1 (butyl rubber suit) is required, no other Hazard Symbol 1 signs would be required due to compatibility requirements.

(d) If a situation should arise that mixed munitions stored in a single storage location could require a Chemical Hazard Symbol 1, Set 2 and/or Set 3, the Set 3 would be considered as having the highest degree of protection due to the flame-resistant gloves and coveralls. In such a situation, Chemical Hazard Symbol 1, Set 2, would be optional.

(e) Chemical Hazard Symbol 3 will be posted as applicable.

(f) When a complete row of magazines within a magazine storage area is used for storage of only one type of chemical agent or agent-filled munitions, hazard markers may be posted at the access road entrance(s) servicing that row of magazines in lieu of being posted on each magazine.

(g) Facilities used for manufacturing, filling, processing, laboratory work, inspection workshop, etc., will be identified by posting hazard markers at entrances into the area where only a single building is involved or at entrances and on each separate building where more than one building is involved. If more than one hazard or class of munitions is in a workshop, each class will be separated into bays and properly identified with correct hazard symbols posted outside the entrance.

(h) Protective clothing and apparatus prescribed by Symbols 1 and 2 are for firefighting purposes and do not necessarily apply to normal operations.

1 When the Chemical Hazard Symbol that orders the wearing of full protective clothing (Symbol 1) is colored with a red rim and figure, the symbol indicates the presence of highly toxic chemical agents that may cause death or serious damage to body functions. The following full protective clothing, identified as Set 1 will be used: M9 series protective gas mask or self- contained breathing apparatus with applicable hood or approved equivalents, impermeable suit, hood, gloves and boots, cotton undergarments, explosive handler's coveralls, and other protective footwear as applicable. A fire blanket should also be available in case of a fire.

2 When the Chemical Hazard Symbol that orders the wearing of full protective clothing (Symbol 1) is colored with a yellow rim and figure, the symbol indicates the presence of harassing agents (riot control agents and smokes). The following protective clothing, identified as Set 2, will be used: M9 series protective gas mask or self-contained breathing apparatus, coveralls, and protective gloves.

3 When the Chemical Hazard Symbol that orders the wearing of full protective clothing (Symbol 1) is colored with a white rim and figure, the symbol indicates the presence of white phosphorus and other spontaneously combustible material. The following protective clothing, identified as Set 3, will be used: flame-resistant coveralls, flame-resistant gloves and M9 series protective gas mask or self-contained breathing apparatus.

(i) The Chemical Hazard Symbol that orders the wearing of breathing apparatus (Symbol 2) indicates the presence of incendiary and readily flammable chemical agents. These agents present an intense radiant heat hazard and may be posted together with any of the other symbols, if required. Protective masks to prevent inhalation of smoke from burning incendiary mixtures will be used.

(j) The Chemical Hazard Symbol warning against applying water (Symbol 3) indicates that a dangerous reaction will occur if water is used in an attempt to extinguish the fire. This Chemical Hazard Symbol may be posted together with any of the other symbols, if required.

Note: **Show VG25 (Firefighting Procedures).**

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i. Firefighting Procedures. All fires starting in the vicinity of munitions or explosives shall be reported and be fought immediately by all available means without awaiting specific instructions by personnel at hand, However, if the fire involves explosive material or is supplying heat to it, or if the fire is so large that it cannot be extinguished with the equipment at hand, the personnel involved shall evacuate and seek safety.

(1) Firefighters of munitions and explosive fires shall have a thorough knowledge of the specific reactions of munitions and explosives exposed to heat or to the fire itself.

(2) The firefighting forces should be briefed before approaching the scene of the fire. They are to be informed of the known hazards and conditions existing at the scene of the fire before proceeding to the location of the fire.

(3) All non-essential personnel shall be withdrawn from the scene of the fire to a distance that will provide adequate protection. The following distances are the minimum allowable. Greater distances shall be used whenever possible.

(a) The minimum public withdrawal distance for an accident depends on whether the vent involves no fire or fire, or whether the contents and/or the quantities are known or unknown. If no fire is involved, on-site emergency authorities should determine the minimum withdrawal distance.

(b) The minimum public withdrawal distances for an accident involving fire of explosives facilities, tractor trailers and/or trucks, and rail cars of unknown contents and/or quantities are:

- Tractor trailer and/or truck = ¾ mile.
- Rail Car/Facilities = 1 mile.

(c) The minimum public withdrawal distance for an accident involving fire of Explosive A such as Class/Divisions 1.1 and 1.2 laden tractor trailer and/or trucks and rail cars of known contents and/or quantities are given by:

- Range (Feet) = 105 W*1/3, but not less than 1,250 feet for non-fragmenting explosives materials. If known, maximum debris throw ranges, with an applicable safety factor, may be used to replace the 1,250-foot minimum range. Range = 328 W*1/3, but not less than 2,500 feet for fragmenting explosive materials out to a maximum range of 4,000 feet. For bombs and projectiles with caliber 5 inch or greater, use a minimum distance of 4,000 feet. If known, the maximum fragment throw range (including the interaction effects for stacks of items), excluding lugs and/or strongbacks and nose and/or tail plates, may be used.

(d) The minimum public withdrawal distance for an accident involving fire of Explosive B such as Class/Division 1.3 materials and Explosive C laden tractor trailers and/or trucks and rail cars is 600 feet and 300 feet, respectively.

Note: **Show VG26 (Withdrawal Distances From an Explosive Facility).**

(e) The minimum withdrawal distances for an accident involving fire in an explosive facility of known contents and/or quantities are given by symbol as shown in VG26.

(f) The minimum withdrawal distance for essential personnel at accidents shall be determined by emergency authorities on site. Emergency authorities shall determine who are essential personnel.

(g) For accidents involving propulsion units, it is impractical to specify minimum public withdrawal distances that take into account the potential flight ranges of the propulsion units.

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3. Learning Step/Activity 3: The students will complete a practical exercise on fire and explosives.

Method of instruction: PE2
Instructor-to-student ratio: 1:12
Time of instruction: 1.0 hour
Media: None

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a. Directions to Instructor:

(1) Ensure each student has a copy of the Practical Exercise 55B40C01-PE2 Worksheet - 1.

(2) Inform students of directions listed below.

(3) Provide assistance as required.

(4) Critique the exercise upon conclusion.

b. Directions to Students:

(1) The purpose of this practical exercise is for you to demonstrate how well you have retained the material we have covered in this lesson.

(2) Talking between students is not allowed during the practical exercise.

(3) Raise your hand for assistance, if needed.

(4) Using the reference material provided answer the questions and cite the reference where you found the answer.

(5) You have 50 minutes to complete this Practical Exercise.

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4. Learning Step/Activity 4: The instructor will facilitate a discussion on the storage of specific types of munitions and explosives. (Reference Chapter 4, TM 9-1300-206)

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 1.5 hours
Media: Viewgraphs

Note: Instructor will present a 10-minute lecturette on the storage of specific types of munitions and explosives.

Assign each group of students a paragraph or series of paragraphs (to include paragraphs 4-3 through 4-6 in Chapter 4) on which to lead a discussion during this period.

Note: **Show VG27 (Munitions Storage).**

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a. Munitions Storage. Explosives and munitions should be stored in buildings designed, designated, and isolated for that specific purpose.

(1) When specially constructed magazines are not available, the buildings used must afford suitable protection against moisture and excessive changes in temperature, have means for adequate ventilation, and have floors of approved materials.

(a) In structures where heat is permissible, only authorized heating equipment may be used.

(b) Open fires or heating by stoves are not permitted.

(2) Buildings used for munitions storage may not be used for any other concurrent operations.

(3) Munitions (except for limited amounts of small arms) and explosives may not be stored in basements, attics, portions of barracks, company supply rooms, general storehouses, or any buildings being used for other purposes.

(4) Limited quantities of Class/Division 1.3 and 1.4 munitions, as required by operational necessity and with written local authorization, may be stored in limited quantities in or near buildings such as hangars, troop buildings, and manufacturing or operating buildings without regard to quantity-distance; e.g., small arms munitions and pyrotechnics for alert or security purposes.

Note: **Show VG28 (Storage by Lot Number).**

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b. Lot Number. Munitions must be stored by lot number in stacks, arranged so that free circulation of air beneath and throughout the stacks is possible. When more than one lot is stored, all items or containers of a lot should be stored together, and the line of separation between lots should be clearly indicated. A magazine data card (DA Form 3020-R) should also be affixed to the stack. Lots of munitions must never be mixed randomly.

(1) Except in igloos, tops of munitions stacks must be below the level of the eaves but not closer than 18 inches from the roof to avoid the heated space directly beneath the roof. In igloos, munitions may not touch the roof or sides of the igloo. In heated warehouses or other buildings, munitions stacks may not be closer than 18 inches to radiators or heaters.

(2) The bottom layer should be raised off the floor about 3 inches. Dunnage should be level; if necessary, shims or wedges will be used to prevent the stacks from tipping. Stacks may not be so high that munitions or its containers in the lower layers will be crushed or deformed.

(3) Partly filled boxes should be fastened securely, marked, and kept on the top of the stack. Except for unit basic loads, only one light box per lot is authorized. Light boxes will be painted orange; however, within local ASPs, light boxes need not be painted orange if a positive means of identification is used; i.e., a light box card securely attached to the box. This method of identifying light boxes is for ASP use only; all issued or shipped light boxes must be painted orange.

Note: **Show VG29 (Storage Containers).**

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c. Containers. Boxes, cases, and other storage containers used with munitions should be clean and dry before being stored. Munitions containers should not be opened in a magazine. They should not be stored after having been opened unless they are securely closed, except that munitions and explosives in damaged containers in the process of being repaired may be stored overnight in magazines. When it is necessary to store munitions and explosives overnight in damaged containers, they will be separated from serviceable munitions. Repair or chaining of the containers can be accomplished at intraline distance from the magazine, based on the quantity of explosives at the site. Magazine doors must be kept closed during such operations.

