WAR DEPARTMENT TECHNICAL MANUAL

TM 9-1900

This Technical Manual supersedes TM 9-1900, dated 3 July 1942, and Changes No. 1, dated August 1943; OST 9-18, Vols. 1 and 2, incl., dated October 1942; OFSTB 1900-11, dated 13 January 1943; OFSTB 1900-13, dated 23 April 1943; WDTB 9 1900-13, dated 22 April 1943; OFSTB 1900-16, dated 11 June 1943; OFSTB 1900-17, dated 20 September 1943; WDTB 9-1900-19, dated 5 August 1943; and WDTB ORD 51, dated 5 March 1943. This Technical Manual supersedes portions of WDTB ORD 194 (a reprint of OFSTB 1900-18), dated 6 November 1943; WDTB ORD 204, dated 25 October 1944; and WDTB ORD 249, dated 1 February 1945.

AMMUNITION, GENERAL

WAR DEPARTMENT • *JUNE 1945*

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WAR DEPARTMENT
Washington 25, D. C., 18 June 1945

TM 9-1900, Ammunition, General, is published for the information and guidance of all concerned.

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(For explanation of symbols, see FM 21-6.)

CONTENTS

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CHAPTER 1

GENERAL

Section I

INTRODUCTION

1. PURPOSE.

a. This manual is published for the information and guidance of Army personnel concerned with ammunition. Those responsible for the handling of ammunition should become thoroughly familiar with its provisions.

b. The requirements of this manual will apply to Class I, II, and III installations. The requirements of the Ordnance Safety Manual (O.O. Form 7224) will govern Class III installations under the control of the Chief of Ordnance.

2. SCOPE. The information contained in this text is of a general technical nature. It concerns the several types of ammunition, their general characteristics, means of identification, care in handling and use, storage, surveillance, packing and marking, shipping, and the destruction of duds and unserviceable ammunition.

3. REFERENCES. Further information concerning specific types of ammunition is contained in specific Technical Manuals and Field Manuals. A complete list of references appears in chapter 5.

Section II

GENERAL DISCUSSION

4. NOMENCLATURE.

a. SNL groups. Standard nomenclature is established so that every item supplied by the Ordnance Department may be specifically identified by name. It consists of the type, size, and model of each item. Its use for all purposes of record is mandatory, except where use of AIC symbol (par. 4 b) is authorized. Ammunition nomenclature is published in ORD 11 Standard Nomenclature Lists (SNL's) of groups P, R, S, and T, and its exact use will keep to a minimum errors in the shipment, storage, issue, recording, and use of ammunition items.

(1) Group P contains lists of ammunition for medium and heavy field artillery (155-mm gun and above), coast artillery, and antiaircraft weapons.

(2) Group R contains lists of ammunition for light and medium field, tank, antitank, and aircraft artillery weapons (20-mm gun through 155-mm howitzer), mortars, mines, and demolition material.

(3) Group S contains lists of bombs, grenades, pyrotechnics, and rockets.

(4) Group T contains lists of ammunition for small-arms weapons.

b. Ammunition Identification Code symbols. The Ammunition Identification Code (AIC) symbol has been established to facilitate the supply of ammunition in the field. Code symbols assigned to each item of ammunition in a specific packing are to be used in messages, requisitions, and records. These code symbols are published basically in ORD 11 SNL's of groups P, R, S, and T. A full explanation of the composition and use of the AIC symbol will be found in SB 9-AMM 5 and changes thereto.

5. CLASSIFICATION.

a. General. Ammunition is classified according to use as service, practice, blank, or drill (or dummy). It may also be classified according to type of filler as explosive, chemical, or inert.

b. Service ammunition. Service ammunition is intended to be fired for effect in combat. Such ammunition (except small-arms ammunition) may be further classified according to type as high-explosive, high-explosive-antitank, armor-piercing, gas, smoke, canister, incendiary, illuminating, or pyrotechnic.

c. Practice ammunition. Practice ammunition is fired for effect in simulated combat and is provided for training in marksmanship. The projectile in this type of ammunition may have a small quantity of low-explosive filler to serve as a spotting charge, or it may be inert.

d. Blank ammunition. Blank ammunition is provided in small and medium calibers for saluting purposes and simulated fire. It has no projectile.

e. Drill ammunition. Drill or dummy ammunition is used for training in handling and loading ("service of the piece"). It is completely inert.

6. IDENTIFICATION.

a. General. Ammunition is completely identified, except as to grade, by painting and marking on original packing containers. For purposes of record, the standard nomenclature of the item, together with its lot number, completely identifies the ammunition. Once removed from its packing, ammunition may be identified by the painting and marking on the ammunition items. Other essential information may also be obtained from the marking on ammunition

items. The muzzle velocity of projectiles may be obtained from the firing tables and ammunition data cards; in the case of some rounds of smaller caliber, the muzzle velocity may appear on the packing box. Included in both the marking and the standard nomenclature are:

(1) A brief description of the type or suitable abbreviation thereof.

(2) Caliber, weight, or size.

(3) Model designation.

(4) Where required, such additional information as the model and type of fuze, the model of the cannon in which the item is fired, the weight of projectile for which a separate-loading propelling charge is suited, etc.

(5) The lot number is marked on the ammunition but is not a part of the nomenclature. However, when referring to specific ammunition, it is necessary to mention the lot number as well as the standard nomenclature.

b. Mark or model. To identify a particular design, a model designation is assigned at the time the model is classified as an adopted type. This model designation becomes an essential part of the nomenclature and is included in the marking of the item. The present system of model designation consists of the letter "M" followed by an arabic numeral, for example, "M1." Modifications are indicated by adding the letter "A" and the appropriate arabic numeral. Thus, "M1A1" indicates the first modification of an item for which the original model designation was "M1." Wherever a "B" suffix appears in a model designation it indicates an item of alternative (or substitute) design, material, or manufacture. Certain items standardized for use by both Army and Navy are designated by "AN" preceding the model designation, for example, AN-M103A1, AN-Mk 19. From World War I to 1 July 1925, it was the practice to assign mark numbers, that is, the word "Mark," abbreviated "Mk," followed

by a roman numeral. The modification was indicated by the addition of MI to the mark number, the second MII, etc. After 2 April 1945, these roman numerals in Mark numbers will be indicated by arabic, rather than roman, numerals. This change from roman to arabic numerals will affect ammunition items in use by the U. S. Army which are of British or Navy origin, and also older army items which are now assigned Mark numbers. Prior to World War I, the year in which the design was adopted, preceded by the letter "M," was used as the model designation, for example, M1914.

c. **Ammunition lot number.** At the time of manufacture every item of ammunition is assigned a lot number. Where the size of the item permits, it is marked on the item itself to insure permanency of this means of identification. In addition to this lot number, there is assigned to each complete round of fixed and semifixed ammunition an ammunition lot number which serves to identify the conditions under which the round was assembled, and the components used in the assembly. This ammunition lot number is marked on every complete round of fixed and semifixed ammunition (except where the item is too small) and on all packing containers. It is required for all purposes of record, including reports on condition, functioning, and accidents, in which the ammunition is involved. As far as practicable, all complete rounds of any particular ammunition lot are made up of components selected from the same lot. To obtain the greatest accuracy in any firing, successive rounds should be from the same ammunition lot.

d. **Ammunition data card.** Ammunition data cards will be furnished in the prescribed amounts for all ammunition items of issue except small-arms ammunition. This is a 5- by 8-inch card, on which is printed data concerning the item and its components. Data cards are forwarded with shipping tickets at the time of shipment and are also sent to the ultimate consignee. Information on the cards includes lot number; date packed; identity of components; expected pressures; expected muzzle velocity; assembling and firing instructions when required; and AIC symbols on lots now being produced.

7. PAINTING AND MARKING.

a. **Painting.** Ammunition is painted primarily to prevent rust. Secondary purposes are to provide, by the color, a ready means of identification as to type, and to camouflage the ammunition by the use of lusterless olive-drab paint. See figures 1 to 16, inclusive, for the use of color on ammunition and its packings. The color scheme is as follows:

(1) For ammunition other than bombs, small-arms ammunition, and pyrotechnics:

High-explosive	Olive-drab, with marking in yellow
Low-explosive	Red, with marking in black
Illuminating	Gray, with 1 white band and marking in white
Chemical:	
Persistent casualty gas	Gray, with 2 green bands and marking in green
Nonpersistent casualty gas	Gray, with 1 green band and marking in green
Persistent harassing gas	Gray, with 2 red bands and marking in red
Nonpersistent harassing gas	Gray, with 1 red band and marking in red
Smoke	Gray, with 1 yellow band and marking in yellow
Incendiary	Gray, with 1 purple band and marking in purple
Practice	Blue, with marking in white
Dummy or inert	Black, with marking in white (bronze or brass assemblies are unpainted).

(2) For bombs, other than chemical and practice, the painting is olive-drab, and 1-inch color bands are painted at the nose and tail ends of the body. Markings are in black, except for the incendiary bomb which has purple stenciling. The color of the bands is as follows for the types of bombs indicated:

High-explosive	Yellow
Incendiary	Purple
Drill or inert	Black

When bombs are loaded with Composition B, "COMP. B" is stenciled twice, 180 degrees apart on each band. When bombs are loaded with tritonal, a third color band, ½-inch wide, is located midway between the two bands on either end. These bombs have an inert pad in each end. When TNT or COMP. B loaded bombs are equipped with inert pads, they will be stenciled "WITH PADS" to distinguish from bombs with the small filling, but without pads; the purpose of the inert pad is to render the bomb less sensitive to blows on the end during handling and shipping. Practice bombs are painted blue with white markings but have no color bands. Small fragmentation bombs have no color bands but the nose and tail are painted yellow. Chemical bombs are painted gray, except incendiary bombs which are painted olive-drab, and marked with color bands and stenciling in accordance with the color scheme for other ammunition given in step (1), above.

(3) Small-arms cartridges do not require painting. However, the bullet tips of cartridges are painted a distinctive color (fig. 1) to aid in ready identification as to type, as follows:

Ball	No color tip
Armor-piercing	Black
Armor-piercing-incendiary	Aluminum (silver)
Armor-piercing-incendiary-tracer	Red with aluminum annulus to the rear

Incendiary	Various shades of blue
Tracer	Various shades of red, such as orange and maroon, and white
Frangible	White tip with green annulus to the rear

(4) Pyrotechnics are not marked in accordance with the general color scheme but, where color markings are used, they indicate the color of the pyrotechnic effect produced. In general, however, pyrotechnics are painted gray with marking in black. If the body of the item is aluminum or magnesium, it may not be painted. If the item is intended for incendiary purposes, markings are in purple.

b. Marking. The marking stenciled or stamped on the ammunition and on its packing container includes all information necessary for complete identification. Further information concerning painting and marking will be found under the specific type of ammunition in chapter 2 and in section IV of chapter 3.

8. GRADING.

a. Ammunition is manufactured to rigorous specifications and is thoroughly inspected before acceptance. Ammunition in storage is periodically inspected and tested in accordance with specific instructions furnished by the Chief of Ordnance.

b. Each lot of small-arms ammunition is graded primarily on the quality which make it especially suitable for use in a particular class of small arms weapons such as aircraft and antiaircraft machine guns, rifles, and ground machine guns (WD SB 9-AMM 4).

c. Each lot of ammunition other than small-arms ammunition is graded as a result of surveillance tests into one of four grades, depending on its serviceability (WD SB 9-AMM 1).

Figure 1 — Col[illegible] - Identification of Small-arms Ammunition Types

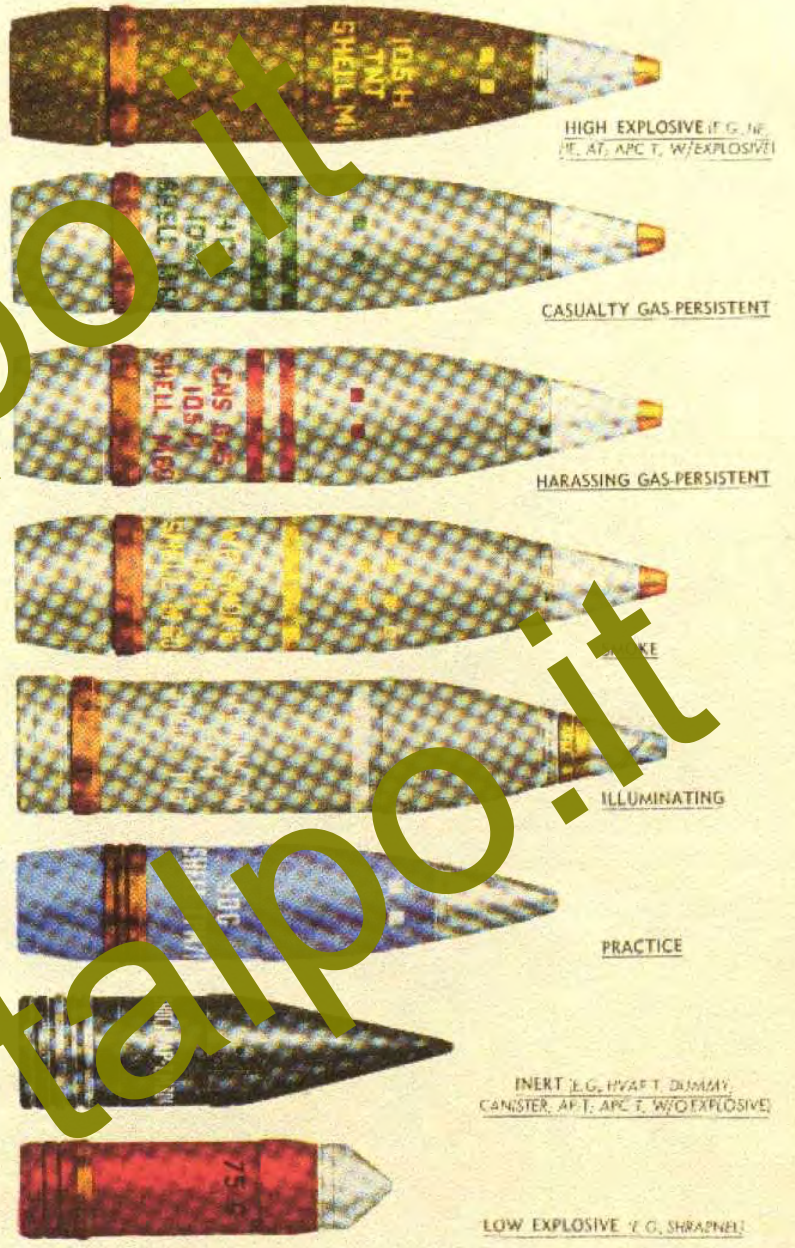
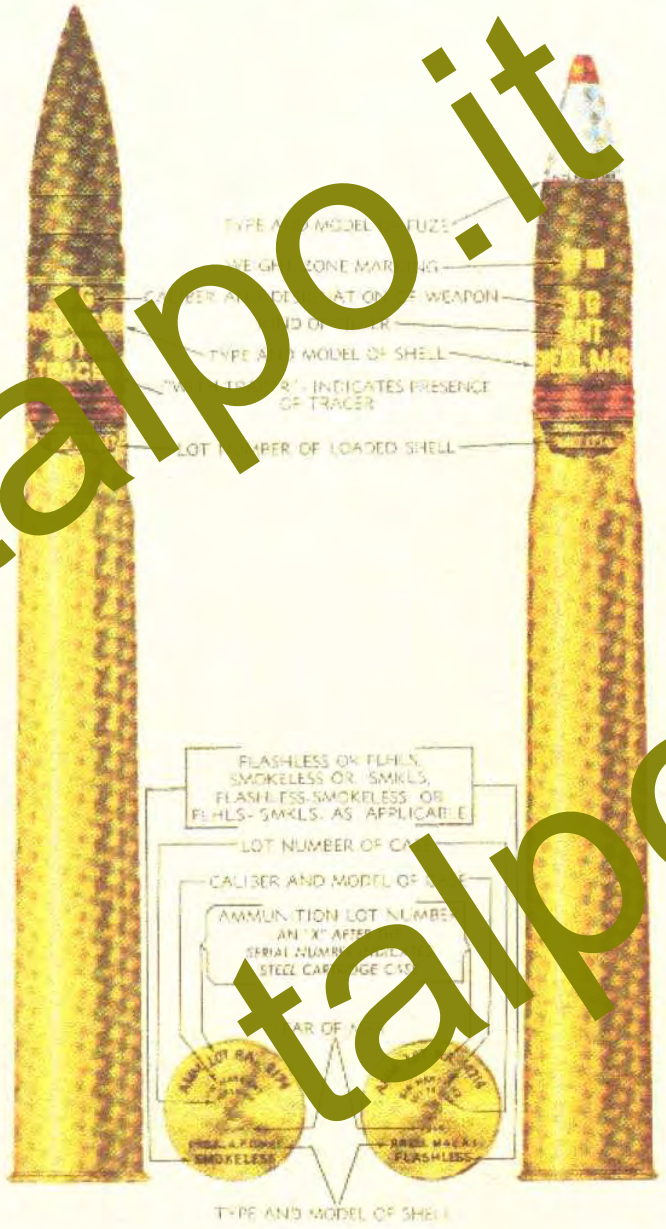


Figure 2— Color Identification of Artillery Projectiles



RA PD 80678A

Figure 3 — Typical Marking of Fixed Artillery Ammunition

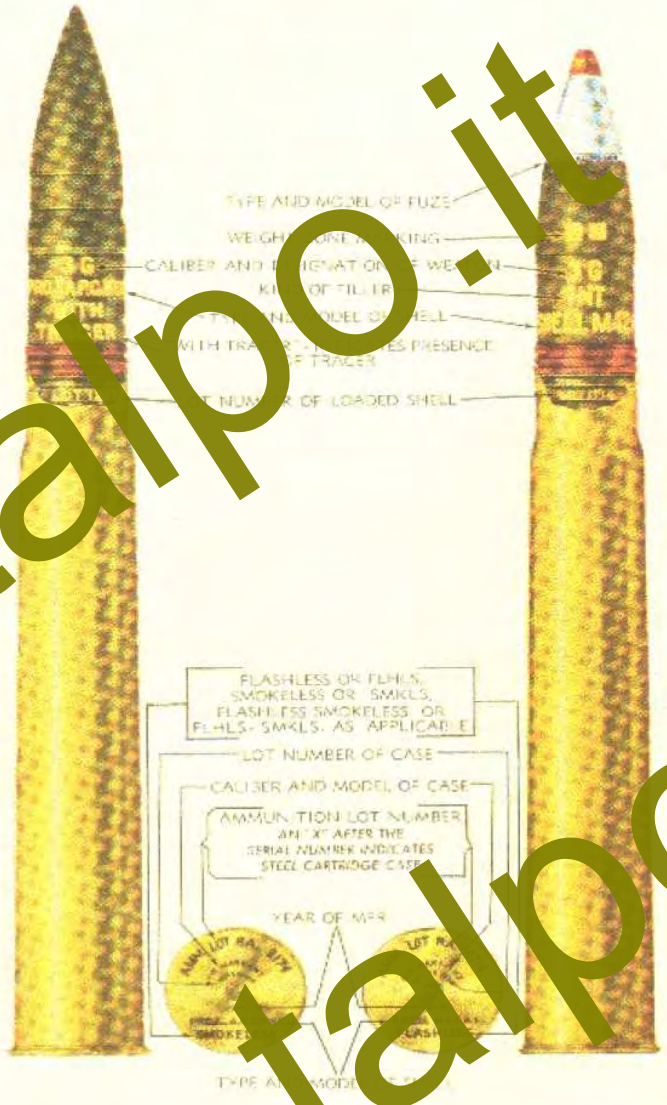


Figure 3 — Typical Marking of Fixed Artillery Ammunition

Figure 4 – Marking of Fixed Artillery Ammunition To Indicate Reduced, Normal, and Super Charges

RA PD 97769

Figure 5 — Marking of 90-mm Separated Artillery Ammunition

Figure 6 — Color Identification of Artillery Propelling Charges

Figure 7 — Color Marking of Packing Boxes and Metal Containers

Figure 8 — Color Identification of Fiber Containers and Cartridge Storage Cases

Figure 9.—Color Identification of Bombs

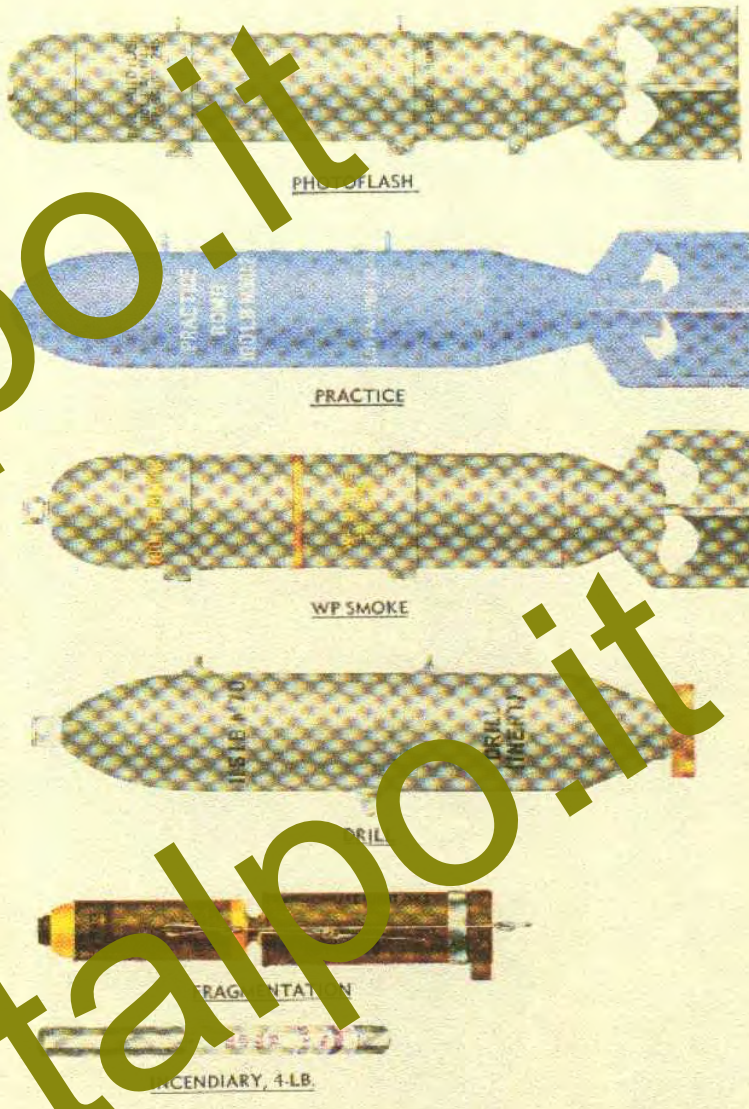
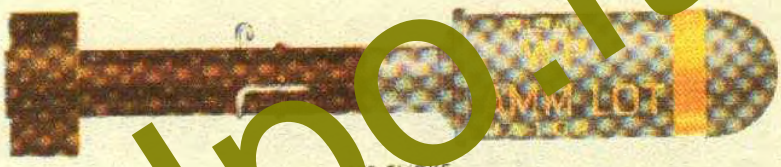


Figure 10 — Color Identification of Bombs (Continued)

Figure 11. Color identification of Hand Grenades

HIGH EXPLOSIVE, ANTITANK

PRACTICE



WP SMOKE

COLORED SMOKE

RA PD 102500

Figure 12 — Color Identification of Rifle Grenades

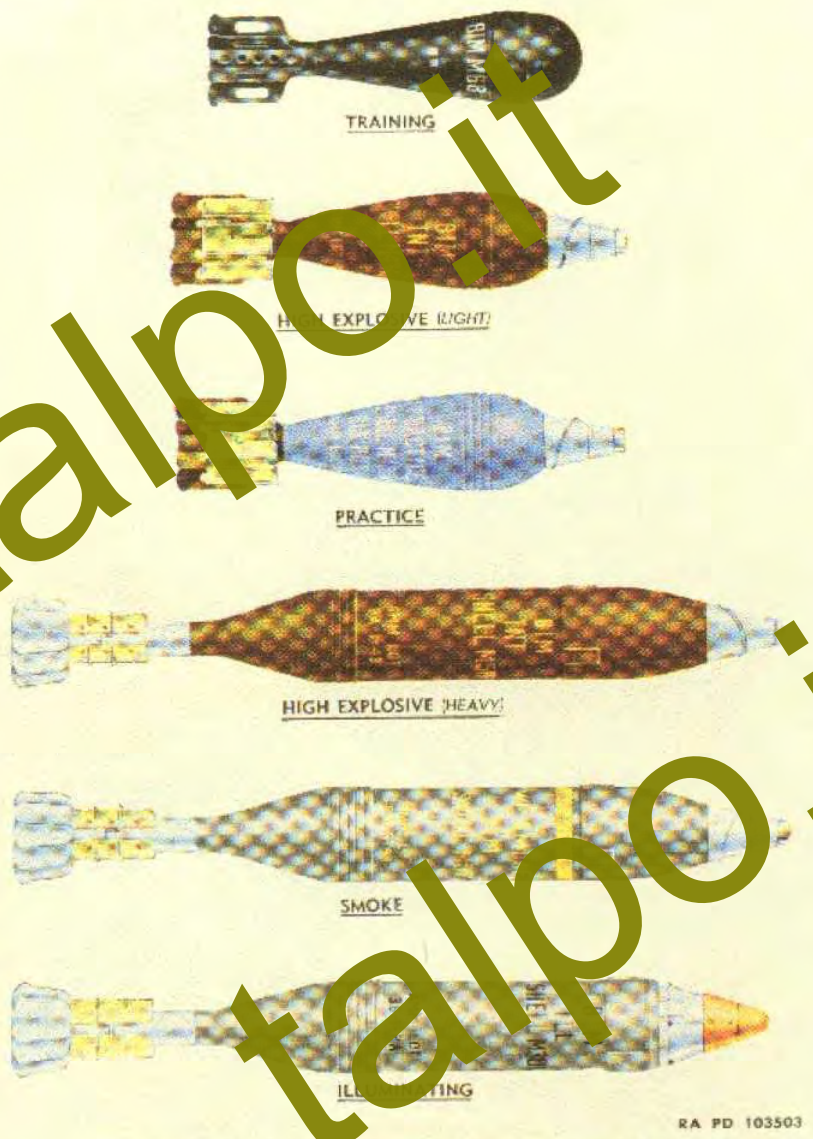
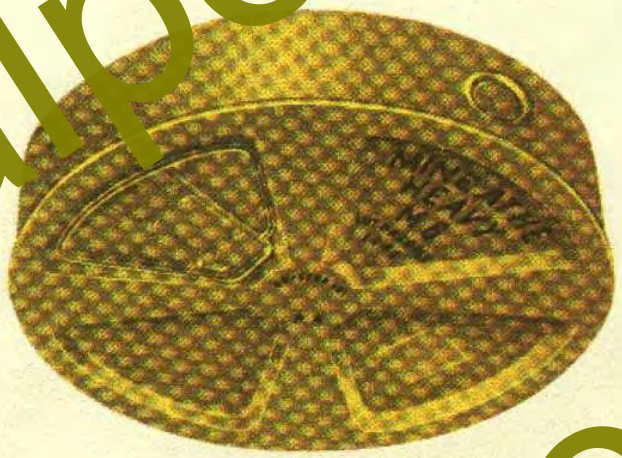


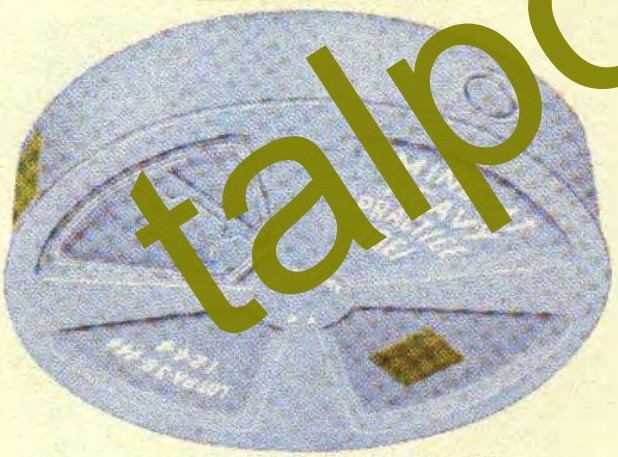
Figure 13 — Color Identification of Mortar Shell

Figure 14 — Color Identification of Antipersonnel Mines

IGHT ANT ANK HE MINE, M7



HEAVY ANTITANK HE MINE, M6



HEAVY ANTITANK PRACTICE MINE, TSE1

RA PD 103578

Figure 15 — Color Identification of Antitank Mines

Figure 16 — Color Identification of Rockets

9. PRIORITY OF ISSUE.

a. Subject to special instructions from the Chief of Ordnance, ammunition of appropriate type and model will be used in the following order: limited standard, substitute standard, standard. Within this rule, ammunition which has had the longest or least favorable storage will be used first. Among lots of equal age, priority of issue will be given to the smallest lot.

b. To prevent the building up of excess stocks in the field, transfers from one station to another should be arranged within the service command if no stock of appropriate grade for immediate use is on hand.

c. Principles of issue for the small-arms ammunition is established by the Chief of Ordnance and published in WD SB 9-AMM 4 or in special instructions.

d. Further details will be found in War Department Supply Bulletins of the 9-AMM series and in AR 775-10.

10. CARE AND PRESERVATION.

a. In order to keep ammunition in a serviceable condition and ready for immediate issue and use, due consideration should be given to the general rules given below. Detailed information on care and preservation is given in chapters 2 and 3.

b. Store ammunition in the original containers in a dry, well-ventilated place protected from the direct rays of the sun and other sources of excessive heat.

c. Keep ammunition and its containers clean and dry and protected from possible damage.

d. Disassembly of components of ammunition, such as fuzes and primers, without specific authorization, is strictly prohibited. Any alteration of loaded ammunition, except by direction of the technical source concerned and under the supervision of commissioned officers of that service, is hazardous and must not be undertaken.

e. Do not open sealed containers or remove protective or safety devices until just before use, except as required for inspection.

f. *Explosive ammunition must be handled with appropriate care at all times. Explosive elements, such as primers and fuzes, are sensitive to undue shock and high temperature.*

g. Return ammunition prepared for firing but not fired, to its original packing, and mark it appropriately. Use such ammunition first in subsequent firings in order to keep stocks of opened packings at a minimum.

Section III

MILITARY EXPLOSIVES

11. GENERAL. To understand the composition and functioning of a complete round of ammunition, a basic knowledge of the characteristics and uses of military explosives is necessary. In order that ammunition may function at time and place desired, it is necessary to employ different kinds of explosives, each of which has a specific role. Explosives suitable for one purpose may be entirely unsatisfactory for another. Thus, the explosive used to burst a forged steel projectile would not only be unsuited but also highly dangerous if used to propel the projectile out of the weapon. Similarly, the explosives used in initiators, such as in primers and fuzes, are so sensitive to shock that only small quantities can be used safely. The characteristics of various types of explosives are given in sections IV and V. For further information, see TM 4-205 and TM 9-2900.

12. DEFINITION. Any mixture or compound which, under the influence of heat or mechanical action, undergoes a sudden chemical change (decomposition) with the liberation of heat and light energy accompanied by a large volume of gases, is called an explosive.

13. CLASSIFICATION.

a. Explosives are classified as low and high explosives according to their rates of decomposition when such decomposition is initiated by the spit of a flame or a mechanical shock. A more exact classification for military purposes distinguishes between non-propagating and self-propagating explosives. Therefore, explosives are divided into two basic groups: Low explosives (propellants) and high explosives.

(1) LOW EXPLOSIVES. Low explosives are combustible materials which decompose very rapidly but do not normally explode; this action is called deflagration. In decomposition, they produce a large volume of gases which produce enough pressure to propel a projectile or rocket forward. The rate of burning is an important factor and depends upon such factors as pressure, grain form, composition, etc. Low explosives do not usually propagate a detonation. Under certain conditions, however, they react in the same manner as high explosives, that is, they may detonate.