Note: **Show VG30 (Storage of Specific Types of Munitions).**

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(1) **Loose Munitions.** Rounds or components may not be kept loose in a magazine containing other munitions packed in accordance with approved drawings. Empty containers, excess dunnage, and/or tools should only be permitted to remain in a magazine during the period of time required to complete the job for which they are being used. Oily rags, paint, and other flammable or combustible materials may not be left in a magazine containing munitions or explosives.

(2) **Liquid Munitions.** Liquid propellants, flammable liquids, oxidizers, other corrosives, and munitions may not be stored together. Munitions must be separated by the inhabited building distance or 18 feet, whichever is less, from storage of flammable liquids to prevent fires originating in one area from spreading to another.

(3) **Chemical Munitions.** Lethal and incapacitating chemical munitions must be stored separately. Storage must be such that containers can be inspected for leaks and removal can be easily accomplished.

(4) **Pyrotechnics/Propelling Charges.** Munitions containing explosives or combustibles, such as black powder, tracer composition, pyrotechnic mixtures or propellant, which are subject to rapid deterioration in damp atmospheres or contained high temperatures, should be stored under the best cover available. Buildings providing protection against dampness and having adequate ventilation are preferable.

(5) **Improved Conventional Munitions (ICMs).** ICMs may be armed and sensitive to initiation if the cargo is ejected from its container or carrier. All ICM high explosive cartridges and projectiles should be stored on the perimeter of a storage area in order to minimize contamination for the entire storage area and expedite explosive ordnance disposal in the event of an incident. Emphasis must be given to blast, unit ejection, and fragment potentials in layout plans, process equipment and operations, storage, disposal, and other associated accident prevention considerations.

(6) **Rockets.** Whenever practicable, rockets and rocket motors that are in a propulsive state should be stored nose down. Small rockets and missiles may be stored in standard earth-covered magazines without regard to the direction in which they are pointed, except that they should not be pointed toward the door of the magazine. If not in a propulsive state, any rocket, rocket motor, or missile may be stored in any magazine without regard to the direction in which it is pointed.

(7) **White Phosphorous (WP).** White phosphorous is a yellowish, wax-like substance that melts at 110 degrees F. Its most characteristic property is that it spontaneously ignites when exposed to air, burning with a yellow flame and giving off a large volume of white smoke. Smoke in field concentrations is not toxic; fumes are toxic. WP is intensely poisonous when taken internally.

Note: **Show VG31 (Outside Storage).**

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d. Outside Storage. Outdoor storage munitions is neither desirable nor recommended and should be utilized only as an emergency expedient. Pilferable items should not be stored in outdoor sites but should be afforded inside storage in locked magazines whenever possible. When existing circumstances necessitate outdoor storage, the following priority list for covered storage will apply:

- Fuzes, primers, boosters, pyrotechnics, propelling charges, combustible cartridge case munitions, demolition priming devices, illuminating and other rounds with black powder expulsion charges.
- Chemical munitions.
- Rocket munitions.
- Small arms munitions.
- Grenades.
- Mines.
- Demolition items.
- Fixed and semifixed munitions (smallest caliber first).
- Separate loading projectiles.
- Bombs.

When local security conditions require, this list may be changed.

Bulk solid propellants, bagged propellants, bagged propelling charges, pyrotechnics, bulk high explosives, and other critical items may not be stored outdoors.

(1) Sites for outdoor storage must be separated from magazines, other facilities, and each other in accordance with requirements identified below in the "Special Requirements for Outdoor Storage" and the quantity-distance (Q-D) requirements in DA PAM 385-64.

(2) The storage site must be level, well-drained, and free from readily ignitable and flammable materials. The supporting timbers or platform upon which the munitions is stored must be well constructed to prevent falling, sagging, or shifting of the munitions.

(a) Steel dunnage should be used where practicable, especially in storing Class/Division 1.1 munitions. In order to ensure stack stability and free circulation of air, not less than 3 inches of dunnage should be used between the bottom of the stack and the earth floor. Provisions should be made also for circulation of air through stacks.

(b) Nonflammable or fire-resistant, waterproof overhead covers should be provided for all munitions. An air space of not less than 18 inches should be maintained between the top of the stack and the cover.

(c) If ventilation is adequate, overhead covers are also desirable for outdoor stacks of bombs and projectiles. Sides of covered stacks also may be protected by nonflammable, fire-resistant, waterproof covers, provided air space is maintained between the cover and the munitions.

(3) Frequent inspections should be made to detect unstable stacks and accumulations of trash between or under stacks.

(4) Excess dunnage should not be stored between outdoor sites and magazines nor between magazines. Excess dunnage storage sites should comply with applicable Q-D requirements, except that during outdoor storage operations, service supplies of dunnage may be located not closer than 50 feet from the stack being processed.

(5) Suitable types of firefighting equipment and fire division symbols will be provided.

(6) Unbarricaded open storage sites must be separated from each other by the quantity-distances required for above-ground magazines.

(7) Sites between earth-covered magazines may be located midway between adjacent earth-covered magazines that are 400 feet apart, provided the sites are barricaded and are separated from the barricaded sides of the nearest magazine by 185 feet. Munitions in such sites should not be stored beyond lines drawn through the fronts and backs of magazines in the same row. Barricading does not reduce the required inhabited building or public traffic route distances. The storage of Classes (04), (08), and (12) 1.2 between earth-covered magazines is not desirable and should be resorted to only when necessary. Sites containing Classes (08) and (12) 1.2 may not be located within 800 and 1,200 feet, respectively, of sites containing Classes (18) 1.2 and 1.1.

Note: **Show VG32 (Magazines).**

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e. Magazines. This portion of the lesson will focus on magazine types.

(1) **Earth-Covered Magazines.** Earth-covered magazines, which include igloo, steel-arch type, hillside, and subsurface type magazines, are preferred for the storage of all munitions and explosives that require special protection of explosives and/or security. Munitions and explosives stored in earth-covered magazines are better protected from external sources of initiation than in above-ground magazines. Earth-covered magazines also provide better temperature control than above-ground magazines and are particularly desirable for the storage of solid propellants and pyrotechnics.

(2) **Types of Army Igloo Magazines.** Army igloo magazines include the following:

(a) Reinforced concrete, arch-type, earth-covered magazines whose construction is at least equivalent in strength to the requirements of Corps of Engineers Drawings 33-15-06, 1 August 1951, as revised 31 May 1956 (formerly 652-686 through 652-693, 27 December 1941, as revised 14 March 1942); 33-15-58, 3 February 1958 (atomic blast resistant); and 33-15-61, 30 December 1959. For all quantities of explosives up to 500,000 pounds.

(b) Reinforced concrete, arch-type, earth-covered magazines whose construction is not equivalent in strength to the requirements of (a) above. For all quantities of explosives up to 250,000 pounds.

(c) Special use igloo magazines used for maximum quantities of 100,000 pounds or less of mass detonating munitions or explosives.

(d) Special-type magazines with steel or wood (instead of reinforced concrete) arches and steel, wood or reinforced concrete end walls, and earth-covered reinforced concrete magazines (such as dome or box type).

(3) **Fusible Links.** The following general information and specifications apply to fusible links for doors and rear-stack ventilators on magazines:

- The melting point will be between 155 degrees and 165 degrees F.
- The minimum rated breaking strength will be 20 pounds for the door ventilator link and 8 pounds for the rear-stack ventilator link.
- The fusible link used will be on a current approved list published by the Underwriters Laboratories, Inc., or another recognized testing laboratory.

(4) **Standard Munitions Magazines.** Standard munitions magazines were designed for the storage of fixed rounds or separate loading projectiles. For future use, they should be restricted to the storage of Class (04) 1.2, Class (08) 1.2, and Class (12) 1.2, 1.3, and 1.4 materials (excluding rockets and rocket motors). The magazines measure 51 feet 7 inches by 218 feet 8 inches, are usually spaced 300 feet apart, and have concrete foundation walls and piers, hollow-tile walls, steel frames, and concrete floors. The storage capacity of the magazines is not stated in definite figures since the number of items that can be stored is regulated by the appropriate quantity-distance tables.

(5) **Above-ground Magazines.** Above-ground magazines includes any type of magazine constructed above ground, other than standard igloo magazines and special-type magazines. Richmond-type magazines are considered to be barricaded above-ground magazines.

Note: **Show VG33 (Storage Buildings).**

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f. Storage Buildings and Areas. Magazines and other buildings in which munitions and explosives are stored will be given a formal inspection every 7 months. Such inspections will be performed by QASAS, who will record and report the results.

(1) A formal record of the results of these inspections (and lightning protection system tests) will be maintained.

(a) The record will include discrepancy reports forwarded to responsible installation activities and the resolution or corrective actions resulting from these reports.

(b) Inspection results will be considered part of the technical history of the items in storage.

(2) Any unusual or changing conditions encountered during an inspection that have had or could have an adverse effect on any of the stored items will be recorded on appropriate DSR cards. Such conditions, along with any potentially hazardous conditions, will be specifically noted reported to the appropriate organization for prompt corrective action.

(3) A reinspection will be scheduled for locations where potentially serious conditions have been encountered to verify that they have been corrected.

(4) Conditions to be considered in the inspections of magazines and storage buildings include, but are not limited to, the following:

- Compliance with storage drawing.
- Segregation of lots and condition codes.
- Adequacy of aisles.
- Stability of stacks.
- Separation of stacks by safety distance where such are specified.
- Compliance with quantity-distance limits in stacks and magazines.