(2) HIGH EXPLOSIVES. High explosives are characterized by the extreme rapidity with which the decomposition occurs; this action is called detonation. They decompose almost instantaneously, either in a manner similar to an extremely rapid combustion, or with rupture and rearrangement of the molecules themselves. In either case, gaseous and/or solid products of reaction are produced. The disruptive effect of the reaction makes the explosive valuable as a bursting charge but precludes its use as a propellant because the gases are

formed so quickly that excessive pressures would be developed which might burst the barrel of the weapon. A detonation may be pictured as resulting from an explosion wave traveling through the high-explosive charge at an extremely high velocity (22,000 to 27,500 feet per second).

14. REQUIREMENTS OF AN EXPLOSIVE.

a. **General military requirements.** Before an explosive can be *adopted for military use*, it must have the following characteristics:

(1) Chemical stability over extended periods of storage under normal conditions.

(2) Ability to withstand the mechanical shocks incident to loading, transporting, and handling.

(3) Ability to withstand the shock of set-back on firing weapon (when used in artillery shell), or impact when dropped "safe" (when used in bombs).

(4) Susceptibility to complete ignition or detonation under the action of the preceding element of the explosive train.

(5) Brisance (shattering ability).

(6) A reasonable degree of economy in manufacture.

b. **Specific military requirements.** Additional requirements, differing from the basic ones, must be established to make sure that the explosive will perform properly in the capacity desired. In determining by tests whether a given explosive will meet the requirements, consideration must be given to stability, sensitivity, and brisance.

(1) STABILITY. *Stability refers to the capacity of an explosive* to retain unaltered its chemical and physical properties during an indefinite period of storage, under normal conditions or at higher than normal temperatures.

(2) SENSITIVITY.

(a) To shock or impact. Sensitivity to impact or shock refers to the ease with which an explosive can be detonated by the sudden application of mechanical force.

(b) To detonation by means of initiators. The standard sensitivity to detonation by initiating agents other than mechanical impact is expressed in terms of the amount of initiating explosive as, for example, mercury fulminate required to effect complete detonation of a given weight of explosive under a given set of conditions.

(3) BRISANCE. *Brisance is the ability of a detonating explosive* to shatter material close to it. This property is different from the potential heat energy of the explosive, sometimes referred to as power or strength, which determines the force an explosive can exert when it explodes. Such force depends upon the amount of gas generated and the temperature reached during an explosion, whereas brisance

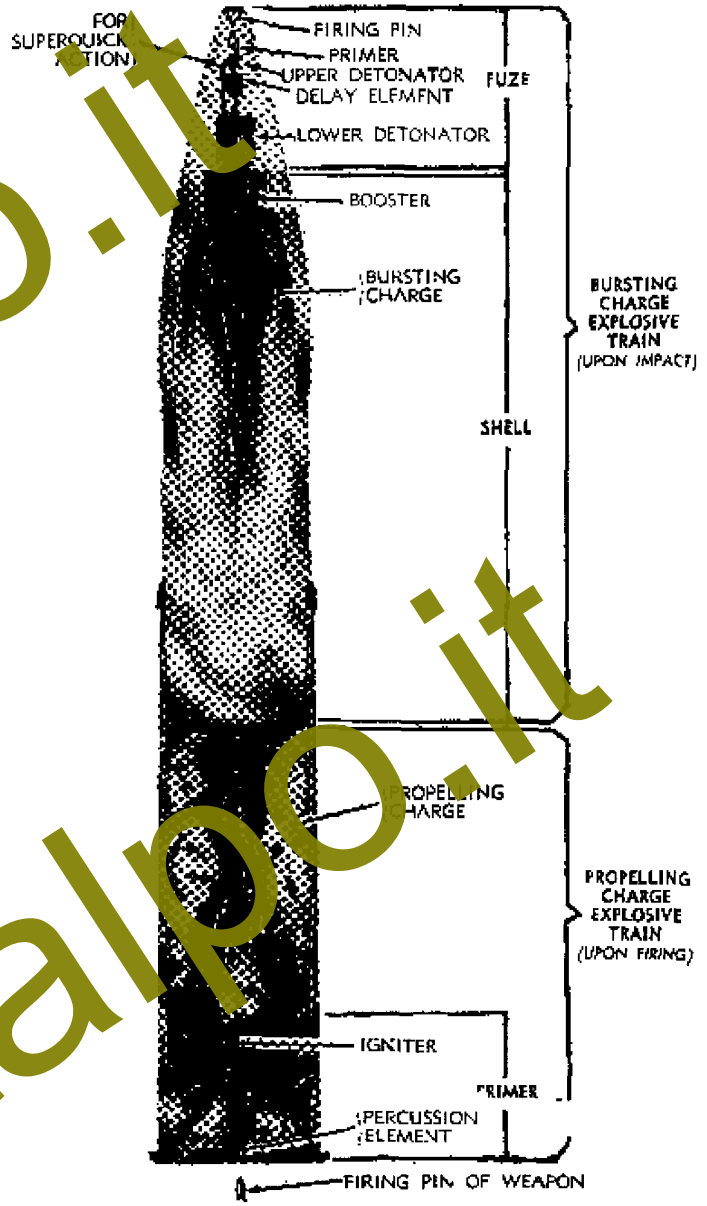


Figure 17 — Explosive Trains in Artillery Ammunition

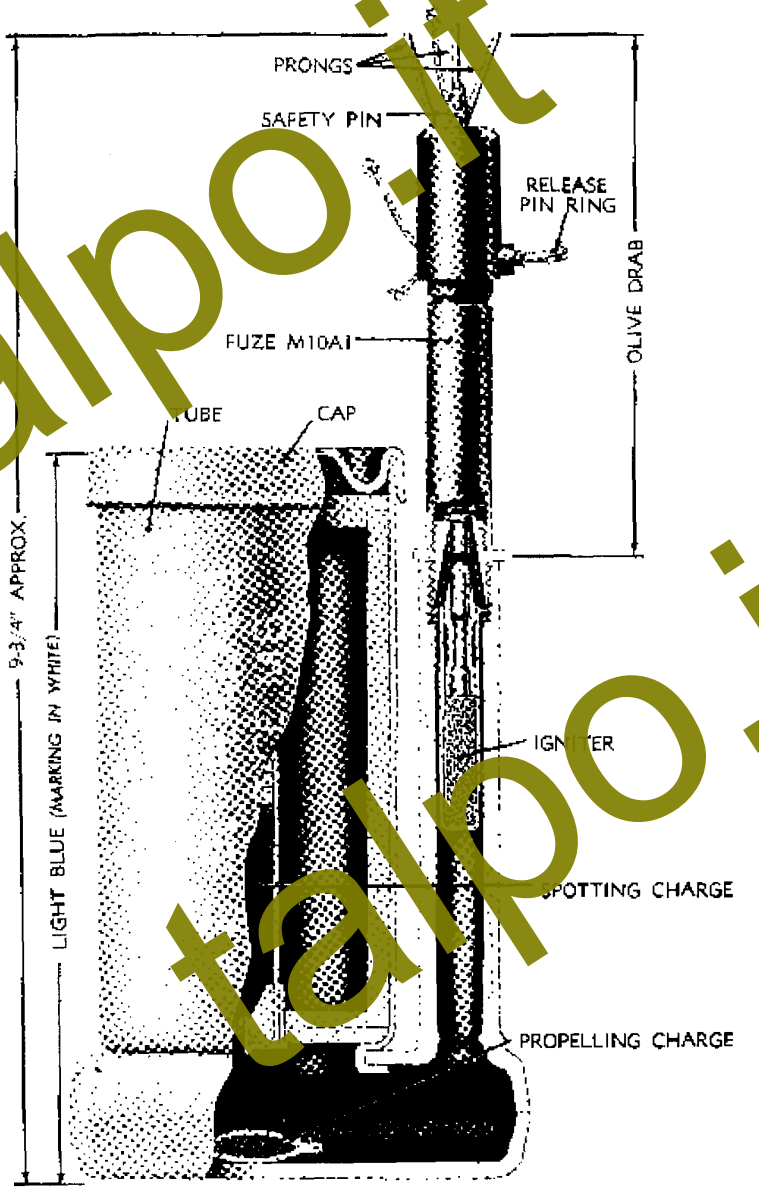


Figure 143 — Practice Antipersonnel Mine M8, With M10A1 Fuze

wooden box, which is stained light brown with marking in yellow, or, more recently, unstained with marking in black. The cast-iron fragmentation antipersonnel mine is packed in a wooden box containing 6 mines, 6 fuzes in individual containers, and 6 spools of wire. The practice antipersonnel mine is packed 2 mine bodies and 2 fuzes, with 20 sets of replacement parts, per wooden box. The box has markings in black, a blue center band and blue vertical end cleats.

Section IX

DEMOLITION MATERIALS

154. GENERAL. Demolition materials include explosive equipment intended for destruction of obstacles (by bangalore torpedoes), fortifications (by shaped charges), special equipment (by destructors), and general material (by demolition blocks). Most demolition charges may be fired electrically by electric blasting caps or nonelectrically with safety fuse and nonelectric blasting cap or delay detonators. For detailed information, see FM 5-25 and TM 9-1940.

155. BANGALORE TORPEDOES. The bangalore torpedo M1A1 (fig. 144) is a tube or pipe filled with high explosive. The steel tube or pipe is 5 feet in length and 2⅛ inches in diameter, and is grooved and capped at each end. The tube is filled with amatol, with about 4 inches of TNT at each end. The weight of the explosive charge is about 9 pounds. The torpedo may be used as an explosive charge for other demolition purposes. The bangalore torpedo M1A1 is packed 10 per kit or box which also contains 10 connecting sleeves and 1 nose sleeve.

156. DESTRUCTORS.

a. General.

(1) Destructors are high-explosive charges fired electrically or by the action of a fuze.

(2) Destructors are for use in certain equipment to be destroyed when the materiel is abandoned or when there is danger of its falling into enemy hands. In general destructors are intended for destruction of the vital parts of the materiel by means of an explosion which is confined within the housing. Destructors may be removed from materiel during normal maintenance repair.

b. Destructor AN-M1. This destructor (fig. 145) is a small explosive container which fits a threaded adapter in certain radio equipment. The head end has a screwdriver slot and is threaded for screwing into the adapter. At the opposite end is a gilding-metal case which is separated from the head end by a plastic tube. The head end contains a small cylinder of nitrocellulose and the ignition wire. The

Figure 144 – Bangalore Torpedo M1A1

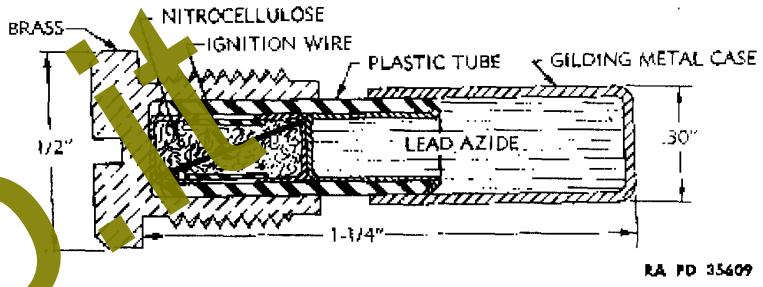


Figure 145 — Destructor AN-M1 — Sectioned

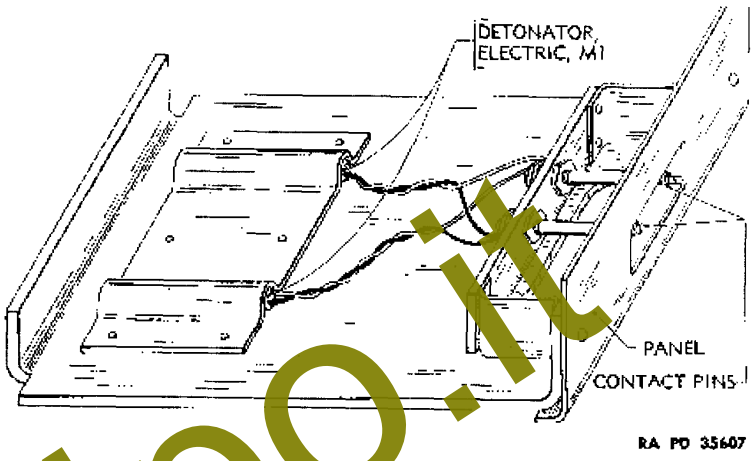


Figure 146 — Destructor AN-M2

metal components at each end of the unit are insulated from each other. When the electrical circuit is closed, the current passes through the ignition wire which, in turn, detonates the destructor.

c. **Destructor AN-M2.** This destructor (fig. 146) consists of a simple sheet-metal platform, upon which the various electrical and explosive components are secured. The rear and forward edges of the platform are curved upward and a panel is attached to the forward edge. The whole assembly is 1½ inches high. This destructor fits into an opening in the enclosing box of certain equipment with which it is used. When a switch is closed, the electric current causes the electric detonators to function.

d. **Destructor AN-M3A1.** This destructor (fig. 147) resembles the destructor AN-M1 in general appearance but is much larger. It

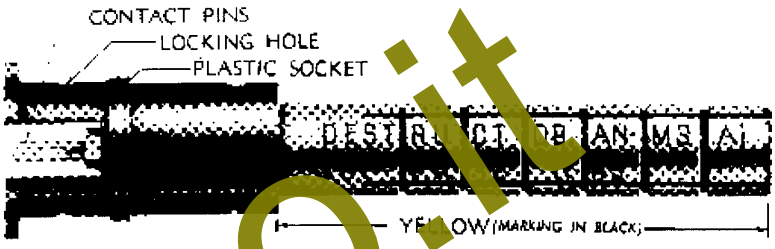


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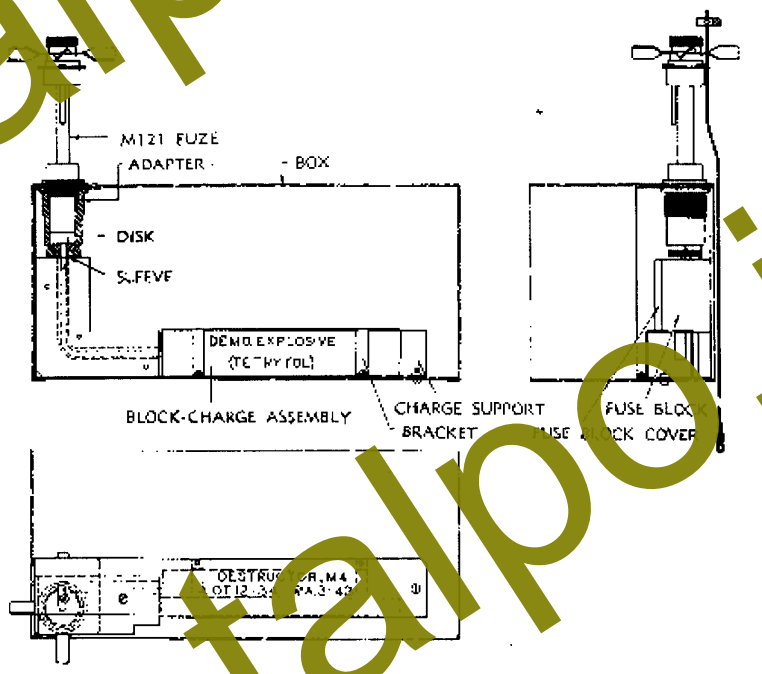
Figure 147 — Destructor AN-M3A1



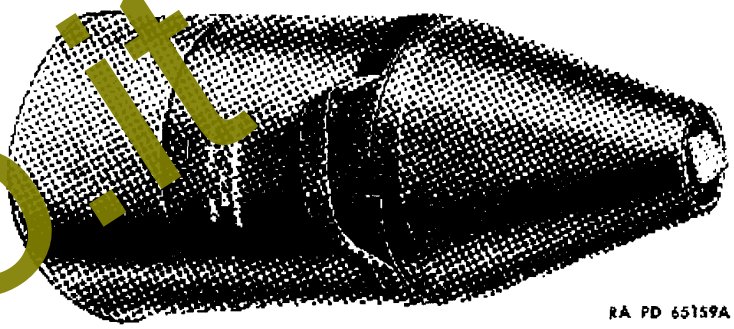
RA PD 89376

Figure 148 — Destructor M4

contains an electric detonator and a 2-gram pellet of tetryl. When a switch is closed, electric current enters the destructor through the two contact posts attached to lead wires from the plane. The current causes the detonator to explode which, in turn, explodes the tetryl pellet.