Note: **Show VG34 (Outside Storage).**

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g. Outside Storage. Munitions placed in outside storage will be given adequate continuing inspection to ensure that packaging is not damaged to the extent that munitions contents are exposed in any manner not intended by the original design of the package.

(1) Any damaged packages will be adequately repaired before they are placed in outside storage. All munitions will be stored in stable stacks with ventilation provided according to existing requirements.

(2) DA policy requires that outside storage of munitions and explosive material be held to an absolute minimum.

It is recognized that there are situations where outside storage may be justified, provided material is stored explosive safety standards. Examples of these situations are as follows:

- Size precludes storage in magazines.
- Material is presently stored outside and scheduled for demilitarization or maintenance.
- Material is temporarily located in outside storage at the time of Suspension from Issue, Movement, and Use (SIMU).

(3) A formal examination of each outside site in which munitions is stored will be made quarterly. The inspection will consist of a general exterior examination of the munitions items and packages for evidence of deterioration or damage and for the presence of any conditions indicating the possibility of future deterioration.

(a) If the exterior examination reveals any evidence of deterioration or nonstandard conditions, additional detailed inspections will be made as necessary to determine the condition of the entire quantity of munitions affected.

(b) Each outside site will be examined immediately following any unusual weather condition, such as severe rain, snow, or wind storms, which might damage or affect the munitions. Munitions in outside storage will be subjected to a complete PI at least semiannually. Primary emphasis will be on detecting any evidence of deterioration or hazardous conditions that may affect the continued serviceability or storage safety of the munitions.

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5. Learning Step/Activity 5: The students will complete a practical on specific storage requirements.

Method of instruction: PE2
Instructor-to-student ratio: 1:12
Time of instruction: 3.0 hours
Media: None

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a. Directions to Instructor:

(1) Ensure each student has a copy of the Practical Exercise 55B40C01-PE2 Worksheet - 2.

(2) Inform students of directions listed below.

(3) Provide assistance as required.

(4) Critique the exercise upon conclusion.

b. Directions to Students:

(1) The purpose of this practical exercise is for you to demonstrate how well you have retained the material we have covered in this lesson.

(2) Talking between students is not allowed during the practical exercise.

(3) Raise your hand for assistance, if needed.

(4) Using the reference material provided answer the questions and cite the reference where you found the answer.

(5) You have 150 minutes to complete this Practical Exercise.

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6. Learning Step/Activity 6: The instructor will facilitate a discussion on quantity-distance and storage compatibility groups. (Reference Chapter 5, TM 9-1300-206)

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 3.0 hours
Media: Viewgraphs

Note: Instructor will present a 10-minute lecturette on quantity-distance and storage compatibility groups.

Assign each group of students a paragraph or series of paragraphs in Chapter 5 on which to lead a discussion during this period.

Note: **Show VG35 (Quantity-Distance Requirements).**

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a. General. Munitions and explosives are classified on the basis of their reactions to specified initiating influences. The grouping of explosives and munitions into the several hazard classes does not necessarily mean that the different items in a class may be stored together. The maximum amount of explosives permitted at any location is determined by its distance from other exposures and the distance shown in the applicable Q-D table found in DA PAM 385-64. Greater distances than those shown in the tables should be used wherever practicable.

(1) When an appropriate degree of protection can be provided either by hardening a target building or constructing a source building to suppress explosion effects, the distance required by the standard Q-D tables may be reduced. When site and general construction plans for munitions and explosives facilities use protective construction to justify reduced distances, they must be accompanied by the rationale or by supporting test results when they are submitted for approval.

(2) Explosives limits must never exceed the minimum required for efficient, safe operation. Operations and personnel must be arranged (consistent with efficient, safe operation) to minimize their exposure to any one explosion or fire hazard.

(3) Explosives safety distance tables prescribe necessary separations and specify maximum quantities of the various classes of explosives permitted in any one location. These tables list the minimum criteria for storage and handling of explosives. Such criteria provide reasonable safety within specified limits compatible with the risk of accidental explosions. Limits established locally must be no greater than necessary for an efficient operation. Operations and personnel must be arranged to minimize exposure to hazards.

(4) Safety policies and standards are provided for munitions and explosives and related facilities and activities. They are also provided for the siting of facilities and activities that do not involve munitions and explosives but would be exposed to such hazards if they were improperly sited. Explosives are classified by hazard class (after considering damage and casualty-producing potentials involved) on the basis of their characteristics and the probability of hazards presented if they explode, ignite, or are released—not on the basis of their compatibility groupings or intended use. Mixed explosives and explosive items of different classes are assigned to the highest applicable hazard class, which provides the maximum degree of protection. It is possible for items to appear in more than one class when different hazards result from such factors as type of packing, size or caliber, physical state or state of assembly, storage configuration, or quantities involved.

b. Requirements. In time of war, military requirements may make full compliance with safety regulations especially difficult. Since the purpose of the regulations is to minimize losses of personnel and military stores and to maintain the full utility of military establishments, compliance with explosives and munitions regulations is extremely important. In time of peace, the Q-D tables must be complied with in DA PAM 385-64, unless a waiver is obtained.

- Buildings at military establishments where personnel are regularly located will be placed at inhabited building distances (IBDs) from facilities and areas containing explosives, except when the buildings are used for operations in support of those functions and areas.

Note: **Show VG36 (Q-D Terms).**

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c. Q-D Terms. This section of the lesson will provide an explanation of terms that you must be familiar with concerning quantity-distance.

(1) **Quantity-Distance.** Quantity-distance is a measurement that consists of the quantity of explosive material and the distance separation relationships that provide defined types of protection. These relationships are based on levels of risk considered acceptable for the stipulated exposures and are tabulated in the appropriate Q-D tables.

(2) **Permissible Exposures of Structures and Personnel to Blast Overpressures.** In assessing the hazards in a given explosive incident, the principal effects to be considered are blast overpressures, fragments and debris, thermal hazards, and chemical hazards. The violent release of energy from a detonation gives rise to a sudden increase in gas pressure. This sudden increase is the blast or shock wave. The blast wave, with concurrent overpressure, rises rapidly at its source, reaches a peak, and then decreases as it radiates from its source, acting on structures and personnel.

(3) **Inhabited Building Distance (IBD).** The IBD is the minimum permissible distance between an inhabited building and a munitions or explosives location. IBDs are also used between:

- Explosives locations and administration areas.
- Adjacent operating lines.
- Explosives locations and other exposures within an establishment.

(a) Except as otherwise prescribed, IBDs are also provided between munitions and explosives locations and the boundaries of Army establishments.

(b) IBDs (based on damage from blast or shock effects) provide frame or masonry buildings with a high degree of protection from structural damage, and provide their occupants with a high degree of protection from death or serious injury. They also provide reasonable protection to superficial parts, such as window frames, doors, porches, and chimneys; but they do not prevent glass breakage, or protect personnel from broken glass or other hazardous fragments. In order to protect personnel in the open from the potential fragment hazard created by an accidental explosion of Class 1.1 material, a minimum IBD or fragment distance has been established.

(c) IBDs for munitions and explosives that are not mass detonating are based on the most severe hazard involved.

(4) **Public Traffic Route.** The public traffic route distance is the minimum distance permitted between a public traffic route (any public street, road, highway, navigable stream, or passenger railroad) and an explosives hazard. The distance at which motor vehicles and rail cars are considered safe from the blast effects of explosions has been fixed at 60 percent of the IBD. The use of lesser distances is based on:

- The smaller height and area of motor vehicles and rail cars exposed to blast.
- The greater resistance of those vehicles to blast (compared to buildings).
- The fact that, while a building is stationary and subject to risk constantly, the presence of a motor vehicle or train is only temporary.

(a) For public traffic routes, the fragment distance minimum for Classes 1.1 and 1.3 may be reduced to 60 percent of the minimum fragment distance that is appropriate for the explosion source under consideration.

(b) In no case may a public traffic route distance be used that is less than that required by the applicable Class 1 or 1.3 Q-D table.

(5) **Intraline Distance.** The intraline distance is the minimum distance permitted (except as indicated in separate facilities below) between any two buildings with one operating line. Intraline distances are also used for separating certain specified areas, buildings, and locations even though actual line operations are not involved. All unpackaged munitions and explosives in such a line, except those in Classes 1.3 and 1.4, are considered Class 1.1. Intraline distance is expected to protect buildings from propagation of explosion due to blast effects and substantially protect against propagation due to missiles if properly designed barricades or unbarricaded intraline distances are used. Buildings separated by intraline distances usually sustain substantial structural damage.

(a) A service-type magazine must be located at intraline distance (based on the quantity of explosives within the magazine) from the nearest operating building of the line of which it forms a part. Service-type magazines must be separated from each other by intraline distances.

(b) Separate facilities (excluding service magazines) servicing a single explosives operating building may be located at less than intraline distance, but not less than prudent fire distance from the operating building. They must, however, be at least intraline distance from other explosive buildings. Such facilities include low pressure heating boilers and paint storage buildings.

(6) **Magazine Distance.** Magazine distance is the minimum distance permitted between any two storage magazines. The distance required is determined by the type(s) of magazine and the type and the quantity of munitions or explosives stored. It is expected to prevent propagation of explosion and blast from one magazine to another and to provide a reasonable degree of protection against propagation of explosion due to fragments. It does not, except possibly for earth-covered magazines, protect magazines from severe structural damage. Magazine distance is also used for certain Q-D computations involving more than two magazines.

(7) **Fragment Distance.** The fragment distance for a given munitions/explosives item is based on the hazardous fragment density range created by an explosion of that item. A hazardous fragment is one that has an impact energy of at least 58 foot-pounds, and a hazardous fragment density is constituted by at least one hazardous fragment impacting in an area of 600 square feet or less. Fragment distances do not indicate the maximum range to which fragments may be projected.