Figure 149 — Destructor M5

Figure 150 — Demolition Block M2



RA PD 65159A

Figure 151 — Shaped Charge, 15-lb, M2A3

e. **Destructor M4.** This destructor (fig. 148) consists of a 2½-pound block of tetrytol mounted on an L-shaped bracket, an impact-type of bomb tail fuze, and accessories for assembly and mounting in a control unit. The main destructor assembly consists of an adapter, into which the fuze fits, and the explosive block mounted on an L-shaped sheet-metal support.

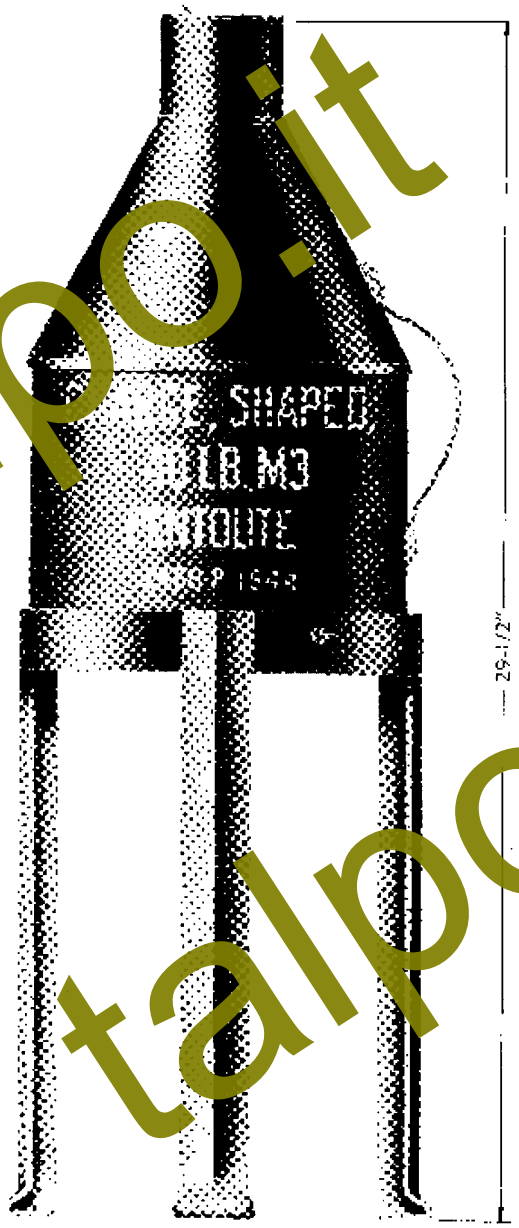
f. **Destructor M5.** This destructor (fig. 149) is essentially a modification of the destructor M4. The complete assembly weighs approximately 8½ pounds.

157. DEMOLITION EXPLOSIVES.

a. **TNT and nitrostarch.** Compressed TNT in ½- and 1-pound blocks, and nitrostarch in ½-pound blocks, are supplied for demolition and like purposes. These may be used by themselves (with any standard firing mechanism equipped with a detonator) or in conjunction with other demolition materials. Nitrostarch is more sensitive than TNT; hence, nitrostarch blocks should not be crushed or broken.

b. **Demolition block M2.** This demolition block (fig. 150) is a rectangular block of tetrytol, with a detonator well in each end. At the outer end of each well is an adapter threaded to receive any of the standard firing devices. At the inner end of each well is a tetryl pellet cast in the block to act as a booster. The demolition block is packed in a cardboard box, 8 boxes per haversack, 2 haversacks per box.

c. **Demolition block M3.** This demolition block is a rectangular 2¼-pound block of plastic explosive. The block consists of Composition C-3 and one block is equivalent to six ½-pound TNT blocks. This plastic explosive can be molded by hand into any desired shape or position and is very efficient, due to the good contact thus obtained combined with its high power. The demolition block is packed in a cardboard box, 8 boxes per haversack, 2 haversacks per box.



RA PD 65188A

Figure 152 — Shaped Charge, 40-lb, M3

d. Demolition block M4. This demolition block is a ½-pound block of composition C-3 and has the same plastic qualities as the block M3. The block M4 is packed 104 blocks per box.

158. SHAPED CHARGES.

a. Shaped charges are explosives which are formed into special shapes for the purpose of focusing the detonation into a penetrating jet. Such a charge has much greater penetrating capacity than a regular block charge of the same weight.

b. Shaped charge 15-lb. This charge (fig. 151) contains approximately 12 pounds of 50/50 pentolite in a moisture-resisting molded fiber container. The top of the charge has a threaded cap well for receiving an Engineer's Special (or other standard issue) blasting cap. The container extends beyond the base of the charge to hold the charge at the correct distance (called "stand-off") from the target to obtain maximum penetration. This charge will penetrate 36 inches of reinforced concrete. If the concrete is of greater thickness, it will produce a hole approximately 30 inches deep and 2 to 3 inches in diameter. This charge is packed 3 per wooden box; 4 in a carton, 2 cartons per wooden box; or 4 in a fiber container, 1 container per wooden box.

c. Shaped charge 40-lb. This charge (fig. 152) contains approximately 30 pounds of 50/50 pentolite in a metal container. A threaded cap well is provided for receiving an Engineer's Special (or other standard issue) blasting cap. Metal legs provide the correct stand-off distance which must be maintained for maximum penetration. This charge will penetrate a 60-inch concrete wall. The resulting hole will be large enough to insert a standard bangalore torpedo.

CHAPTER 3

CARE, HANDLING, AND PRESERVATION

Section I

GENERAL SAFETY PRECAUTIONS

159. GENERAL.

a. This section deals with the hazards inherent in the storage, maintenance, handling, and intra-plant transportation of ammunition. Where rules are given covering related subjects and operations, they should be considered as general.

b. When work is done which involves the direct exposure of explosives material to possible friction, sparks, impact, static electricity, etc., the regulations contained in the Ordnance Safety Manual should be followed. Example of such work is ammunition destruction. The Safety Manual covers safety in the performance of the operation and in the type of equipment necessary for the performance of it.

160. GENERAL PRECAUTIONS.

a. Investigation of accidents which have occurred in the handling, shipping, and storing of explosives and ammunition indicates that, in most cases where the cause could be determined, the accident was due to circumstances which may be classed as controllable. Therefore, the following general safety precautions will be strictly enforced.

b. **For personnel.**

(1) Ammunition will be handled under the direct supervision of a competent person who understands thoroughly the hazards and risks involved. Persons handling ammunition will be impressed with the fact that their safety, as well as that of others, depends upon the intelligence and care exercised by themselves and by their fellow workers.

(2) Personnel handling ammunition must not tamper with any components or disassemble any components, unless especially authorized to do so. Serious accidents may result.

(3) Persons handling ammunition will clean all mud and grit from their shoes before entering the magazine, car, boat, or vehicle in which there are explosives or ammunition.

(4) Appropriate protective clothing and safety equipment will be provided and its use required.

(5) Safety shoes will be worn in locations where operations require the handling of exposed explosives which may be ignited by static discharge or where there may be exposed explosives capable of being ignited by friction or impact. Details of types of safety shoes, con-

ditions under which they should be used, and a list of explosives requiring use of such footwear may be obtained from the Office of the Chief of Ordnance.

c. In ammunition handling.

(1) The handling of ammunition should always be conducted so as to limit the number of personnel exposed and the hazardous material handled to as small a quantity as is practicable.

(2) Explosives and ammunition will be handled carefully. Bale hooks will not be used under conditions where the container may be penetrated by the hook or fall off the hook. Containers will not be tumbled, dragged, thrown, or dropped on each other or rolled or walked over on the floor or dropped from tailboards. Bombs equipped with shipping bands may be rolled with care. Separate-loading shell may be rolled, if the rotating band is protected from damage. Metal roller conveyors and trucks may be used except for hazardous explosives which may be ignited by sparks. Such explosives should be handled either by hand or with wooden or nonsparking conveyors.

(3) If the precautions prescribed herein are strictly complied with in handling ammunition containing the newer types of explosives, such as Composition B, pentolite, and tetryl, it should be no more dangerous than the handling of ammunition loaded with TNT. High-explosive items with thin walls and high charge-weight ratio, require special attention to avoid denting the walls. Such items must not be handled on chutes or otherwise subjected to excessive impact.

(4) No tools or equipment so designed that steel or other spark-producing metal comes in contact with explosive materials will be used in handling hazardous explosives. Safety tools are required in box opening and repair. Such tools are constructed of wood or nonsparking or spark-resistant materials, as bronze, lead, beryllium alloys and monel metal, which, under normal conditions, will not produce sparks.

(5) Gasoline powered lift trucks will not be used for handing exposed explosives, or be used in locations where exposed explosives are present. They must not be used in igloo magazines.

(6) Explosives and ammunition should not be exposed to moisture or dampness or to the direct rays of the sun for any long period. If it is necessary to leave boxes temporarily outside of magazines or cars, they should be covered with a tarpaulin so placed that there is free circulation of air through the pile.

(7) Ammunition will not be improvised, reconditioned, renovated, or salvaged within the magazine area unless the sites, buildings, or cars in which work is being done are devoted exclusively to such work and are specifically approved. Quantity-distance requirements in chapter 3 section II, must be observed.

(8) If explosives spill or sift from a leaky container, all work will be stopped until the explosives have been removed, and surfaces washed or desensitized as far as practicable.

161. FIRE PROTECTION.

a. General.

(1) Fire prevention is of the utmost importance. Many of the fires involving explosives and ammunition are preventable. It is the duty of all concerned in their handling to study the causes of fires and thoroughly inform themselves of the safety precautions that must be taken to prevent them.

(2) A great hazard in and around explosives is heat. Some explosives ignite at temperatures substantially lower than those required to ignite wood, paper, or fabrics, and ignition might result in explosion. Therefore, every effort will be made to maintain normal temperatures surrounding ammunition and explosives.

b. Causes of fires. Fires in magazines and magazine areas may be due to a number of causes, of which the following are most common:

(1) DRY GRASS, LEAVES, AND UNDERBRUSH. These may be ignited by sparks from locomotives, by smoking or the careless use of matches and camp fires.

(2) DETERIORATION OF EXPLOSIVES AND AMMUNITION. This normally occurs at such a slow rate that most explosives and ammunition remain serviceable for many years. However, under unfavorable conditions, explosives and ammunition may produce heat so fast that it cannot be dissipated, causing the explosive or ammunition to burst into flame. Where the explosive or ammunition is confined, an explosion or detonation may result.

(3) REPACKING, RENOVATION, AND SALVAGE OPERATIONS, NOT PROPERLY SUPERVISED AND CONDUCTED IN ACCORDANCE WITH RECOGNIZED SAFETY STANDARDS. The most common sources of trouble are excessive quantities of powder and loose explosives, accumulation of waste paper, broken boxes, unauthorized use of spark-producing tools, defective machinery, faulty electrical equipment, etc., and failure to provide the proper barricades and firebreaks necessary to prevent the spread of fire from one operation to another.

(4) LACK OF TRAINING, OR VIOLATIONS OF INSTRUCTIONS OR WRITTEN REGULATIONS. The most common violations involve smoking, carrying matches in forbidden areas and buildings, or tampering with explosives or ammunition, particularly grenades or fuzes.

(5) FAILURE TO UNDERSTAND AND CAREFULLY OBSERVE THE SAFETY PRECAUTIONS PRESCRIBED FOR DESTROYING EXPLOSIVES AND AMMUNITION. The most frequent source of trouble is flying fragments which cause grass fires or explode piles of explosives and ammunition awaiting destruction.

(6) SPARKS. These may be caused by striking iron or steel nails or metal containers with iron or steel tools, or by nails in shoes striking flint, pebbles, sand grains, or nails in the floor. Such sparks, small as they are, have caused disastrous explosions of black powder or the dust of other explosives which ignite easily. This hazard is the basis for requiring tools of brass, copper, or other nonsparking materials, cleaning mud and dirt from shoes before entering magazines, and wearing safety shoes approved by the Chief of Ordnance, when exposed explosives are present.

(7) STATIC ELECTRICITY. Charges of static electricity can be accumulated on a person and on explosive material such as smokeless powder. The discharge of static electricity is considered a serious hazard in the presence of certain exposed explosives, dust and air mixtures, and inflammable vapor-air mixtures. Processing equipment for such materials subject to static discharge should be electrically grounded; benches and flooring should be covered with electrically grounded conductive material; and personnel provided with safety shoes of authorized types. Cushioned metal chairs should not be used in locations where explosives or highly inflammable materials are present.

(8) FAILURE TO CONTROL SAFELY THE USE OF HEAT- AND FLAME-PRODUCING EQUIPMENT. Such equipment may be that used in maintenance work on buildings or that contaminated with explosive material.

(9) LIGHTNING. Lightning may strike buildings, trees, or other objects in or near explosive areas. All buildings and structures in storage areas should have complete lightning protection which meets the requirements of the Chief of Ordnance.

(10) ELECTRIC TRANSMISSION LINES. These are often blown down or come in contact with combustible materials.

(11) LACK OF A PROPER MUFFLER, or the use of a muffler cutout on motor vehicles can cause fires.

c. **Fire-prevention regulations.**

(1) Matches or other flame- or spark-producing devices will not be permitted in any magazine area or explosives area except by written authority of the commanding officer.

(2) Smoking is prohibited in any magazine or magazine area, or around cars, wagons, motor trucks, or boats in which there are explosives or ammunition. Buildings or locations for smoking may be designated outside restricted area, subject to following limitations that:

(a) Smoking will not be allowed in locations closer than 60 feet to buildings containing explosives, ammunition, or hazardous materials.

(b) Windows and doors of buildings close to explosives or ammunition areas which are approved for smoking will be fitted with wire screens.

(c) Suitable receptacles must be provided for cigarette and cigar butts and pipeheels.

(d) Only permanently installed electric lighters of approved types shall be used in the building.

(e) Hand fire extinguishers, sand boxes, and water barrels with buckets will be furnished as required for each room or building in which smoking is permitted. Persons whose clothing is contaminated with explosives or other hazardous materials will not be permitted in such areas.

(3) All flashlight or storage-battery lamps used in buildings containing explosives or flammable vapors shall be types approved as "permissible" by the United States Bureau of Mines or by a similarly recognized testing laboratory for that specific type of exposure.

(4) If gasoline or electric-powered lift trucks are used for transporting explosives or ammunition, the requirements of the Chief of Ordnance will be complied with.

(5) Where it is necessary to install power transmission and service lines in the vicinity of buildings containing explosives, the distance of the lines from the buildings will be greater than the distance between the poles which support the lines. This is to prevent broken wires from hitting the building. Overhead transmission line must not pass within 50 feet of the buildings. In future installations power lines and services entering buildings containing explosives must be placed underground within 50 feet of the building.

(6) Vegetation in the form of grass, undergrowth, weeds, etc., which is or may become a fire hazard will be controlled by the use of chemical weed killer or by mowing, plowing, cutting, livestock grazing or, in calm weather and with proper control by burning. Chemical weed killers should not contain chlorates or other substances which may ignite spontaneously under hot dry conditions. Burning should not be permitted within the 50-foot space specified in the paragraph below. Brush, grass, wood, etc., in piles, will not be burned within 200 feet of a magazine. Reserve supplies of dunnage should not be stored haphazardly inside the magazine area and in no case within the 50-foot firebreak around the magazine.

(7) A firebreak at least 50 feet wide and as free as practicable from inflammable material will be maintained around each above-

ground magazine. The earth adjacent to and extending over igloo magazines will be cleared of dry debris. Firebreaks around the entire magazine area and at other places within the magazine area, such as along railroad tracks, will be maintained wherever necessary.

(8) Locomotives, trains, and other rail vehicles used in the magazine area will be so equipped that the communication of fire is prevented insofar as practicable. Inspections will be made regularly to insure that safe conditions are maintained.

(9) Gasoline or other highly inflammable liquids will not be used for cleaning purposes. Solvent, dry cleaning, Federal Specification P-S-661a (Quartermaster issue) will be used in all cases where solvents of this nature are required. Dry-cleaning solvent is inflammable differing principally from gasoline in having a higher flash-point. When handling dry-cleaning solvent, AR 850-20, "Precautions in Handling Gasoline", will be observed in all cases. This regulation does not prohibit the use of trisodium phosphate, trichloroethylene, tetrachloroethane, or similar cleaning or degreasing substances for cleaning operations. However, 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. Adequate ventilation must be provided.

(10) Automobile parking should be regulated so that automobiles will not be parked closer than 25 feet to buildings or fire hydrants.

(11) Ammunition boxes, containers, dunnage, and lumber must be stacked in an orderly manner when in the vicinity of explosives renovation, handling or storage operations. Stacks of such combustible materials must be limited to small areas between fire breaks. This is a means of limiting the spread of fire insofar as it is practicable considering the available space, available means of extinguishing fire, and the probability of fire occurring. Under average conditions, areas under solid stacks of such materials should be limited to 1,500 square feet separated from other similar areas by 25-foot fire breaks in which vegetation has been cut and controlled. Bulk stacking of such materials should not be closer than 500 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. Water barrels and pails should be liberally provided in such areas with which to extinguish incipient fires.

(12) The above rules will be supplemented by such additional rules as the commanding officer deems necessary to secure adequate protection against fires.

d. Fire-fighting facilities.

(1) A fire involving explosives or ammunition may result so quickly in an intense conflagration or explosion that means for immediately attacking the first small blaze detected are vitally important. Immediate use must often be made of hand equipment. In addition to organized permanent facilities, the following types of fire-fighting equipment may be used to good advantage:

(a) Barrels and buckets filled with water, placed at each magazine. If this class of fire-fighting equipment is always maintained so that it can be depended upon in case of fire, it is a valuable fire protection. However, in the summertime the barrels must be frequently refilled, and in freezing weather calcium chloride or salt must be added. Buckets deteriorate rapidly unless they are frequently painted or protected from the weather, and are blown about by windstorms if they are not securely fastened in place. Fastening devices must be releasable at will.

(b) Boxes and buckets filled with sand, and shovels.

(c) During freezing weather, trucks and trailers filled with water will require heated storage. Provision should be made for rapid movement of the equipment to the scene of the fire.

(d) To combat grass or forest fires in or near the magazine areas, there will be maintained at suitable locations an adequate supply of gunny sacks, brooms, rakes, hoes, or other similar equipment. This equipment should be regularly inspected and protected against theft or unauthorized use.

(2) When explosives and ammunition are being handled or work is being done in the immediate vicinity of such stores, there will be present, ready for immediate use, two chemical or other type hand fire extinguishers. It is not required that these be permanently located in a magazine, although this should be done if practicable, but it is required that these be in an accessible location. Serious fires may be avoided by the prompt use of hand fire extinguishers. They are required primarily for use on incipient fires in inert combustibles such as grass, grease, oil, dunnage, etc., which if not extinguished might reach explosives. Personnel other than the one using the extinguisher should seek safety immediately, reporting the fire enroute.

(3) The water distribution system should be protected by sectional control valves so that damaged sections of the main can be cut off without impairing the operation of the remainder of the system. Water mains should not be located under railroads or roads used for conveying large quantities of explosives or ammunition, as a

(4) Floors must be free of grit and such stains as those caused by exuding shell or dynamite. Exudate from shell should be removed by scrubbing with hot water. Exudate or oily stain from dynamite must be removed by scrubbing with hot water, acetone, or other suitable solvents.

(5) The 50-foot firebreak must be kept free from inflammable materials. Fire-fighting equipment such as water barrels and sand boxes must be kept full and ready for use.

(6) Magazines must be kept locked, except when opened for necessary operations or inspection.

(7) When open, a magazine must be in the personal care of an officer or other responsible person other than the nearest sentry.

(8) Keys must be under the supervision of the individual responsible for them.

(9) When leaving the magazine, the person in charge of operations must make sure that all doors and shutters are securely locked.

(10) A magazine placard, "Storage and Care of Explosives," O.O. Form No. 5991, must be posted in every magazine, positioned so that it will be conspicuous to all working personnel inside.

f. Repairs to magazines. Magazines will be repaired under direct supervision of a competent person who will decide whether or not the contents of the magazines are to be removed while repairs are made. Under normal conditions, roofs, lightning rods, ventilators, doors, etc., may be repaired, and minor repairs may be made to the interior of the magazine without removing the contents. *This does not apply to magazines containing bulk explosives.* When magazines are repaired, the general safety precautions set forth in this manual will be complied with. In addition the following special regulations will be observed:

(1) Work will be done by careful, experienced workmen.

(2) The floor in the vicinity of the work will be swept and any stains scrubbed with hot water.

(3) No work requiring soldering, melting of asphalt, or use of a blowtorch will be done in a magazine containing explosives or ammunition.

(4) No repairs will be made to the interior of a magazine containing bulk explosives until all explosives have been removed and the interior washed with water.

(5) All persons should be searched for matches before being allowed to enter any magazine.

(1) Every effort should be made to prevent a fire from reaching this class of material which is especially hazardous. If a fire occurs in such a magazine when personnel are present, they should attempt to put the fire out with the equipment at hand, providing it has not actually reached the material and there is a good chance of putting the fire out. Otherwise they will evacuate the magazine and take cover. If fire breaks out in a magazine containing high explosives, fire-fighting forces will not immediately approach the fire. Unless specific information is available either from one who was present when the fire was discovered or from intimate knowledge of the construction of the building and location of the explosives indicating that it is safe to approach the fire, fire-fighting forces will remain a thousand feet distant where up to 50,000 pounds of high explosives are involved, or proportionally greater distance up to 2,000 feet for 100,000 pounds of high explosives, until explosions have occurred, indicating the probable destruction of the explosives present. Fire-fighting forces and their equipment must not be exposed to unnecessary risk where these materials are involved. Demolition or general purpose bombs, and antitank mines are liable to detonate en masse, and propelling charges may explode, producing heat that may blister the paint on buildings 500 feet away. Bulk high explosives packed in boxes will usually burn quietly, but may detonate. Black powder, photoflash bombs, smokeless powder in bulk, and unpacked propelling charges, explode or flash so quickly that there is no time to do anything to save the magazine involved. In almost every instance, the efforts of fire fighters will be confined to preventing fire from spreading to adjacent buildings or magazines.

166. GUARD PROTECTION.

a. Magazines and areas in which there are explosives and ammunition will be guarded adequately at all times. Magazine areas should be protected by non-climbable fences, entrances to which will be locked unless guards are stationed at them. Special precautions will be taken to guard areas which are not protected by a suitable fence.

b. Guards, and others in charge of explosives and ammunition, will be thoroughly instructed in the hazards due to fire and explosions and the safety precautions to be taken. They will be instructed that their most important duty is to protect explosives and ammunition against fire. Alarms will be given with the greatest possible speed so as to start action instantly. Serious fires and explosions have been avoided by prompt action of fire-fighting forces. After giving the alarm, guards will exert every effort to hold the fire under control until the fire-

(6) All magazines should be carefully swept after repairs have been completed, all tools should be removed after repairs have been completed.

(7) The magazine will be inspected by competent authority after repairs have been completed.

172. QUANTITY-DISTANCE CLASSES AND TABLES.

a. To reduce to a minimum the hazards and risks due to fire and explosion, these regulations prescribe:

(1) The distances which will be maintained between magazines at military establishments and public highways, public buildings, public railways, and inhabited buildings.

(2) The distances that will be maintained between magazines.

(3) The maximum quantity that will be permitted in any one magazine.

b. These precautions not only protect persons and property in the territory adjacent to military establishments, but also reduce to a minimum the possibility of any explosion involving large masses of explosives and ammunition, and limit the quantity of military supplies that may be lost in any one explosion.

(1) In time of war, military requirements may make full compliance with safety regulations especially difficult. Since the purpose of the regulations is to reduce to a minimum the losses of personnel and military stores, and to maintain the full utility of military establishments, the compliance with explosives and ammunition regulations is considered highly important in war time.

(2) In time of peace, the quantity-distance tables set forth below will be strictly complied with except when subject to reductions under special conditions as indicated below and in case of existing emplacement magazines at harbor-defense installations. Such harbor-defense magazines may be used for the storage of ammunition pertaining to the armament of the emplacement and not in excess of its war reserve allowance. Magazines of emplacements from which the armament has been removed or has become obsolete may be used for the storage of any class of ammunition and explosives, provided the quantity-distance tables are complied with.

(3) Buildings at military establishments where personnel are regularly located will be placed at inhabited-building distances from magazines except when the buildings are used for operations incident to the magazine area.

c. The distances specified in these tables offer protection against structural damage and most missiles. Occasional missiles which travel a mile or more are not considered because of their rarity, especially when the amount of material involved in one explosion is limited by keeping piles small and spacing them so as to limit the explosion to one pile. It will be noted that the distances specified in the tables are based not on the total amount of explosives in the magazines, but upon the missile hazard and the amount that may be involved in one explosion. The specified distances may be changed under the following special conditions:

(1) In storage of classes 8, 9, and 10 items, when a magazine is effectively barricaded or screened from other buildings, magazines, railway, and highway, the distances may be reduced one-half. Effective screening can be obtained by utilizing natural features of the ground or by an artificial barricade at least 4 feet from the magazine, at least 3 feet thick at the top, at least high enough so that the straight line extended from the top of the side wall of the magazine to the top of the barricade will pass above any part of a building to be protected, and at least 12 feet above any public highway or public railway. Artificial barricades should consist of earth or sand fill, with not more than 15 percent of stones on ground, which should pass through 1-inch openings.

(2) Magazines of standard earth-covered concrete-arch type (igloo type) and emplacement magazines, are considered barricaded on all sides except that of the entrance, which side may be barricaded if local conditions require.

(3) Harbor defense emplacement magazines in a group, being separated from each other by substantial dividing walls, need not comply with the intermagazine distances. However, each magazine, as a unit, must comply with the table distances for inhabited building, public highway, and public railway.

(4) Where the construction of the magazine is such as effectually to stop the missiles resulting from an explosion in another magazine, the distances between the two may be based upon the total explosives material in ammunition components in the latter magazine, considered as class 9 instead of the distance prescribed for the class stored. Such magazines are the standard earth-covered concrete-arch type (igloo type) and emplacement magazines. The quantity to be considered will be the total quantity to be stored in the magazine except where specific cases are excepted in step (5), below.

(5) SPECIAL REQUIREMENTS FOR SPECIFIC CLASSES OF AMMUNITION. When ammunition of Classes 6 and 7 are stored in igloo magazines in accordance with Ordnance drawings, the aisle width is not sufficient to preclude mass detonation. Therefore, quantity-distance

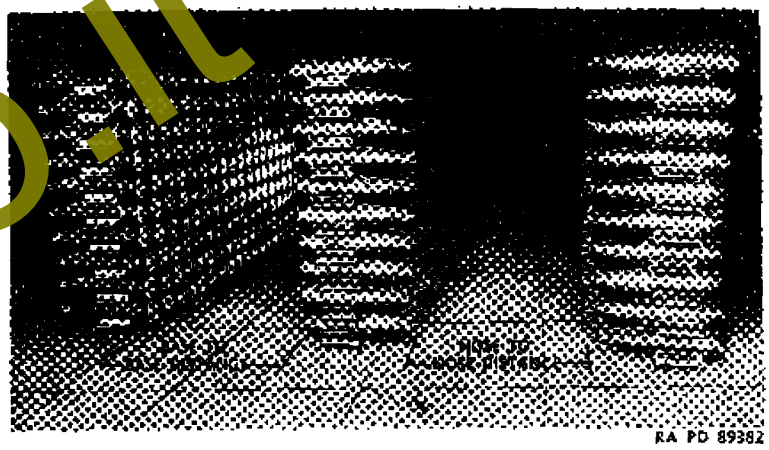


Figure 156 — Method of Stacking Shell in Above-ground Magazine Storage

requirements for Classes 6 and 7 when so stored including the maximum permitted in each magazine, shall be those prescribed for Classes 9 and 10. In above-ground storage magazines, the quantity-distance tables for ammunition and ammunition components of Classes 6 and 7 are based on the assumption that on initiation mass detonations will not occur, and that the detonation at any one instant will be limited to the amount contained in one stack and that the missile distance is the controlling consideration. Ammunition of Class 6 stored in above-ground magazines shall be spaced in stacks containing not over 5,000 pounds of explosives each, with stacks spaced at a minimum of 2 feet apart. Ammunition of Class 7 stored in above-ground magazines shall be placed in stacks containing not more than 15,000 pounds of explosives each and spaced in accordance with Ordnance Drawing 19-48-12. See figures 156, 157, and 158. If stacking requirements are not satisfied in the storage of Classes 6 and 7 material, it will be assumed that, on initiation, all ammunition in one magazine will detonate en masse and that the quantity-distance requirements, including the maximum permitted in each magazine, shall be those prescribed for Classes 9 and 10.

d. Definitions. Terms used in the following tables are defined as follows:

(1) INHABITED BUILDING. Any building or structure occupied in whole or in part as a habitation for human beings, whose people

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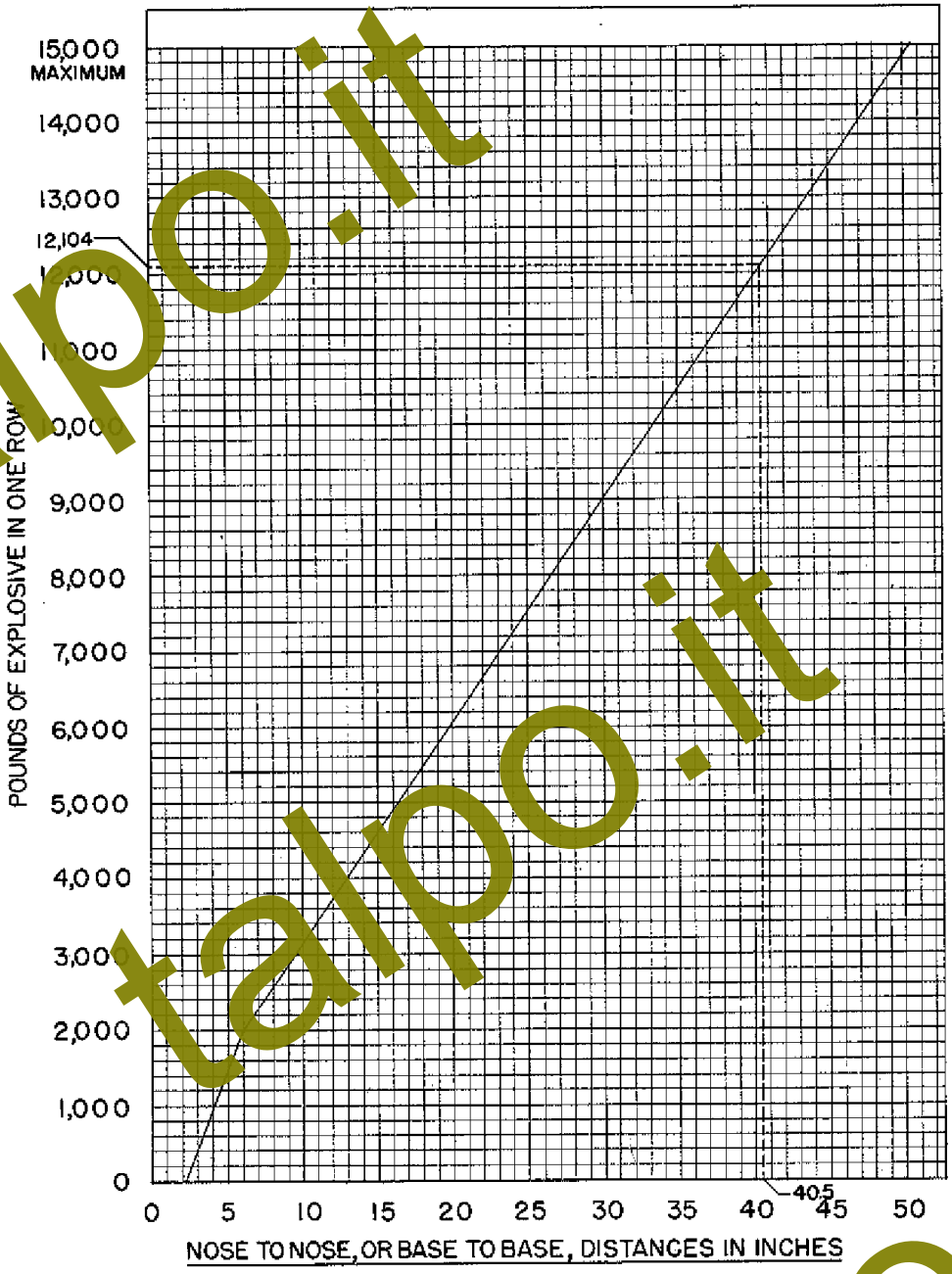
Figure 157 — Method of Stacking Shell in Igloo Magazine Storage



EXAMPLE SHOWN: M107 HE SHELL FOR 155-MM HOW. CONTAINS 15.13 LBS. OF EXPLOSIVE PER SHELL. STORING 80 SHELL, 10 HIGH, OR 800 SHELLS IN ONE ROW IS EQUAL TO 800 X 15.13, OR 12,104 LBS. OF EXPLOSIVE. FROM THE CHART, 12,104 LBS IS EQUIVALENT TO A NOSE TO NOSE, OR BASE TO BASE, DISTANCE OF 40.5 INCHES.
NOTE: THE DISTANCES BETWEEN PILES SHOWN BY THIS CHART ARE INTENDED TO LIMIT EXPLOSIONS TO ONE PILE.