(a) Fragment distances, applicable to Class 1.1 through 1.3, are indicated by a number placed in parentheses to the left of the class/division designator (for example, (18)1.1, (08)1.2, and (06)1.3). The number in parentheses indicates the fragment distance in hundreds of feet.

(b) A minimum distance number is used for all items in Class 1.2. The fragment distance indicated by the minimum distance number corresponds to the IBD for the various categories within Class 1.2.

(c) For items in Classes 1.1 and 1.3, the minimum distance number may be used when separation distances greater than those specified by the applicable explosives Q-D table are necessary for specific hazards (projection of debris, fragments, or firebrands). Those minimum fragment distances, which are intended to protect personnel in the open, are applied to installation boundaries, administrative and housing areas, athletic fields, and other recreation areas. They need not be applied to separations between and within explosive operating lines, nor to relatively static inert storage areas, such as parking areas for dead storage of military vehicles.

(d) If a minimum distance number is not shown for cased munitions of Class 1.1, the minimum distance is 1,250 feet. For such items, 1,250 feet or the distance shown in the Q-D table, whichever is greater, is used. (Facilities sited at 1,235 or 1,245 feet in accordance with past standards are considered to be in compliance with the 1,250-foot minimum requirement.)

(e) For bulk high explosives, propellant ingredients, pyrotechnics, other in-process materials, and thin-skinned munitions items of Class 1.1, the minimum distance of 1,250 feet is used unless it can be shown that debris from structural elements of the buildings or process equipment do not present a hazard beyond the required distances for the quantity involved.

(f) Rationale for using fragment distances under 1,250 feet for Class 1.1 must be included in all required site plans and safety reviews. When there is no test data to substantiate distances less than 1,250 feet, analogies to similar items or facilities, fragment dispersions from previous accidental incidents, or analytical modeling of the debris spread should be investigated. All munitions in Class 1.2 is automatically considered to be Class 1.1 when it is unpacked, unless testing has shown otherwise.

(8) **Net Explosive Weight (NEW).** NEW is the total quantity of explosive material or high explosives equivalency, in each item or round, to be used with Q-D criteria or other standards.

(9) **Net Explosive Quantity (NEQ).** NEQ is the total quantity of explosive material expressed in kilograms.

Note: **Show VG37 (Quantity of Explosives).**

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d. Quantity of Explosives.

(1) The explosive content of munitions or components is shown in approved drawings. If drawings are not available, the information should be requested from:

Headquarters, US Army Materiel Development and Readiness Command

ATTN: AMCSF

5001 Eisenhower Ave.

Alexandria, VA 22333-0001

(2) The total quantity of explosives in a magazine, operating building, or other explosives facility is the net weight of the explosives calculated on the following bases. Such calculations are intended for use with the tables in DA PAM 385-64.

(a) Mass-Detonating Explosives: The net explosives weight (NEW).

(b) Non-Mass-Detonating Explosives.

(c) Propellants: The net propellant weight.

(d) Pyrotechnic Items: The sum of the net weights of the pyrotechnic composition and the explosives involved.

(e) Bulk Metal Powders and Pyrotechnic Composition: The sum of the net weights of metal powders and pyrotechnic composition in containers.

(f) Other Munitions: The net weight of high explosives plus a suitable contribution, if any, from propellant, pyrotechnic components, or expelling charges.

(3) Combinations of mass-detonating and non mass-detonating munitions and explosives (excluding Class I) are treated on the basis that all explosives are subject to mass-detonation and the total quantity used. In the event that the non-mass-detonating items require a greater distance than the total explosives so computed, the greater distance is mandatory.

Note: **Show VG38 (Separation of Operating Lines and Miscellaneous Buildings).**

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e. Separation of Operating Lines and Miscellaneous Buildings, Structures, and Yards. Explosives and munitions operating lines and storage areas must be separated from each other, from inert areas (warehouses, shops, administrative facilities, etc.) and from the installation boundary by the appropriate IBD.

(1) A building, a group of buildings, or an operation conducted in the open, when serving more than one explosive line or area, constitutes a special area that must be separated from those lines or areas by IBD. A facility or activity that serves a single explosives line or area may be separated from the line or area by intraline distance, but it must be separated from all other lines or areas by IBD. Those general principles govern in all cases except those addressed below.

(2) For miscellaneous structures in a magazine area:

(a) Guard shelters, field offices, munitions surveillance buildings, bombproofs, and other personnel shelters must be separated from magazines containing Class 1.1 materials by unbarricaded intraline distance and from magazines containing other classes of materials by a minimum of magazine distance.

(b) Change houses, lunchrooms, packaging and shipping buildings, dunnage preparation buildings, and lumber storage for magazine areas must be located at least unbarricaded intraline distance from magazines.

(c) Normal maintenance operations may be performed in a magazine area when they are authorized by the MACOM commander or the installation commander in accordance with established guidelines. Under those guidelines, normal maintenance of small arms munitions may be performed in magazines containing small arms munitions only.

(3) Buildings forming an operating line must be separated from each other by intraline distance. Outdoor operations or operations conducted under sheds within an operating line must also be located at intraline distances. Where missiles pose a hazard, intraline distances may not provide sufficient protection. A barrier or barricade should therefore be provided as additional protection, particularly when personnel concentrations are high; for example in lunchrooms and change houses.

(4) IBDs need not be applied to facilities for the housing of security personnel who are required by their mission to have a quick reaction capability in the immediate vicinity of a potential explosion site. Such security facilities should be provided intraline distance protection. This exemption applies to any manned security facility, regardless of continuous occupancy and numbers of duty personnel. The exemption may not, however, be extended to barracks that are the permanent quarters of assigned troops.

(5) Individual sentry posts are not subject to Q-D separation standards, but they should be located a prudent distance from any explosives facility.

Note: **Show VG39 (Yards).**

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f. Classification Yards. Cars carrying explosives and munitions in a classification yard should be switched for transfer as soon as possible. They should not remain in the yard for more than 24 hours.

(1) To provide protection from an external explosion, the classification yard must be separated from other explosives sites by the magazine distance that applies for the quantity of explosives at the explosives site.

(2) Except as indicated above, a classification yard used exclusively for receiving, dispatching, classifying, and switching cars is not subject to Q-D regulation. However, such a yard should be located as far as practicable from inhabited buildings and the installation boundary. It is permissible to open the free-rolling doors of rail cars to remove documents or make a visual inspection. If these requirements are not met, IBDs must be maintained to the installation boundary and to inhabited buildings on the installation.

g. Holding Yards.

(1) Explosives loaded vehicles in holding yards are considered above-ground magazines for Q-D purposes.

(2) Generally, rail holding yards should be laid out on a unit car-group basis with each car-group separated by the applicable above-ground magazine distance.

(3) If the rail holding yard is formed by two parallel ladder tracks connected by diagonal spurs, the parallel tracks and the diagonal spurs must be separated by the applicable above-ground magazine distance.

(4) If the rail holding yard is a “Christmas tree” arrangement consisting of a ladder track with diagonal dead-end spurs projecting from each side at alternate intervals, the spurs must be separated by the applicable above-ground magazine distance for the net quantity of high explosives in the cars on the spurs.

(5) Generally, truck holding yards should be laid out on a unit truck-group basis, with each group separated by the applicable above ground magazine distances. Both rail and truck holding yards must be separated from other facilities by the applicable Q-D criteria.

(6) In addition to the temporary parking of rail cars, trucks, or trailers containing munitions and explosives, holding yards may be used to interchange truck trailers or rail cars between a commercial carrier and a DOD activity and to conduct visual inspections.

h. Interchange Yards.

(1) Truck, trailer, or rail car interchange yards are not subject to Q-D regulations when they are used exclusively:

(a) To interchange vehicles or rail cars containing munitions or explosives between a commercial carrier and installation.

(b) To conduct external inspection of the trucks, trailers, or rail cars containing munitions or explosives.

(c) To conduct visual inspection of the external condition of the cargo in the vehicles that pass the external inspection.

(2) If the yards are ever used for any other purpose, applicable Q-D tables will apply.

Note: **Show VG40 (Suspect Car Spur Tracks).**

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i. Suspect Car Spur Tracks. When the inspection of a car of explosives or munitions 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 spur or section of track should lead directly from the inspection point and be located so that suspect cars can be moved without entering the classification yard. The distance between the spur or track and installation boundaries, classification yards, inhabited buildings, administration areas, operating buildings, magazines, inert storage locations, public railways, and public highways should be the IBD based on the maximum quantity of explosives that the installation can receive in one rail car. Only one car is permitted on the spur or section of track at any time. Incoming explosives- or munitions-laden motor vehicles must be inspected at a station located in accordance with applicable requirements.

Note: **Show VG41 (Loading Docks).**

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j. Loading Docks.

(1) Loading docks, including elevated docks, pads, container transfer sites, or other locations at which munitions or explosives are transferred to and from vehicles, including railway cars, must be located at not less than the following distances:

(a) Magazine distance from magazines, based on the quantity of material in the magazine or on the dock, whichever is greater.

(b) Intraline distance from the operating line or munitions workshop building the dock serves, based on the quantity at the dock or building(s), whichever requires the greater distance.

(c) IBD from administrative areas, inert areas, operating lines, or munitions workshops that are not served by the dock, installation boundaries, and other unrelated facilities.

(d) Magazine distance from other loading docks.

(e) Intraline distance from LCL (less-than-carload) buildings, munitions surveillance buildings, and other miscellaneous structures in the magazine area.

(2) Sites used solely for transfer of containers are subject to the same Q-D as loading docks. The quantity of Class 1.1 materials at one loading dock may not exceed 250,000 pounds, but two rail cars containing more than 125,000 pounds each are permitted, provided the Q-D requirements are met.

Note: **Show VG42 (Barricades).**

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k. Barricades.

(1) Properly constructed, separate, artificial or substantially natural barricades are effective means for protecting structures or operations. General rules concerning barricades are given below:

(a) Barricades may not be used to reduce distances for fire hazard materials such as Class 1.3 propellants, and fragment-producing items such as Class 1.2 munitions.

(b) Protection is considered effective when a line drawn from the top of any side wall of an explosives building to any part of the other location to be protected will pass through the intervening barricade.

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

(d) A barricade must be separated from both the building it is to screen and the building containing the hazard. The nearest toe of the barricade must be no less than 4 feet nor more than 40 feet from the building, except in the case of igloo-type magazines. The separation should be as near the 4-foot minimum as practicable. Although it is permissible to locate a barricade adjacent to either the building to be protected or the building containing the hazard, the former is recommended.

(e) Barricades may be (a) natural or artificial earth mounds having natural sloping sides, or (b) single rivetted walls of either wood or concrete, with an earth mound of a minimum width of 3 feet at the top and a natural slope on one side. Single rivetted barricades are preferred. Barricades in excess of 20 feet in height must be at least 5 feet wide at the top. Earth fill or artificial barricades should contain no more than 15 percent of stones or gravel, all of which should pass through a 1-inch screen. The rivetted sides of barricades may be concrete, masonry, or timber walls.

(f) Existing double rivetted artificial barricades with a minimum width of 3 feet at the top, with sloped sides, and with proper anchorage to give stability against overturning forces are approved for reducing Q-D requirements for a maximum of 50,000 pounds of high explosives. For quantities in excess of 50,000 pounds, natural or single-rivetted barricades described above are the only types approved. One exception is the barricade incorporated in the design of existing ammonium nitrate graining buildings.

(2) Barricades must be inspected periodically to determine the degree of settling. When a barricade no longer provides effective protection because of settling, fill must be added. Wood-rivetted barricades must also be inspected periodically. Rotted timbers or planking that affects the strength or effectiveness of the barricade must be replaced.

Note: **Show VG43 (Q-D Classes).**

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l. Q-D Classes. The following paragraphs outline the hazard classification system and Q-D criteria applicable to the development, manufacture, test, maintenance, storage, and shipment of munitions and explosives, and all handling incidental thereto. The requirements are designed to provide specified levels of protection for nearby communities, public railroads and highways, and plant facilities from the effects of possible fires or explosions. The grouping of munitions and explosives into the several classes does not necessarily mean that the different items in a class may be stored together. The maximum amount of explosives permitted in any location is specified in the Q-D tables. Local limits are established in amounts no greater than those consistent with safe, efficient operation.

(1) Quantity-Distance Hazard Classification. The Q-D hazard classification system is based on the system recommended for international use by the United Nations Organization (UNO), which consists of nine classes for dangerous goods. Munitions and explosives are included in UNO Class 1, explosives; munitions that has no explosive components but contains toxic chemical agents and containers of toxic chemical agents in bulk are included in UNO Class 6, Poisonous (Toxic) and Infectious Substances.

(2) The current munitions and explosives hazard classes are divided into divisions based on the character and predominance of the associated hazards and their potential for causing personnel casualties or property damage, not on compatibility groupings or intended use.

(3) A number is placed in parentheses to the left of division designators 1.1 through 1.1 when it is necessary to properly describe a hazard; for example, (18)1.1, (08)1.2, and (06)1.3. The number in parentheses indicates the minimum separation distance (in hundreds of feet) required to provide inhabited buildings, public traffic routes, and personnel in the open with specified levels of protection from munitions and explosive items. A minimum distance number is used for all items in Class 1, Division 2.

Note: Instruct students to follow along as each of the following tables and figures are discussed. Pose questions as necessary to ensure learning is accomplished using the group dynamics process.

- Table 5-0, Probable Effects of Blast Overpressures. (TM 9-1300-206, page 5-2)
- Table 5-1, Ammunition and Explosives Approved Separation Distances (TM 9-1300-206, page 5-10 through 5-10.9)
- Figure 5-2, Application of the Hazard Classification System (TM 9-1300-206, page 5-17)
- Table 5-2, Conversion from Superseded Classification System to Current U.N.O. System (TM 9-1300-206, page 5-18)
- Table 5-4, Quantity-Distance IBD and PTR. (TM 9-1300-206, page 5-21 and 5-22)
- Table 5-5, Quantity-Distance Intraline Separations. (TM 9-1300-206, pages 5-25 and 5-26)
- Table 5-6, Class 1.1 Intermagazine Applications (TM 9-1300-206, page 5-27)
- Table 5-7, Intermagazine Hazard Factors and Distances, for Use with Table 5-6. (TM 9-1300-206, pages 5-28 through 5-30)
- Table 5-10 through Table 5-13, Class 1.2 Quantity-Distance (TM 9-1300-206, page 5-32)
- Table 5-14, Class 1.3 Quantity-Distance (TM 9-1300-206, page 5-33)
- Table 5-17, Class 1.4 Quantity-Distance (TM 9-1330-206, page 5-36)
- Table 5-18, Quantity-Distance Separation for Protection of Underground Service Installations (TM 9-1300-206, page 5-37)

Note: **Show VG44 (Q-D for Hillside Underground Magazines, and Chemical Munitions).**

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m. Quantity-Distance for Hillside Underground Magazines, and Chemical Munitions.

(1) When it is necessary to store munitions and explosives in a magazine beneath the ground or in a hillside, the details of the proposed magazine, magazine area, and type of ground in the area must be submitted through command channels to Headquarters, US Army Materiel Command, for approval. Detailed Q-D standards for the storage of all types of munitions and explosives in natural caverns or in excavated chambers below the natural ground surface can be found in DA PAM 385-64.

(2) Q-Ds for chemical agents and agent-filled munitions must meet the requirements established for each specific agent, or as listed below.

(a) Magazines containing Chemical Group A and/or B items with explosive bursters require intermagazine separation.

(b) Bulk Chemical Group A and B agents and Class 6 munitions (agent-filled, not containing explosives) require a minimum separation distance of 50 feet between each storage magazine, building, or storage pad.

(3) Separate storage is required for each of the four chemical groups (A, B, C, and D) to preclude mixing them with each other or with other dissimilar materials. Chemical munitions of the same chemical group that have essentially the same toxic and explosives characteristics may be stored together, except those in SCG K. Because chemical agents assigned to SCG K are inherently hazardous and have different personal protection equipment requirements, they must be stored separately.

(4) Igloo magazines in which toxic chemical munitions are stored must be located an appropriate distance from other magazines based on the quantity of explosives involved.

Note: **Show VG45 (Storage Compatibility Groups).**

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n. Storage Compatibility Groups.

All munitions and explosives are assigned to an appropriate SCG for storage at Army activities. Factors that determine munitions and explosives storage compatibility groupings are evaluated on the basis of data obtained from munitions drawings and various tests during research and development.

o. Storage Principles.

(1) The highest degree of safety in munitions and explosives storage could be assured if each item or division were stored separately; however, such ideal storage generally is not feasible. A proper balance of safety and other factors frequently requires mixing several types of munitions and explosives in storage.

(2) Munitions and explosives must not be stored with dissimilar materials or items that present positive hazards to the munitions. Examples are mixed storage of munitions and explosives with flammable or combustible materials, acids, or corrosives.

(3) Different types of munitions and explosives by item and division may be mixed in storage, provided they are compatible. Munitions and explosives are assigned to an SCG when they can be stored together without significantly increasing the probability of an accident or, for a given quantity, the magnitude of the effects of such an accident. Some of the considerations used in developing the SCGs were:

(a) Chemical and physical properties.

(b) Design characteristics.

(c) Inner and outer packaging configuration.

(d) Quantity-distance division.

(e) Net Explosive Weight (NEW).

(f) Rate of deterioration.

(g) Sensitivity to initiation.

(h) Effects of deflagration, explosion, or detonation.

(4) Subject to the application of appropriate standards (particularly to compatibility standards), munitions and explosives should be mixed in storage when such mixing will facilitate safe operations and promote overall storage efficiency. Assignment of items to SCGs requiring separate storage should be minimized consistent with actual hazards presented; it should not be based on administrative considerations or end use.

(5) In these standards, the phrase "with its own means of initiation" indicates that munitions has its normal initiating device assembled to it and this device is considered to present a significant risk during storage. However, the phrase does not apply when the initiating device is packaged in a manner that eliminates the risk of detonating the munitions when the initiating device accidentally functions, or when fuzed end items are configured and packaged to prevent arming of the fuzed end items. The initiating device may even be assembled to the munitions, provided its safety features preclude initiation or detonation of the explosives filler of the end item in the event of an accidental functioning of the initiating device.

Note: **Show VG46 (Compatible Ammunition and Explosives).**

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p. Compatible Munitions and Explosives.

(1) Different kinds of explosives within any one of the following three groups may be stored together. However, items in one of the three groups listed below are not necessarily compatible with items in another of the groups.

(a) Initiating explosives.

(b) Propellants regardless of Q-D class or Q-D division.

(c) High explosives.

(2) Different types of munitions within any one of the following seven groups are compatible and may be stored together. These munitions are generally compatible with munitions in other groups.

(a) All types of initiating devices.

(b) All types of HE munitions without their own means of initiation, without a propelling charge.

(c) All types of HE munitions without their own means of initiation, with a propelling charge.

(d) All types of HE munitions with their own means of initiation, with or without a propelling charge.

(e) All pyrotechnics and all types of munitions containing both explosives and illuminating, incendiary, smoke, or tear-producing agents except:

- Water-activated pyrotechnics and munitions.
- Munitions containing WP, flammable liquids, or gels.