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Figure 158 — Quantity-Distance Chart for Above-ground Magazine Storage of Separate-loading Projectiles

are accustomed to assemble, both within and outside of Government establishments. However, buildings on Government establishments in which people are regularly engaged in operations which require the location of such buildings in the magazine area, may be placed in accordance with intraplant or magazine-to-magazine distances. Land limits or boundaries of military reservations will be considered possible sites of inhabited buildings.

(2) PUBLIC RAILWAY. Any steam, electric, or other railroad which carries passengers for hire.

(3) PUBLIC HIGHWAY. Any street, alley, road, or navigable stream open to the use of the general public.

(4) NAVIGABLE STREAM. A body of water capable of extensive navigation by tugs, barges, or larger vessels.

(5) NEAREST MAGAZINES. The nearest magazines containing explosives or ammunition. The amount of explosives or ammunition permitted to be stored in a magazine can sometimes be increased if the nearest magazines are filled with inert materials, thus greatly increasing the distances to the nearest magazines containing explosives or ammunition.

(6) MAXIMUM PERMITTED. The largest amount of explosives or ammunition permitted to be stored in a magazine even if it is more isolated than the tables prescribe. It is imperative that the loss of military supplies be kept to an absolute minimum.

(7) STRUCTURAL DAMAGE. The serious weakening or displacement of foundations or brick or stone supporting walls or the breaking of wooden main supporting members in outside or inside walls. No readily reparable damage such as broken glass or loosened plaster is considered structural damage.

e. Explosive content. The explosive content of ammunition or components is shown in the technical manuals for each caliber and type of gun, on ordnance drawings, and in OCD 11 SNL's; if such information is not available, it should be requested from the Chief of Ordnance. The quantities shown in the following tables were computed as follows:

(1) SMOKELESS POWDER. The quantities in pounds are the net weights of the powder in the boxes or in the propelling charges.

(2) PYROTECHNICS. The quantities are based on the net weight of the illuminant or explosive composition.

(3) SEPARATE-LOADING AND UNFIXED SHELL AND BOMBS. The quantities are computed by taking the net weight of explosive in the charge of one shell and multiplying by the number of shell or bombs in the magazine.

(4) FIXED AMMUNITION. The quantity is the net weight of the high-explosive charge in the shell multiplied by the number of rounds. The smokeless powder propelling charge is so much less hazardous that it is not included in the computation for this class of ammunition.

(5) ROCKETS. The quantity to be considered for quantity-distance purposes is the weight of the high explosive in the head (shell) plus the weight of the propelling charge in the motor. If there is a detonation of the explosive in the head, the propelling charge may be expected to detonate as well. For classification of rocket motors refer to subparagraph f (4).

f. **Classes of explosives and ammunition.** The grouping of explosives and ammunition into classes listed below does not imply that the items in a particular class are to be stored together but means merely that the hazards involved are similar for all items in the same class. The items which may be stored together on one magazine are set forth in the Combination Storage Chart, paragraph 173. The maximum amount of explosives permitted in any location is the top limit for the distance specified. However, the quantity may be excessive for any particular case under conditions surrounding the individual operations. Therefore, it is mandatory that local limits be established in amount no greater than those consistent with continuous and efficient operation. Operations and personnel will be so arranged consistent with continuous efficiency as to constitute the smallest personnel exposure to any one explosion hazard. When military explosives and ammunition are packed in accordance with the provisions of War Department drawings and specifications, they may be grouped, according to the degree of hazard involved, into the following classes:

(1) CLASS 1. *Small-arm ammunition including 20-mm, except HE and HE-I rounds; mechanical time fuzes without boosters; AT practice grenade; Engineer Corps combination, pull, pressure, and release firing devices; thermit; miner's safety fuse; fuse lighters M1 and M2.* This class is principally a fire hazard. No quantity limit is placed on storage of materials in this class.

(2) CLASS 2. *Single-base multiperforated smokeless powder of web thickness greater than 0.019 inch; chemical ammunition containing phosphorus (except complete rounds); thermite and similar burning compositions; illuminating, flare, or signal compositions which have been consolidated in the final press operations so that no explosive material is exposed; 60-mm and 81-mm mortar illuminating shell.* These materials may become unsafe under extreme conditions of moisture, high temperature, or age. They burn with intense heat, but usually do not form dangerous missiles or generate pressures which will cause serious structural damage to adjacent magazines.

CLASS 2. QUANTITY-DISTANCE TABLE

Smokeless powder in containers (in boxes, powder cans, cartridge storage cases, etc.); pyrotechnics (footnote [1]); chemical ammunition containing phosphorus (except complete rounds); 60-mm and 81-mm mortar illuminating shell (footnote [4])

QUANTITY[3] (POUNDS)		MINIMUM UNBARRICADED DISTANCE IN FEET FROM NEAREST			
Over	Not Over	Inhabited Building	Public Railway	Public Highway	Magazine
100	1,000	75	75	75	50
1,000	5,000	115	115	115	75
5,000	10,000	150	150	150	100
10,000	20,000	190	190	190	125
20,000	30,000	215	215	215	145
30,000	40,000	235	235	235	155
40,000	50,000	250	250	250	165
50,000	60,000	260	260	260	175
60,000	70,000	270	270	270	185
70,000	80,000	280	280	280	190
80,000	90,000	295	295	295	195
90,000	100,000	300	300	300	200
100,000	200,000	375	375	375	250
200,000	300,000	450	450	450	300
300,000	400,000	525	525	525	350
400,000	500,000[3]	600	600	600	400
Smokeless powder in bulk (not in containers)					
100	1,000	100	100	100	50
1,000	5,000	150	150	150	75
5,000	10,000	200	200	200	100
10,000	20,000	250	250	250	125
20,000	30,000	285	285	285	145
30,000	40,000	310	310	310	155
40,000	50,000	330	330	330	165
50,000	60,000	345	345	345	175
60,000	70,000	360	360	360	185
70,000	80,000	375	375	375	190
80,000	90,000	390	390	390	195
90,000	100,000	400	400	400	200
100,000	200,000	500	500	500	250
200,000	300,000[3]	600	600	600	300

[1]For storage of Class 2 pyrotechnics and pyrotechnic materials, the following figures apply under the conditions given:

(a) Illuminating, flare or signal compositions which have been consolidated in the final press operations and are so closed that no explosive material is exposed, and military pyrotechnics, except Class 9 material, that have been packed and are ready for shipment, may be stored at one-half of the Class 2 distances.

(b) In quantities from 100 to 5,000 pounds, inhabited building, public railway, and public highway distances are 50 feet; magazine distance is 35 feet.

(c) Total quantity of pyrotechnic or pyrotechnic materials at any one location should not exceed 50,000 pounds and must not exceed 200,000 pounds.

[2]For storage in standard igloo magazines, prescribed distances may be halved from all sides except the door end.

[3]Maximum quantity permitted at any one location (except pyrotechnics and pyrotechnic materials).

[4]When necessary, 60-mm and 81-mm mortar illuminating shell may be stored with Class 4 items.

(3) CLASS 3. *All loaded fuzes except fuzes containing HE loaded boosters; All practice mines containing a smoke charge; and artillery primers.* These usually explode progressively, not more than a box or two at a time. Pressures which will cause structural damage to adjacent magazines usually are not generated. Missiles are small and light, and usually fall within 100 yards.

CLASS 3. QUANTITY-DISTANCE TABLE

QUANTITY (POUNDS OF EXPLOSIVE)		MINIMUM UNBARRICADED DISTANCE IN FEET FROM NEAREST[1]			
Over	Not Over	Inhabited Building	Public Railway	Public Highway	Magazine
	50	400	400	400	60
50	200	400	400	400	100
200	1,000	400	400	400	180
1,000	10,000[2]	400	400	400	300

[1]For storage in standard igloo magazines, prescribed distances may be halved from all sides except the door end.

[2]Maximum quantity permitted at any one location.

(4) CLASS 4. *When packed in accordance with ordnance drawings and specifications: Fixed and semifixed artillery ammunition including 20-mm HE-I (complete rounds), with all types of projectiles except pentolite-loaded shell; light mortar ammunition (81-mm and smaller); grenades, including practice grenade, Mk 2; antipersonnel mine M2; blank ammunition for cannon; rocket ammunition assembled in complete rounds, except those with HE loaded heads but including 4.5-inch TNT-loaded rocket T22, and rocket motors (see footnote[2], Class 4 Quantity-Distance Table.* Items in this class usually explode progressively, only a few boxes at a time, and many explosions of individual rounds are of low order. Pressures which will cause structural damage to adjacent magazines usually are not generated. Most missiles will fall within 200 yards. This class includes all fixed and semifixed chemical shell (complete rounds) for artillery except that quantity limitation does not apply. It also includes 76-mm and 3-inch illuminating projectile, complete rounds. Although 60-mm and 81-mm mortar illuminating shell are Class 2 items, they may be stored with Class 4 items when necessary.

(5) CLASS 5. *Separate-loading shell, loaded with explosive D, and all calibers of shell not assembled to or packed with cartridge cases.* These usually explode, one shell at a time end, in nearly all cases, with low order. The missiles are limited as to number and range, and most of them fall within 400 yards.

(6) CLASS 6. *Fuzes containing HE-loaded boosters, adapter-boosters, packed separately in boxes.* These items usually explode progressively by stacks. Structural damage caused by the pressures is usually limited to adjacent magazines. Missiles are light and usually fall within 200 yards.

CLASS 4. QUANTITY-DISTANCE TABLE

QUANTITY (POUNDS OF EXPLOSIVE) Not Over	MINIMUM UNBARRICADED DISTANCE IN FEET FROM NEAREST[2] Inhabited Building	Public Railway	Public Highway	Magazine
50	1,200	1,200	1,200	60
500	1,200	1,200	1,200	140
1,000	1,200	1,200	1,200	180
50,000	1,200	1,200	1,200	225
500,000[3]	1,200	1,200	1,200	300

[1]For storage in standard igloo magazines, prescribed distances may be halved from all sides except the door end.

[2]Maximum quantity permitted at any one location.

[3]Class 4 rockets with motors assembled to loaded or unloaded heads, should not be stored in above-ground magazines located at less than the following missile distances from the listed locations:

LOCATION	MINIMUM MISSILE DISTANCE
Inhabited Building	Maximum flight range of rocket or 4,310 feet, whichever is less
Public Railway	60% of maximum flight range of rocket or 2,590 feet, whichever is less
Public Highway	30% of maximum flight range of rocket or 1,300 feet, whichever is less

CLASS 5. QUANTITY-DISTANCE TABLE

QUANTITY (POUNDS OF EXPLOSIVE) Not Over	MINIMUM UNBARRICADED DISTANCE IN FEET FROM NEAREST[2] Inhabited Building	Public Railway	Public Highway	Magazine
1,000	1,200	1,200	1,200	100
25,000	1,200	1,200	1,200	200
650,000[3]	1,200	1,200	1,200	300

[1]For storage in standard igloo magazines, prescribed distances may be halved from all sides except the door end.

[2]Maximum quantity permitted at any one location.

CLASS 6. QUANTITY-DISTANCE TABLE

QUANTITY[1] (POUNDS OF EXPLOSIVE) Not Over	MINIMUM UNBARRICADED DISTANCE IN FEET FROM NEAREST[2] Inhabited Building	Public Railway	Public Highway	Magazine
50	240	140	70	60
200	240	140	70	100
5,000	1,500	900	450	200
100,000[3]	1,500	900	450	300

[1]When items of this class are stored in concrete igloo magazines, the quantity-distance requirements of Class 9, bulk explosives, will govern, except that no distances less than one-half the distance prescribed in this table for Class 6 items are authorized. The quantity of explosive material given in paragraph 172 a (5) may be used when in above-ground magazines if the material is stacked and segregated in accordance with Ordnance drawings.

[2]For storage in standard igloo magazines, prescribed distances may be halved from all sides except the door end.

[3]Maximum quantity permitted at any one location.

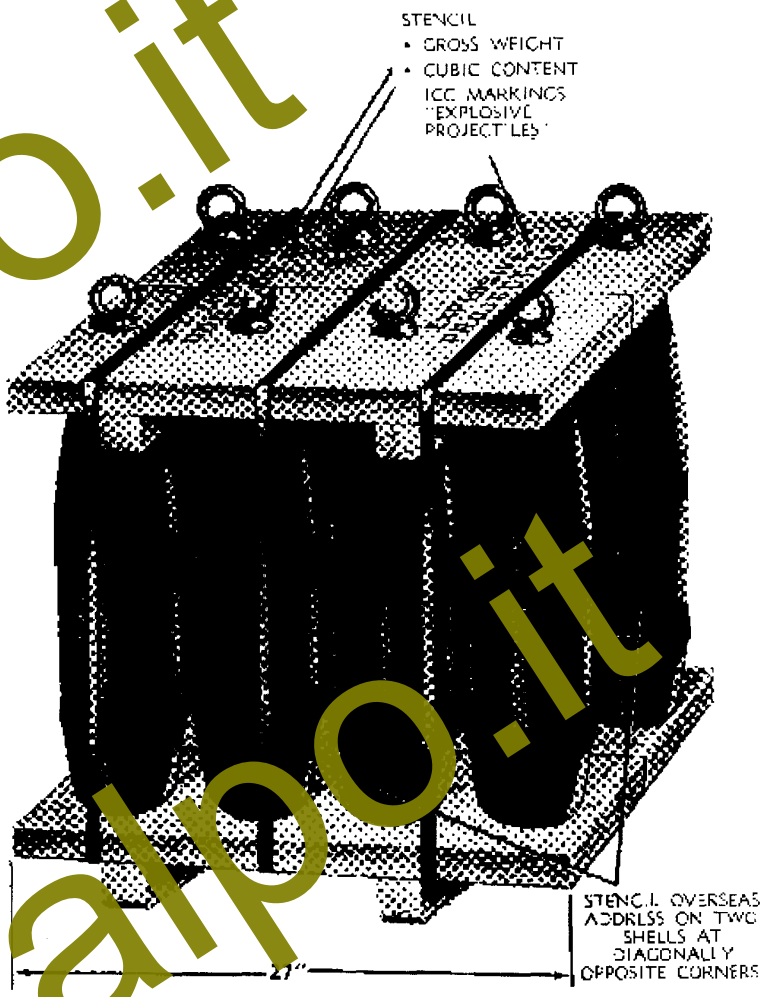

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Figure 159 — Palletization of 155-mm Shell

with complete rounds (57-mm through 105-mm) may be packed two or four per wooden box, in crated clover leaf 3-round bundles, or in single-round metal containers. Fiber containers for certain rounds of fuzed semifixed ammunition have covers at each end; the projectile and cartridge case can then be inserted at opposite ends, relieving the neck of the cartridge case of excessive weight. In both single- and double-end containers a U-shaped metal packing stop is used for fuzed projectiles.