- All types of munitions containing both explosives and white phosphorus.
- All types of munitions containing both explosives and flammable liquids or gels.

(3) Certain kinds of explosives may be stored with certain types of munitions:

(a) Bulk propellants are compatible with propelling charges, and cartridges within inert or solid projectiles or without projectiles.

(b) Bulk high explosives are compatible with HE munitions without its own means of initiation and without a propelling charge.

Note: **Show VG47 (Chemical Munitions).**

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q. Chemical Munitions.

(1) The group designation used for agents is also used for chemical munitions. The chemical and storage compatibility groups of a munitions item must be the same as those of the chemical agent contained within the item. Chemical agents include lethal, riot control, and incapacitating agents, as well as smoke-producing agents, incendiaries, and pyrotechnic compounds related to their dissemination. Chemical munitions include a variety of items, the effects of which depend primarily on the chemical agent with which they are filled rather than explosion or fragmentation, even though they may contain explosive elements or pyrotechnic materials to activate them.

(2) The fencing and security requirements for any structure or storage area containing chemical munitions must meet the criteria listed below.

(a) Bulk containers of GB and VX agents and agent-filled items assembled with explosives and/or propellants must be stored in earth-covered magazines or other structures that can be expected to offer a degree of protection and containment in the event of an accident.

(b) Bulk 1-ton containers of mustard (H series) agents may be stored out of doors on steel dunnage when they are properly secured and measures have been taken to prevent theft of agent. Detailed procedures for securing containers and preventing theft of agent are available from AMCSS.

(c) Incendiary and pyrotechnic munitions (including riot control items designed for thermal dissemination), smoke grenades, riot control grenades, and incendiary items must be stored in structures appropriate to their explosive classification.

(d) Projectiles, bombs, or other items filled with agents but not assembled with explosives or initiating components must be stored in approved-type magazines.

(3) Chemical munitions or agents may not be stored in magazines with floors made of wood or other porous material that would absorb them and make decontamination difficult.

(4) Magazines and open areas used for storage of chemical munitions must be equipped with lightning protection. Lightning protection need not be provided for outdoor storage of 1-ton containers.

(5) The storage arrangement for munitions must permit munitions to be easily inspected and single items or storage units to be easily removed.

(6) Bulk containers must be stored so that both ends of the containers can be inspected. Aisles must be wide enough to permit easy passage of forklift trucks or emergency equipment.

(7) H-type mustard containers are exceptions. They must be stored with their valves horizontally aligned.

(8) Individual magazines and storage buildings must be kept locked; they may be opened only by authorized personnel to permit operations or inspections.

(9) Munitions and explosives must be stored separately if:

(a) Their packaging is substandard or damaged.

(b) They are in a suspect condition.

(c) They have characteristics that increase risk in storage.

(d) They are not compatible with other munitions and explosives.

Note: **Show VG48 (Storage Compatibility Groups).**

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r. Storage Compatibility Groups.

In view of munitions and explosives storage principles and the considerations for mixed storage, munitions and explosives are assigned to 1 of the 12 storage compatibility groups (A through H, J, K, L, and S) described in TM 9-1300-206, Table 5-19.

Note: **Show VG49 (Mixed Storage).**

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s. Mixed Storage.

(1) Mixing of SCGs is permitted, as indicated in TM 9-1300-206, Figure 5-3.

(2) Items from SCGs C, D, E, F, G, H, J, and S may be combined in storage, provided the net quantity of explosives in the items or in bulk does not exceed 1,000 pounds per storage site. The items must be packaged in accordance with approved drawings.

(3) In addition, munitions 30mm and less assigned to Hazard Class 1.4, SCG C, G, or S, may be combined in storage without regard to explosive quantity limitations.

Note: **Show VG50 (Hazard Classification and Compatibility Groups).**

---

t. Hazard Classification and Compatibility Groups.

TM 9-1300-206, Table 5-20 provides examples of the relationship between SCGs and Q-D divisions.

---

7. Learning Step/Activity 7: The students will complete a practical exercise on munitions quantity-distance and compatibility.

Method of instruction: PE2
Instructor-to-student ratio: 1:12
Time of instruction: 3.0 hours
Media: None

---

a. Directions to Instructor:

(1) Ensure each student has a copy of the Practical Exercise 55B40C01-PE2 Worksheet - 3.

(2) Inform students of directions listed below.

(3) Provide assistance as required.

(4) Critique the exercise upon conclusion.

b. Directions to Students:

(1) The purpose of this practical exercise is for you to demonstrate how well you have retained the material we have covered in this lesson.

(2) Talking between students is not allowed during the practical exercise.

(3) Raise your hand for assistance, if needed.

(4) Using the reference material provided answer the questions and cite the reference where you found the answer.

(5) You have 150 minutes to complete this Practical Exercise.

SECTION IV. SUMMARY

Note: **Show VG51 (Summary).**

Method of instruction: SGI
Instructor-to-student ratio: 1:12
Time of instruction: 0.9 hours

Review/ Summarize Lesson

During the last sixteen hours, we have used small group instruction employing group dynamics to identify and apply the skills and knowledge required of you as an NCO (55 series) to ensure that munitions and explosives storage standards are observed. The efficiency and safety of these requirements are, to a large extent, dependent upon your ability and technical guidance during Class V operations.

Check on Learning

Determine if students have learned the material presented by:

a. Soliciting student questions and explanations.

b. Asking questions and getting answers from the students.

c. Correcting student misunderstandings.

Transition to Next Lesson

Your next lesson will be Lesson C02, Inspect Munitions Storage Facilities.

SECTION V. STUDENT EVALUATION

Testing Requirements	Upon completion of Part I of this annex, your performance will be evaluated by a written examination.
Feedback Requirement	a. Schedule and provide feedback on the evaluation and any information to help answer students' questions about the test. b. Provide remedial training as needed.
Note:	Rapid, immediate feedback is essential to effective learning.

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Practical Exercise Work Sheet - 1

(STUDENT NAME) (RANK) (CLASS) (DATE)

1. Reserve supplies of dunnage are provided storage within the firebreak located around an above-ground barricaded storage location. Is this procedure a safety violation?

ANSWER:_____
REFERENCE:_____

2. A 40-foot stake and platform (S&P) trailer is stored at 85 feet between two stradley-type magazines. The trailer is loaded with 1320-D544. The net explosive weight (NEW) of the trailer has been calculated at 1,387 pounds. The trailer is placarded with 1.1 placards. The trailer has just caught on fire with several rounds exploding. Firefighters are on the site, and firefighting procedures are underway. You are assisting in the evacuation of personnel. What is the minimum public withdrawal distance for non-essential personnel?

ANSWER:_____
REFERENCE:_____

3. You have a magazine in your storage area that contains the below-listed items. Determine the proper fire symbol that should be posted at this location.

   (a) Ctg, 40MM Practice.
   (b) Catapult, aircraft ejection set, M3A2.
   (c) Rocket motors, M3 and M30.

ANSWER:_____
REFERENCE:_____

4. What elements/points are required to be included in the written fire plan?

ANSWER:_____
_____
_____
_____
_____
REFERENCE:_____

5. SITUATION: You have been assigned the responsibility to develop the storage facilities fire prevention and firefighting plan. One of the key elements of the plan is to identify the instructions for fighting fires involving munitions and bulk explosives.

Requirement: Develop a series of paragraphs to satisfy this requirement.

NOTE: Ensure that the following sub-elements are covered.

a. Actions taken when it is discovered that a magazine is on fire.
b. A fire is discovered in grass or other combustible materials surrounding a magazine.
c. A fire is discovered in a building where people are working with explosives present.
d. General guidance on extinguishing fires, or when firefighting forces should seek the nearest suitable protection.

ANSWER:

REFERENCE:

SOLUTION SHEET 1
FIRES AND EXPLOSIVES
PRACTICAL EXERCISE

1. Answer: Yes, the area used for the storage of reserve supplies of dunnage is a violation.
   Reference: Paragraph 3-2g, page 3-2, TM 9-1300-206.

2. Answer: Not less than 4,000 feet public withdrawal distance.
   Reference: Paragraph 3-7d(3), page 3-8, TM 9-1300-206.

3. Answer: Fire symbol "2".
   Reference: Table 5-21, TM 9-1300-206.

4. Answer:
   a. List of communications of alarm signals to be made.
   b. Responsible individuals and alternates, their organizations, training and emergency functions of each.

   Reference: Paragraph 3-1, page 3-1, TM 9-1300-206.

5. Answer: See paragraph 3-6a through d, page 3-5, TM 9-1300-206.

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Practical Exercise Work Sheet - 2

(STUDENT NAME) (RANK) (CLASS) (DATE)

SITUATION: You are assisting operations in the selection of magazine storage locations (specific magazine type) to accomplish storage of the following Class V material:

a. Munitions 20mm, practice and high pressure test.
b. Ctg 40mm, TP.
c. Ctg, 105mm HE, M1 w/o fuze.
d. Chemical munitions, Group D, TPA filled, w/o explosive components.
e. Mines, practice, with spotting charge and/or fuze.

Questions:

1. May the material be provided storage in "standard above-ground munitions magazines"?

ANSWER:_____
REFERENCE:_____

2. Due to magazine non-availability, you are considering the storage of 1340-H555 in a primer and fuze-type magazine (27 feet 6 inches in width and 43 feet 4 inches in length). Is this magazine authorized by regulation for proper the storage of this DODIC?

ANSWER:_____
REFERENCE:_____

3. What type of magazine is used for the intermediate storage of minimum quantities of explosives, necessary for the safe and efficient conduct of a processing operation (e.g., explosive filled operation)?