(5) MISCELLANEOUS.

(a) Metal cans made of terneplate or tin plate are used for packing small-arms cartridges, small components of ammunition, fuzes, rifle grenades, etc., individually or in small quantities, to preserve them against moisture. Metal liners for wooden boxes are also used in many types of packing of components, for certain small-caliber complete rounds where a moistureproof container is desired, or for shipments of smokeless powder. Stainless-steel-lined plywood boxes are generally used for storage of nitrocellulose cannon powders.

(b) All-steel boxes of both Army-Navy design are used for storing nitrocellulose cannon powders having a web of 0.019 inch and more. Sheet-steel cylindrical drums are used for black powder, which is contained in a cloth bag inside the drum. The drums are crated for overseas shipments.

(c) Fiber cartons are used for packing primers or small fuzes, a small number being packed in each carton. The carton can be made moistureproof by wrapping in a grade C, type I paper, conforming to U. S. Army No. 100-15 (JAN-P-121), and immersion or dip coating sealing compound conforming to U. S. Army No. 100-34 (JAN-P-115).

(d) Packings known as "jungle packs" contain additional waterproof containers or envelopes so that the ammunition may better withstand hot humid climates.

c. Palletization (fig. 159) has been authorized to reduce handling time and save man hours in storage and shipment of certain types of ammunition. Pallets are constructed of lumber in accordance with ordnance drawings. When palletized ammunition is shipped, a notation to that effect will appear on the repship.

179. REGULATIONS.

a. General regulations governing the packing, marking, and shipping of explosives and ammunition are set forth in AR 55-155. All shipments of explosives and ammunition made by the War Department will comply with applicable requirements of Interstate Commerce Commission, Bureau of Explosives Regulations, Port and Harbor Regulations, State and Municipal laws, and pertinent Army Regulations.

b. Explosives and other dangerous articles offered for shipment on a common carrier will be packed to comply with Interstate Commerce Commission regulations, but paragraph 14 (a), section I, of these regulations states that "shipments of explosives offered by or consigned to the War and Navy Departments of the United States Government must be packed, including limitations of weight, in accordance with these regulations or as required by their regulations." Any proposed departure from the requirements of Interstate Commerce Commission regulations must be submitted to the Chief of Ordnance for decision.

c. Military explosive and ammunition are packed in accordance with U. S. Army specifications and drawings. The methods of packing specified are used not only to meet military requirements and protect the articles from damage in transit but are also designed to comply with Interstate Commerce Commission regulations.

d. When shipments of explosives and other dangerous articles are to be made and containers which comply with U. S. Army specifications for the particular article to be shipped are not available, containers complying with Interstate Commerce Commission regulations will be used. This applies particularly to the shipment of deteriorated explosives or ammunition, and to powder, explosives, and loaded components of ammunition obtained from salvage operations.

e. Other regulations concerning packing will be found in the various Technical Manuals, Standard Nomenclature Lists, Ordnance Safety Manual O.O. No. 7224, Ordnance Department Safety Bulletins, and AR 55-470 (shipments by water).

180. SEALING.

a. Packings are sealed for airtightness by closing the test hole of airtight containers or cases with solder or a plug. Fiber containers are sealed with water-resistant adhesive tape at the joint formed by the body and cover, but they are not considered completely airtight.

b. After the contents are properly packed, each container is sealed in some manner which will indicate whether or not the container has been tampered with. The method of sealing depends upon the type and construction of the container. Where metal strapping or wire is used around boxes, other seals are not necessary and will not be used in the future.

181. MARKING.

a. General. This paragraph covers markings for items as packed and shipped. For marking and painting on ammunition items themselves, see basic color schemes given in paragraph 7; sections in

chapter 2 of this manual; and other Technical Manuals on Ammunition.

b. **On ammunition.** The markings on uncrated bombs and uncrated shell serve also as a means of identification for shipping purposes.

c. **On containers.**

(1) Containers of ammunition and explosives are marked to provide a ready means of identification as to contents. Packing containers are also marked in accordance with Army Regulations, specifications, and ICC regulations.

(2) With certain exceptions given in AR 55-155, each package of supplies turned over for shipment on a Government bill of lading is marked with:

(a) Name and address of destination of port officer (or code designation).

(b) Name and address of ultimate consignee.

(c) List and description of contents.

(d) Ammunition code symbol, published in ORD 11 SNL's.

(e) Gross weight in pounds, displacement in cubic feet.

(f) The number of the package.*

(g) The letter "U. S." in several conspicuous places.*

(h) Order number or contract number.*

(i) Ordnance insignia.

(j) Name or designation of consignor preceded by the word "From."*

(k) Lot number.

(l) Month and year packed.

(m) Inspector's stamp.

(3) The adhesive sealing strips on fiber containers are in the same color as ammunition item in accordance with basic color scheme. Thus, blank ammunition has sealing strips in red, to indicate low explosive (black powder). It will be noted, however, that for rounds with high explosive projectiles the strips are yellow.

(4) The top of boxes containing ammunition used in both American and British guns (for example, some lots of 20-mm ammunition) are marked "COMMON AMMN."

(5) For further information on regulations governing marking of containers for shipment, consult AR 55-155 and AR 55-470 (shipments by water). Shipping names are published in ORD 11 SNL's.

(6) Markings on boxes, barrels, or crates are made in stencil

*For LCL shipments only.

black or stencil white, whichever is more appropriate. On boxes of ammunition which are stained brown, the marking is in yellow; on unstained boxes, the marking is black. When it is impracticable to stencil or paint the markings on the containers, or when a container is not used in shipping, at least two shipping tags bearing markings should be used. The shipping tags may be of cloth, leather, metal, or waterproof paper, and are attached to the article by wire. The use of writing ink, chalk, or marking material other than waterproof ink or paint is prohibited.

(7) Metal containers are painted olive drab; marking in yellow.

(8) Containers for green bag propelling charge, white bag propelling charge, or section of propelling charge containing the black powder igniter are painted with green, white, or red stripes, respectively. Containers containing igniters only are painted completely red.

(9) Containers for rounds having high-explosive shell have a yellow strip; having chemical shell, a gray strip (superimposed with yellow, red, or green bands to indicate smoke or gas fillers); or having inert shell, a black strip.

(10) Containers for ammunition assembled with shell which have the supplementary bursting charge have stenciled thereon "W/SUPPL. CHG." and the letter "P."

d. On pallets. Boxes, containers, or unpacked shell and bombs are packed for shipment and storage in pallets. Pallets are marked so that the shipping name, weight, and cubic feet are stenciled on the top section of the pallet. The overseas address, if any, is stenciled on two boxes, containers, shells, or bombs, both being in diagonally opposite corners of the pallet (fig. 159).

182. LOT NUMBER. Lot numbers are basically described in chapter 1, section II.

Section V
SHIPPING

183. GENERAL. The information contained in this section outlines the special regulations controlling the shipping and transportation of explosives and ammunition. The general regulations are contained in AR 55-155 which apply to government as well as to commercial shipments. Shipments made by military establishments will comply with applicable requirements of these regulations and recommendations. When any difficulties are encountered in complying with these regulations, a report in detail will be submitted to the Chief of Ordnance through appropriate channels.

184. REGULATIONS AND REFERENCES.

a. Military. A list of publications controlling transportation of explosives is provided in chapter 5.

b. Nonmilitary. Regulations for the transportation of explosives, inflammable, and other dangerous articles by rail, motor vehicles, and merchant vessels are prescribed by the Interstate Commerce Commission (for rail and motor vehicles, see par. 185) and U. S. Coast Guard (for merchant vessels, see Regulations Governing Transportation of Military Explosives on Board Vessels During Present Emergency and Regulations for the Security of Vessels in Port).

c. State and municipal laws, ordinances, and regulations. In addition to the Federal laws governing interstate transportation of explosives and other dangerous articles, each state and nearly all municipalities have laws or ordinances regulating the transportation of explosives and other dangerous articles within their jurisdiction. Shipments of explosives and ammunition will comply with applicable requirements of Interstate Commerce Commission regulations, Port and Harbor regulations, State and Municipal laws, and recommendations by Bureau of Explosives.

d. Rail regulations. For these regulations, consult "Interstate Commerce Commission Regulations for Transportation of Explosives and other Dangerous Articles by Freight," published by the Bureau of Explosives, 30 Vesey Street, New York, New York; and see specific application by reference to items involved in index of Consolidated Freight Classification.

185. INTERSTATE COMMERCE COMMISSION REGULATIONS.

a. The transportation of explosives and other dangerous articles within the limits of the jurisdiction of the United States is regulated by Federal law, Act of March 4, 1909, chapter 321, sections 232 and 234 (35 Stat. 1134), as amended by the act of March 4, 1921, chapter 172 (41 Stat. 1444-1445), and the Dangerous Cargo Act of October 9, 1940 (Public No. 809, 76th Cong.). Violations of this act are punishable by severe fines and imprisonment.

b. Section 233 of the above-mentioned act, as amended, reads in part as follows: "The Interstate Commerce Commission shall formulate regulations for the safe transportation, within the limits of the jurisdiction of the United States, of explosives and other dangerous articles, * * * which shall be binding upon all common carriers engaged in interstate or foreign commerce which transport explosives or other dangerous articles via any common carrier engaged in interstate or foreign commerce by land or water." Section 235 of the Act of March 4, 1921 requires the shipper of explosives and other dangerous articles to describe, pack, and mark all packages properly, and to

Figure 160 — Method of Stowing Shell in Freight Cars

inform the agency transporting the packages of the true nature of contents. Violations of this act are punishable by severe fines and imprisonment. ICC Freight Tariff No. 3 prescribes regulations for transportation by water.

c. Under the authority of the above-quoted act, as amended, the Interstate Commerce Commission has published regulations governing the transportation of explosives and other dangerous articles by rail, motor vehicle (highway), and vessel.

186. U. S. COAST GUARD. The U. S. Coast Guard prescribes regulations governing the storage, stowage, and use of explosives and ammunition on board merchant vessels. It is responsible for security and supervision of vessels, which includes barges, unless specifically exempted. (See Regulations Covering Transportation of Military Explosives On Board Vessels During Present Emergency.)

187. COMBINATION OF TYPES FOR SHIPPING BY RAIL OR MOTOR VEHICLE.

a. Regulations of the ICC restrict the shipping of different types of explosives and ammunition in the same car or truck. These restrictions are specified in the Loading and Storage Chart of Explosives and Other Dangerous Articles and published in ICC Regulations. The restrictions may be summarized as follows:

(1) Bulk initiating explosives may not be shipped dry.

(2) Initiating components such as detonating fuzes, blasting caps, boosters, and bursters may not be shipped with any other high-explosive item except when assembled thereto. A further exception is permitted in case of emergency certified by the Office of the Chief of Ordnance, in which case initiating components may be shipped with high-explosive components provided they are separated by a 3-foot sand barricade.

(3) Fireworks may not be shipped with high explosives or black powder.

(4) Chemical agents may not be shipped with high explosives or black powder.

188. RAIL SHIPMENT.

a. **Loading.** When loading freight cars for shipment (figs. 160, 161, and 162), Bureau of Explosives Pamphlets No. 6 and 6A should be consulted. These pamphlets govern the methods of loading, staying, and bracing of carload and less than carload (LCL) shipments of explosives and other dangerous articles, loaded shells (projectiles), and loaded bombs *not covered in ordnance drawings.* Ordnance drawings, specifications, and standard practice sheets contain certain technical information required in the carloading and storage and marking

Figure 161 — Bracing of 300-, 500-, and 600-pound Bombs in Freight Cars

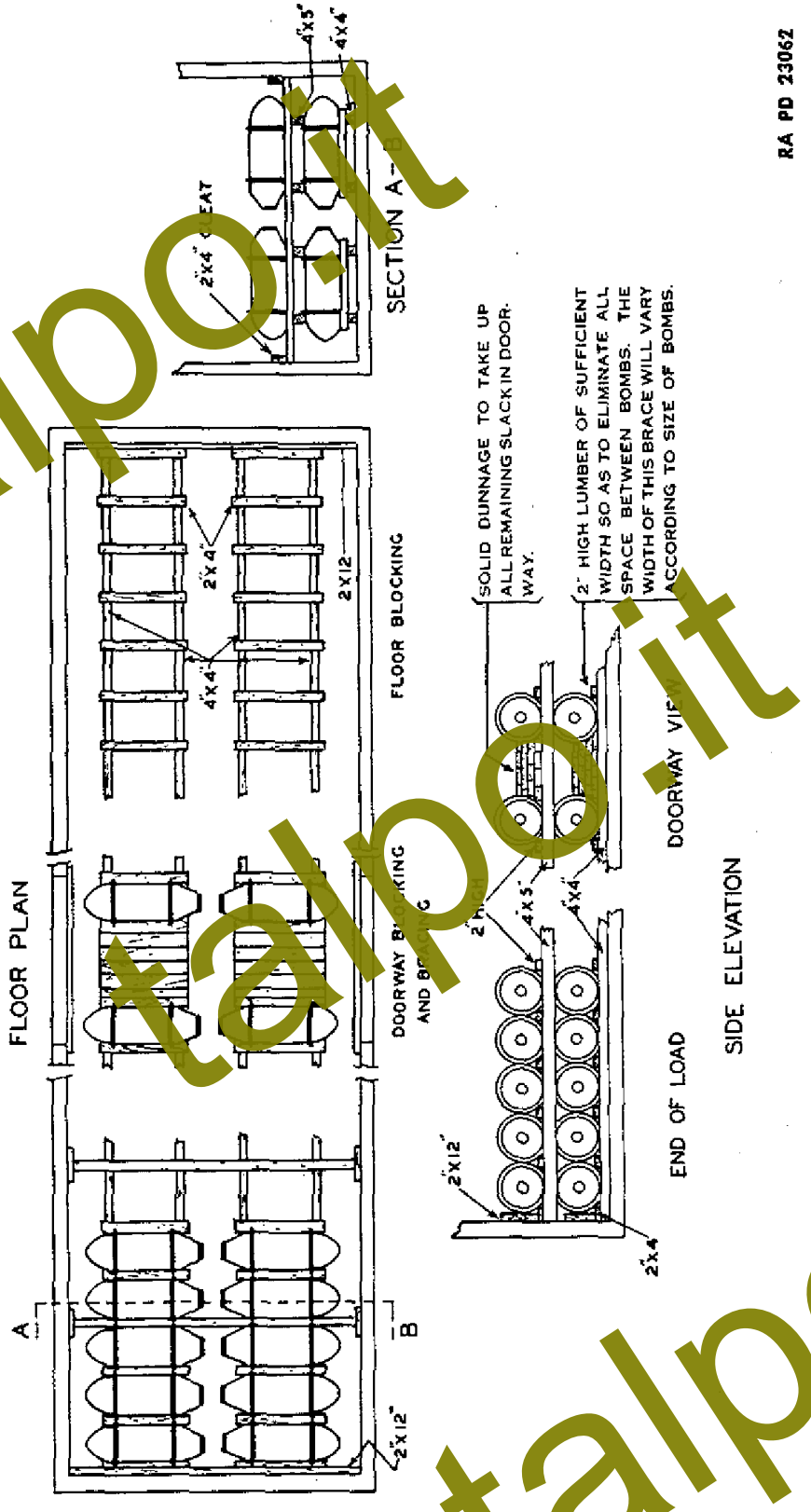

Figure 162 — Bracing of 1000- and 1100-pound Bombs in Freight Cars

of ammunition. They may be obtained by applying directly to the Office of the Chief of Ordnance. The Chief of Ordnance has compiled a series of volumed drawings, covering ammunition storage, loading, and blocking which are in class and division 19-48. Items are listed by Ammunition Identification Code Symbol, packing, drawing, and abbreviated nomenclature. For information on legal requirements, consult ICC regulations.