ANSWER:_____
REFERENCE:_____

4. Which type of magazine is preferred for the storage of all munitions and bulk explosives?

ANSWER:_____
REFERENCE:_____

5. What is the usual spacing requirement maintained between two primer and fuze-type magazines?

ANSWER:_____
REFERENCE:_____

6. According to current munitions and explosives standards concerning the use of standard above-ground munitions magazines, which storage class/divisions should they be restricted to?

ANSWER:_____
REFERENCE:_____

7. SITUATION**:** During the conduct of a storage inspection, it is noted that the following Class V material is provided storage in an earth-covered igloo magazine: Projectile, 155mm HE, M449/M449E1 (1320-D561) and Projectile, 155mm HE, M483A1 (1320-D563). Munitions surveillance has identified this location as not complying with specific compatibility requirements for storage.

   Determine if the findings of the surveillance safety inspection are valid and, if so, determine the action necessary to correct the safety violation.

ANSWER:_____
_____
_____
_____
REFERENCE:_____
_____

8. Your storage platoon is engaged in the transfer of 1375-M030 and 1375-M032 from damaged packages to new containers. What type of tools and personnel safety equipment are required during this operation and what is the minimum safety distance required from the storage magazine to the maintenance location?

ANSWER: _____

_____

_____

REFERENCE: _____

9. SITUATION: The storage activity has received authority to place 1320-D544 and 1315-C508 in an outside storage location for approximately 30 days. During the planning phase of the operation, you are advised by SFC Woods that assets of palletized small arms munitions should be used to construct barricades between the outside storage locations and the magazine storage facility.

   Is the procedure advised by SFC Woods valid, or is it in violation of established storage regulations?

ANSWER: _____

_____

_____

REFERENCE: _____

10. SITUATION: Your storage activity has received advanced notification via DD Form 1348-1 (advanced shipping document) concerning the receipt of 60,000 rounds of 1320-D509 Projectile, 155mm AT, M741. Subject munitions are identified as Q-D class (18)1.2 and are fitted with care recessed lifting plugs. Total NEW of individual magazine locations (igloo magazines) will exceed 15,000 pounds of explosive per storage location.

    Which quantity-distance table applies, due to the above situation, and which AMC storage drawing is required to meet this specific storage requirement?

ANSWER: _____

_____

_____

REFERENCE: _____

11. SITUATION: During the conduct of a storage safety inspection concerning a 80'L x 25'W x 14'H reinforced concrete, oval arch stradley magazine, it is noted that assets of H555, H557 and TOW missiles are placed into individual stacks with their warheads pointing toward the door of the magazine.

    Is the above storage in violation of specific safety requirements and, if so, what are they?

ANSWER: _____

_____

_____

REFERENCE: _____

12. SITUATION: The following Class V material is presently provided storage in a standard ordnance igloo magazine (81'L x 26'6"W x 12'9"H): Projectile, 155mm, Dummy, M7 with charge propelling Dummy, M2; Projectile, 155mm, HE, M107; and Projectile, 155mm HERA, M549A1. This storage was necessary due to limited availability of magazine storage space.

    Does the above storage situation violate safety? Are any additional procedures required in order to promote safety?

ANSWER: _____

_____

_____

REFERENCE: _____

13. A storage igloo magazine is presently used for the storage of the following Class V material:

    a. 1315-C276
    b. 1315-C512
    c. 1315-C708
    d. 1320-D550
    e. 1330-G945
    f. 1305-A360
    g. 1305-A071
    h. 1305-A400
    i. 1305-A475

    As the platoon leader your responsibility is to ensure that all of your personnel are provided with the correct protective equipment and must be readily available to munitions handlers during the storage operation.

What protective equipment is necessary to be centrally stored and issued in the event of an emergency?

ANSWER:_____

REFERENCE:_____

14. What corrective action is necessary in the event a fire is present in magazine 0036 (Corbetta type) and the structure is stored with Class V materials having the following fillers?

    a. TEA
    b. TH
    c. IM

ANSWER:_____

REFERENCE:_____

15. It is necessary to store Chemical Group B munitions in outside storage.

    Who must be contacted for prior approval, and what measure concerning protection must be identified and implemented during the conduct of this storage operation?

ANSWER:_____

REFERENCE:_____

16. Your storage activity has received advanced notification via message traffic that it will be receiving Projectile, 155mm, GB2. The projectiles will be uploaded with its non-critical compound (OPA). In addition, canisters of DF are slated to arrive at the magazine area in 15 days.

    What are the specific storage requirements for the munitions and the critical component identified by the message?

ANSWER: _____

_____

_____

REFERENCE: _____

17. During the inspection of 1340-01-122-3506 H104 (using unit field return concerning 3 pods), it is identified by munitions surveillance personnel that the material is in a suspect condition.

    What specific storage procedures are required based on this situation?

ANSWER: _____

_____

_____

REFERENCE: _____

SOLUTION SHEET 2
SPECIFIC STORAGE REQUIREMENTS
PRACTICAL EXERCISE

1. ANSWER Yes.
   REFERENCE: Paragraph 4-3c(2) and Table 5-21, TM 9-1300-206.

2. ANSWER: No. Magazine type should be restricted to the storage of Class (04) 1.2 and 1.3 (except rockets and rocket motors) and Class 1.4 munitions.
   REFERENCE: Paragraph 4-3c (2.2), TM 9-1300-206.

3. ANSWER Service magazines and service storage buildings are used for the intermediate storage of minimum amounts of explosives necessary for the safe and efficient processing operations.
   REFERENCE: Paragraph 4-3c(3), TM 9-1300-206.

4. ANSWER Earth-covered magazines are preferred for the storage of all munitions and bulk explosives.
   REFERENCE: Paragraph 4-3c(1), TM 9-1300-206.

5. ANSWER: Primer and fuze-type magazines are usually spaced 300 to 400 feet apart.
   REFERENCE: Paragraph 4-3c (2.2), TM 9-1300-206.

6. ANSWER: For future use, standard magazines should be used for the storage of classes, (04)1.2, (08)1.2, (12)1.2, 1.3 and 1.4 materials, excluding rockets and rocket motors.
   REFERENCE: Paragraph 4-3c (2), TM 9-1300-206.

7. ANSWER: Yes. Both items are compatibility group D. They are identified as improved conventional munitions (ICM). Due to their sensitivity to initiation, cargo may be ejected from the projectile during a fire. Magazines for these items should be located on the perimeter of the storage area in order to minimize contamination of the entire storage area.
   REFERENCE: Paragraph 4-6a and Table 5-21 and compatibility table.

8. ANSWER: DODAC items, when handling is accomplished in loose form (e.g., loose explosives), require handlers to wear safety/non-sparking shoes and use spark-resistant tools in opening boxes. Material in damaged boxes to be transferred to new boxes requires a distance of 90 feet from a magazine containing Class V.
   REFERENCE: Paragraph 4-6c, TM 9-1300-206.

9. ANSWER: Boxed small arms munitions shall not be used as barricades or dividing walls between stacks of other types of munitions and is in violation of current munitions and explosive safety standards, as outlined by TM 9-1300-206.
   REFERENCE: Paragraph 4-6g, TM 9-1300-206.

10. ANSWER: When Class (18)1.2 items are provided storage in above-ground magazines, the quantity-distance requirements for Class 1.1 shall apply. Drawing 19-48-4003 will be used.
    REFERENCE: Paragraph 5-7d(2), TM 9-1300-206.

11. ANSWER: Whenever practicable, small rockets and missiles may be stored nose down and may be stored in standard earth-covered magazines without regard to direction in which they are pointed; however, they will not be pointed toward the door of the magazine.
    REFERENCE: Paragraph 4-6n (1), TM 9-1300-206.

12. ANSWER: Dummy or inert munitions may be stored with live or practice munitions if other storage space is not available. The service rounds (proj. 155mm, HE and HERA) will be segregated and clearly identified.
    REFERENCE: Paragraph 4-7, TM 9-1300-206.

13. ANSWER: Chemical Group C material is provided storage at location 0027 and requires the following protective equipment:
    a. Fire-resistant gloves and coveralls.
    b. Chemical safety goggles.
    c. Protective mask.
    REFERENCE: Paragraph 4-21b, TM 9-1300-206.

14. ANSWER: Firefighters shall be confined to preventing the spread of the fire. Fires in corbetta magazines will not be fought.
    REFERENCE: Paragraph 4-31c, TM 9-1300-206.

15. ANSWER: Approval must be obtained from the appropriate major command (MACOM) on a case-by-case basis. Munitions should be covered with tarpaulins to protect from direct rays of the sun and exposure to the elements. Munitions should be stacked to permit free air circulation. Tarpaulins should be supported to permit free flow of air under the tarpaulins.
    REFERENCE: Paragraph 4-9i, TM 9-1300-206.

16. ANSWER: The storage of projectile 155mm GB-2 and DF canisters will require placement in separate fireproof buildings. The two binary containers (OPA and DF) are incompatible. DF will not be stored with other industrial-type chemicals. When the DF is assembled in projectiles, the uploaded projectiles are assigned to SCG K, and separate storage in igloo magazines is required.
    REFERENCE: Paragraph 4-3.2a, TM 9-1300-206.

17. ANSWER: Items shall be segregated and stored separately from serviceable munitions based on the quantity and type as related to the appropriate quantity-distance standards.
    REFERENCE: Paragraph 4-33c, TM 9-1300-206.

PE Work Sheet - 3

(STUDENT NAME) (RANK) (CLASS) (DATE)

1. SITUATION: Due to present non-availability of suitable storage space, the commanding general has authorized the temporary storage of motor vehicles at your munitions storage facility.

   Munitions surveillance (QA/QC) has identified that the only available storage space to meet the commanding general's requirement is located 715 feet from all storage locations (25' x 80' type magazines located in a storage block).

   Can these motor vehicles be stored at this facility?

ANSWER: _____

_____

_____

REFERENCE: _____

2. SITUATION: Two standard earth-covered, arch-type magazines are positioned side-to-side at 80 feet.

   Using magazine distance, determine the maximum allowable (NEW) of 1.1 that each of the magazines are authorized?

ANSWER: _____

_____

_____

REFERENCE: _____

3. SITUATION: Combinations of mass detonating and non-mass detonating munitions are slated for storage in a standard earth-covered, arch-type magazine. All items to be stored are compatible and meet current mixing requirements outlined in TM 9-1300-206.

   What is the basis used to determine the maximum quantity of explosives authorized with the storage location?

ANSWER: _____

_____

_____

REFERENCE: _____

4. SITUATION: Projectiles, separate loading (explosive D loaded) (18)1.2, are authorized for destruction. Currently the items are stored in an igloo arch-type magazine. Inspection of the storage location identifies that munitions are not stored in properly spaced 15,000 lb stacks.

   Which quantity-distance requirements apply?

ANSWER: _____

_____

_____

REFERENCE: _____

5. SITUATION: The following Class V material is provided storage in an igloo-type magazine (25' x 80'):
   composition C-4, fuse lighters, and safety fuse.

   You have been advised by the operations officer, via the findings of a safety inspection conducted by munitions surveillance, that the following safety violations are present:

   A storage compatibility problem is present at the storage location.

   Magazine explosive content is exceeded. (Magazine is located 3,900 feet from the facility laundry and 2,250 feet from a public traffic route. Explosive content has been computed as being 500,000 pounds NEW).

   a. Does a storage compatibility problem exist at the storage location?

ANSWER: _____

_____

_____

REFERENCE: _____

   b. Is the magazine "overloaded" and, if so, what is the authorized net explosive weight (NEW)?

ANSWER: _____

_____

_____

REFERENCE: _____

6. SITUATION: 1315-C454 is provided storage in an igloo-type magazine. The magazine is located 1,200 feet from a public traffic route and 1,375 feet (IBD) safety distance.

What is the maximum net explosive weight (NEW) authorized at the storage location?

ANSWER: _____

_____

_____

REFERENCE: _____

7. SITUATION: The following Class V material is provided storage in an earth-covered igloo magazine.

a. Ctg, cal 50, AP
b. Ctg, 20mm, practice.
c. Ctg, 105mm, HEAT, M341
d. Grenade fragmentation
e. Grenade, riot control, CS1, M25A2
f. Grenade, smoke, HC
g. Grenade, smoke, WP, hand M15

Does a compatibility problem exist?

ANSWER: _____

_____

_____

REFERENCE: _____

8. SITUATION: Loading docks A and B support a single operating line. The docks are authorized to hold 250,000 pounds of explosive each.

What quantity-distance application is applied to the following locations?

a. Loading dock to loading dock?

ANSWER: _____

_____

_____

REFERENCE: _____

b. Loading dock A to the operating line the dock supports?

ANSWER: _____

_____

_____

REFERENCE: _____

c. Loading dock B to administrative areas or munitions workshops not served by the dock?

ANSWER: _____

_____

_____

REFERENCE: _____

d. Loading dock A to the nearest magazine storage location? (The storage magazine is authorized to store a maximum of 500,000 pounds of 1.1 explosive material.)

ANSWER: _____

_____

_____

REFERENCE: _____

9. SITUATION: An individual sentry post is located at the entrance to magazine storage block. Magazines within the storage block are Stradley type and are authorized to store 500,000 pounds (NEW) per storage location.

What is the quantity-distance required between the sentry post and the explosive storage locations?

ANSWER: _____

_____

_____

REFERENCE: _____

10. SITUATION: For personnel protection, a bomb-proof shelter is used at the munitions surveillance function test range.

    What is the type of separation distance required between a magazine containing 1.1 materials and the bomb-proof shelter?

ANSWER: _____

_____

_____

REFERENCE: _____

11. When are railroad cars, trucks, or trailers containing munitions and explosives, and the explosive content of the storage location (magazine) considered as a unit for quantity-distance purposes?

ANSWER: _____

_____

_____

REFERENCE: _____

12. If a minimum distance number (e.g., (18)) is not shown for cased munitions of class 1.1, what is the minimum safety distance required between a storage location and the post laundry?

ANSWER: _____

_____

_____

REFERENCE: _____

13. SITUATION: A magazine is constructed and meets the following specifications: Reinforced concrete, arch-type, earth-covered magazine whose construction is not equivalent in strength to Corps of Engineers drawing 33-15-06, dated 1 August 1951. All distance requirements for IBD, PTR, magazine distance and intraline distance are satisfied to allow maximum capacity storage.

    What is the maximum quantity of explosives that may be stored in magazines that meet these same specifications?

ANSWER: _____

_____

_____

REFERENCE: _____

14. What chemical storage groups are currently assigned to class 6.1?

ANSWER: _____

_____

_____

REFERENCE: _____

15. United Nations Organization (UNO) recommendations include class 1.5 (comprising certain very insensitive explosive substances). For the purposes of TM 9-1300-206 at DOD activities, what is the class/division and SCG consideration for these items?

ANSWER: _____

_____

_____

REFERENCE: _____

16. What is the expected hazard and current storage hazard class and division assigned to superseded Hazard Class-5 munitions and explosives?

ANSWER: _____

_____

_____

REFERENCE: _____

17. What is the IBD and above-ground magazine distance required when a magazine is authorized to store 500,000 pounds (NEW) of H110?

ANSWER: _____

_____

_____

REFERENCE: _____

18. May the following Class V items be combined in storage without regard to explosive quantity limitations?

    a. Ctg, cal 50, ball
    b. Ctg, 20mm HPT
    c. Ctg, igniter, M2
    d. Catapults, aircraft ejection seat M4A1 and M5

ANSWER: _____

_____

_____

REFERENCE: _____

19. What munitions storage compatibility group (SCG) is Class V material assigned to when their characteristics do not permit storage with other types of munitions, or kinds of explosives or dissimilar munitions of this group?

ANSWER: _____

_____

_____

REFERENCE: _____

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SOLUTION SHEET 3
AMMUNITION STORAGE QUANTITY-DISTANCE AND COMPATIBILITY PRACTICAL EXERCISE

1. ANSWER: No. When no other suitable storage space is available, sites located at the appropriate intraline distance (but not less than 800 feet) from magazines and open sites containing munitions and explosives, may be selected in the magazine area for the storage of motor vehicles, artillery, tanks, etc.
   REFERENCE: Paragraph 4-3a(2), page 4-3, TM 9-1300-206.

2. ANSWER: 250,000 pounds NEW.
   REFERENCE: Page 5-27, Table 5-6 and 5-7, TM 9-1300-206.

3. ANSWER: Combinations of 1.1 and 1.2 shall be treated on the basis that all are subject to detonation and the total calculated quantity used.
   REFERENCE: Paragraph 5-3g, page 5-5, TM 9-1300-206.

4. ANSWER: Quantity-distance for 1.1 applies.
   REFERENCE: Paragraph 5-7d(2), page 5-13, TM 9-1300-206.

5. ANSWER: a. A compatibility problem does not exist.
   REFERENCE: Page 5-40, mixing chart, TM 9-1300-206.

   ANSWER: b. 500,000 pounds of explosive (NEW) exceeds allowable limits
   REFERENCE: Pages 5-31 and 5-32, Tables 5-9 and 5-12, TM 9-1300-206.

6. ANSWER: (2) 1.2 (500,000 lb NEW).
   REFERENCE: Page 5-32, Table 5-12, TM 9-1300-206.

7. ANSWER: No, unless the 1,000 pounds rule is applied.
   REFERENCE: Paragraph 5-18e(2), page 5-40, TM 9-1300-206.

8. ANSWER: a. Magazine distance from other loading docks.
   b. Intraline distance from loading dock A to the operating line it serves.
   c. IBD from the loading dock B to munitions workshops and administrative areas not served by the loading dock.
   d. Magazine distance from magazines based on the NEW in the magazine or dock, whichever is greater.
   REFERENCE: Paragraph, 5-4e, Page 5-07, TM 9-1300-296.

9. ANSWER: Individual sentry posts are not subject to Q-D standards but should be located at prudent fire protection from the explosive facility.
   REFERENCE: Paragraph 5-3h(4)(a), page 5-6, TM 9-1300-206.

10. ANSWER: Unbarricaded intraline distance.
    REFERENCE: paragraph 5-3h(4)(a), page 5-6, TM 9-1300-206.

11. ANSWER: When simultaneous detonation can occur.
    REFERENCE: Paragraph 5-7e(7), page 5-14, TM 9-1300-206.

12. ANSWER: 1,250 feet safety rule applies.
    REFERENCE: Paragraph 5-3f(4)(a), page 5-4, TM 9-1300-206.

13. ANSWER: Not over 250, 000 pounds of explosives (NEW) may be stored.
    REFERENCE: Paragraph 5-7b, page 5-11, TM 9-1300-206.

14. ANSWER: Chemical Ammunition Groups A and B without explosive components.
    REFERENCE: Paragraph 5-15, page 5-36, TM 9-1300-206.

15. ANSWER: Class 1.1 D.
    REFERENCE: Page 5-17, Table 5-1, Note D, TM 9-1300-206.

16. ANSWER: (12) 1.2.
    REFERENCE: Page 5-18, Table 5-2, TM 9-1300-206.

17. ANSWER: 1,200 feet IBD and 300 feet magazine distance.
    REFERENCE: Page 5-32, Table 5-12, TM 9-1300-206.

18. ANSWER: Yes.
    REFERENCE: Paragraph 5-18e(3), page 5-39, TM 9-1300-206.

19. ANSWER: SCG L.
    REFERENCE: Paragraph 5-18d(1), page 5-39, TM 9-1300-206.