b. The cargo should be studied and decision on appropriate stowage made beforehand. The car best suited for the needs at hand should be ordered. When the car arrives, it should be given a thorough sweeping and inspection for protruding nails and bolt heads, which must be removed or covered with wood. The sides of the car should be boarded up where necessary to obtain an even bearing and proper dunnage (see Bureau of Explosives Pamphlets). Substantial gangways should be provided; obstructions which may prevent free entry to the car removed; the immediate vicinity cleared of leaves, dry grass, and other inflammable materials; and the brakes set and wheels chocked. During loading operations, the car and magazine door should be closed when engines or speeders are passing. Cars should not be left partly loaded unless it is impossible to finish loading at one time, in which case car doors must be securely locked. After loading, the shipment should be properly braced and stayed, the car properly sealed and placarded (see ICC regulations), and a permanent record of car numbers kept. Too much importance cannot be placed on proper blocking and staying. In many cases the bracing may seem excessive for the packages involved; however, if a car loaded with packages of explosives, moving at a rate of 5 miles per hour, should bump a solid train of loaded cars, the packages may be subjected to a pressure as high as 5 times the total weight of packages involved. For example, under these circumstances a 58-pound box momentarily approaches 290 pounds of pressure. In unloading cars the same safety precautions that have been outlined above should be observed. An inspection must be made of the method of blocking, staying, and condition and serviceability of contents before releasing a car for shipment. All cars that have contained explosives should be carefully swept and all placards removed. Sweepings should be thrown in running water, burned, or placed in a metal receptacle for later disposition. All shipments received in a badly damaged condition should be reported through channels to the Chief of Ordnance.

c. **Certified cars.** Interstate Commerce Commission regulations require the use of a "certified car" for shipment of many explosives; refer to ICC Freight Tariff No. 4 for exceptions. A "car certified" for shipment of certain explosives (see ICC regulations) must be signed in duplicate by a representative of the carrier and of the shipper after shipment is loaded and properly braced. Two of these must be

attached outside the doors or to the sides of the car, one on each side, in addition to required explosive placard.

d. **Spotting of loaded cars.** Loaded railroad cars will not be left in the open area between magazines, where they may act as an intermediate step in propagation of an explosion. Railroad loading and unloading facilities for ammunition should be separated from inhabited buildings, public highways, and public railroads in accordance with quantity-distance requirements, chapter 3, section II. Cars should not remain at the loading or unloading facilities longer than 24 hours. Not more than one car should be permitted at the unloading facilities at one time (this does not apply to Ports of Embarkation). Additional cars should be held on an isolated spur. Cars containing ammunition should not be in groups of more than three when spotted on the spur, and the groups should be separated by 400 feet. Before cars containing explosives and ammunition are moved by a locomotive, the air brake couplings must be coupled and tested to assure that the air brakes are in proper working condition. When cars are spotted and engines are detached, the hand brakes must be set. During the moving of a car by pinchbar, a man must be stationed at the hand brake at all times. "Dropping," "bumping," "kicking," or the use of the flying switch with cars loaded with explosives and ammunition is prohibited.

e. **Inspection of incoming shipments.**

(1) All railway cars before entering a military installation, must receive complete exterior inspection. This includes examination of car seals for tampering, and verification of numbers against shipping papers and bill of lading to insure that cars have not been opened in transit. If car seals have been tampered with or do not correspond with documents, or sabotage is suspected, the car should be inspected by authorized personnal at a special location.

(2) Complete interior inspection is made when the cars are opened. Check contents for condition and serviceability, and blocking and staying methods if damage is prevalent.

189. WATER SHIPMENTS.

a. **Regulations.** Shipments of explosives and other dangerous articles aboard vessels (including lighters and barges) by commercial service shall conform to the regulations prescribed by the U. S. Coast Guard Regulations Governing Transportation of Military Explosives on Board Vessels during present Emergency, and ICC Tariff No. 3. These regulations permit the transportation of military explosives and ammunition in accordance with requirements of the War and Navy Departments. AR 55-470 contains regulations governing transportation of military explosives, inflammables, and chemical materials. Also regulations of ports and harbors of the cities and states affected should be consulted and complied with.

b. Precautions and safe handling.

(1) Transportation of explosives, except small-arms ammunition, on ships carrying passengers is prohibited except for combat loading and other operational requirements which may be excepted upon decision by competent authority. Equipment to be used for shipment should be inspected and declared as acceptable by duly authorized port authorities. Regulations covering use of fires, stoves, gasoline, matches, smoking, flags, anchors, lamps, hooks, etc., should be consulted and strictly complied with. Persons under the influence of liquor or drugs should not be permitted on board a vessel while loading, unloading, or transporting of explosives and ammunition is in progress. No repairs other than emergency repairs shall be undertaken while any explosives are on board as cargo, and operations with equipment necessitating the use of open flames or acid is prohibited except upon special permission of port authorities. Explosives shall be stowed and segregated by groups according to Coast Guard regulations.

(2) Ammunition or explosives in bulk may be stowed in a hold before or after other cargo, provided all precautions are made against the hazard of articles being dropped from the sling. As far as practicable all work in connection with the construction of a magazine, or other conditioning of holds, decks, or hatches, shall be completed prior to actual loading of ammunition or bulk explosives.

(3) The floors of all magazines and holds shall be cleared of all rubbish, discarded dunnage, and spilled explosives, and swept broom clean before any ammunition or explosives are loaded onto the vessel. Buildings shall also be examined and any residue of previous cargo removed therefrom.

(4) The hatches of the vessel will be kept closed except during loading or unloading operations, and when so closed will be covered with tarpaulin and battened.

(5) If loading or unloading is not completed during operational time, proper precautions will be taken to guard and protect the cargo against fire, and a sufficient crew will be left in charge to handle the vessel in case of emergency. Docks should be kept clear of rubbish, etc. Ammunition and explosives should not be left on a dock or elsewhere unless proper guard is provided or delivery made to authorized persons. Explosives and ammunition will not be left on board overnight unless such action is necessary incident to their transportation. Lighters should not be tied up to that part of a vessel or dock where the fireroom or boiler is located. Explosives should be kept as far away from the boiler room and engine room as is possible.

(6) The use of oil or chemical burning lamps or lanterns is prohibited when loading. Only electric lanterns will be used when a movable artificial light is necessary.

(7) Lighters, barges, scows, and tugs engaged in hauling vessels or vessels berthed at an ammunition loading pier loaded with explosives must have their funnels or smoke stacks covered with screening of suitable size to prevent the escape of sparks. This screening must be renewed whenever it is broken.

(8) Magazines (cargo space) for explosives and ammunition and all metal obstructions and constructions must be lined entirely with wood or authorized wood substitute not less than 1 inch thick, nailed with cement-coated nails and countersunk.

(9) Explosives awaiting removal or delivery should be stored outside the dock or wharf when practicable and every possible effort must be made to reduce the time of such storage. Storage of these materials must be in a safe place and away from dangerous articles.

(10) *Packages of explosive and ammunition must not be handled roughly, thrown, dropped, dragged, or rolled over each other or over decks.*

(11) Metal hand hooks shall not be used in handling packages of explosives. Cant hooks shall not be used for raising or lowering barrels, drums, or other containers of explosives.

(12) Containers of explosives showing evidence of damage or leakage shall not be accepted for transportation or storage on board a vessel. Recoopering or repacking of damaged or faulty containers should be done at a safe distance from the vessel.

190. MOTORTRUCK SHIPMENTS.

a. Regulations.

(1) Regulations governing transportation of ammunition and explosives by truck is fully covered by ICC Motor Carrier Regulations, part No. 7, for commercial carrier, and AR 55-155 for government-operated vehicles, and will be strictly adhered to. Most states and cities, towns, villages, etc., have their own laws concerning the transportation of explosives and other dangerous articles within their jurisdiction. The local authorities of those sections through which motor shipments will pass should be consulted and their rules, regulations, and recommendations as to the best route to follow in order to avoid congested areas, be strictly adhered to. On request, local public safety authorities will provide escorts or guards for movement of explosives through their jurisdiction. If compliance with these rules is impracticable, the matter shall be referred to the Chief of Ordnance in detail.

(2) Except in cases of emergency, shipments of ammunition or explosive materials, except small-arms ammunition, will not be shipped by motortruck without prior approval of the War Department. This does not apply to local or nearby hauling but it is intended to prevent truck shipment where rail or water facilities are available.

projectile if the round was not issued fuzed, or unscrewing the fuze from the projectile if not fired.

(5) Every precaution should be taken to keep moisture away from powder-train time fuzes.

(6) Time fuzes are always issued set "safe," and if not used after making a setting, they should be reset to safe before storing.

(7) When ready to be loaded into the gun, each round which contains a time fuze or point-detonating fuze should be kept out of the path of recoil until recoil of the previous round has taken place; this practice will prevent a heavy blow on the fuze. If fuzed rounds are accidentally struck in this manner, they will not be fired under any circumstances but will be immediately placed in a segregated location and reported to the post ordnance officer for examination and necessary action.

(8) When checking the accuracy of fuze setting by cutting trial fuzes, no fuze should be cut more than twice.

220. BLANK AMMUNITION.

a. Only blank ammunition furnished by the Ordnance Department will be used. Blank ammunition is issued to the using services in complete rounds only. Smoke-puff charges or blank ammunition will not be improvised when they are not provided.

b. If kept intact, handled with care, and protected from heat, the complete round of blank ammunition is comparatively safe. The following precautions, however, should be observed:

(1) Under no circumstances will rounds of blank ammunition be tampered with in the field.

(2) Blank ammunition should not be removed from the fiber container sooner than is necessary before firing. Remaining rounds should be kept away from the gun.

(3) Identification of the ammunition before firing must be positive, and no attempt should be made to use it in a gun other than that for which it is intended.

(4) Any round in which the chipboard closing cup is not firmly in place should not be fired and should be handled with care until disposed of as directed in chapter 4.

221. PYROTECHNICS, GRENADES, AND CHEMICAL AMMUNITION.

a. Pyrotechnics and grenades should be located some distance either to the right or left of the firing points, never directly behind. Protective measures against grass fires should be provided, and extreme care should be taken to prevent a grenade or piece of burning pyrotechnic material from dropping into boxes of ammunition.

Pyrotechnics which have been unsealed should be disposed of as provided in OFSB 3-9.

b. In order to prevent accidents from the use of lethal or toxic chemical ammunition, no live chemical ammunition other than nontoxic smoke and nontoxic lachrymatory gas will be used for training purposes, including target practice, demonstrations, and tactical exercises, except under the personal and direct supervision of a commissioned officer of the Chemical Warfare Service. This limitation does not apply to the use of instructional gas identification sets or detonation gas identification sets. Smoke-producing materials will not be released in training within 300 yards of personnel, livestock, buildings, equipment, or other objects which may be damaged. Equipment contaminated with corrosive acids produced by liquid smokes will be washed with water as soon as possible except when other methods of protection or cleaning are prescribed in the appropriate Technical Manuals.

c. Burning-type grenades, smoke pots, and two-compartment candles should be stored in a cool, dry place. They should not be ignited within 5 feet of dry grass or other inflammable materials. Burning-type grenades will not be fired closer than 20 feet from personnel, because grenades occasionally flash. When firing smoke pots, care should be taken not to have the face directly above the smoke pot.

d. Unfuzed grenades will not be fuzed in ammunition dumps or storage magazines, or in greater quantities than are needed for immediate use.

222. BOMBS. Altitudes and distances safe from fragmentation and blast effect will be specified by the Commanding General, Army Air Forces (par. 21, AR 750-10, 22 January 1944). Safety precautions and methods of unfuzing, disassembly, and handling bombs are contained in TM 9-1980. All live bombs will be carried safe and will not be armed until released.

223. MORTAR AMMUNITION. The same safety precautions will be observed in the field in the handling and use of mortar ammunition as apply to artillery shell (par. 219). Further information will be found in FM 23-85 and FM 23-90.

CHAPTER 4

DESTRUCTION OF AMMUNITION IN ZONE OF THE INTERIOR

224. GENERAL.

a. General.

(1) The instructions set forth in this section are for destroying limited quantities of explosives and ammunition. The term "limited" is defined in subparagraph d, below. When larger quantities are to be destroyed or the instructions set forth cannot be complied with, special instructions will be furnished by the Chief of Ordnance.

(2) Unserviceable ammunition, ammunition components, and explosives which constitute a hazard, cannot be salvaged, or are unfit for their intended purpose and cannot be used to advantage for any other purpose should be destroyed in accordance with existing regulations. As a general rule at Class I, II, or III installation, the only ammunition items requiring destruction are obsolete or deteriorated ammunition (which may be considered together) and duds.

(3) Lumber which has been exposed to explosives and which cannot be readily decontaminated should be destroyed by burning only under conditions approved for safety. Examples of such lumber are wooden sections of tanks, vats, hoods, pipe lines, etc., in which hazardous material is impregnated. However, if wood has been exposed to explosive material to a limited extent it may be possible to decontaminate it completely by washing or steaming.

b. Responsibility and procedure. Prior to destruction, an Ammunition Condition Report (O.O. Form 517—formerly O.O. 7235) will be submitted to the Chief of Ordnance in order that the disposition may be approved. This report will be prepared in accordance with instructions on the reverse side of the form. An exception is deteriorated explosives or ammunition which is found to be immediately dangerous to life or property; in such instances, disposition may be made by order of the local commanding officer. The responsibility for disposition is a function of the inspector; the responsibility for destruction is a function of the post ordnance officer. Where local breakdown of unserviceable ammunition is ordered, technical instructions for the work will be furnished by the Chief of Ordnance.

c. Methods. Destruction of explosive material will be accomplished by burning, exploding, or dumping at sea, as specified below. Burying of explosives or ammunition or dumping them into waste places, pits, wells, marshes, shallow streams, or inland waterways is *absolutely prohibited;* except that loose black powder (par. 227) may be disposed of by dumping into a stream or body of water. Methods for destruction are generally based on the number of units to be destroyed, the size and nature of each unit, the facilities available, and the topography of the land.

d. Quantity of ammunition and explosives. By a "limited" quantity of ammunition and explosives, this section refers to the number of unexploded shell and other ammunition normally found on a target range or in the field as an accumulation from firings or other peacetime maneuvers. Larger quantities, generally referring to ammunition resulting from deterioration in storage or from obsolescence, are to be destroyed according to specific instructions from the Chief of Ordnance.

e. Materials used in destroying by explosion. Charges of ½-pound blocks of TNT or sticks of dynamite are used. These are set off either by time fuse (safety fuse) and a blasting cap, or by a magneto and an electric blasting cap. In no case will "instantaneous" fuse be used. For demolition purposes nitrostarch blocks have been authorized as a substitute for TNT blocks. Nitrostarch is a hard dense substance considerably more sensitive to friction and impact than TNT. *The crushing or breaking of the nitrostarch blocks is hazardous.* Dynamite is not to be used in the destruction of duds.

f. Materials used in destroying by fire. Fires used in destroying small ammunition components may be made from scrap lumber, wood, or such material as excelsior. When components to be destroyed are laid on the pile before lighting, the fire will be lit from a distance by means of a train of inflammable material or by a charge of black powder ignited with an electric squib.

g. Specific types. Information dealing with the particular type to be destroyed will be found in the paragraphs following.

h. Demolition methods. For details of methods and procedure of demolition work, consult FM 5-25.

225. DUMPING AT SEA.

a. When burning or detonation of explosives or ammunition is impractical, dumping at sea at depths not less than 900 feet and not less than 10 miles from shore is permitted. Before disposal, by dumping in the sea, of any ammunition, every effort will be made to salvage it for further use or reclamation of component parts. Dumping in the sea will, in every instance, be done only upon War Department order.

b. Navy, Coast Guard, and port authorities must be consulted and their regulations regarding transfer and disposal of material of this nature must be observed. Ammunition items must be removed from containers before being dumped overboard. The location selected for dumping should be appreciably deeper than surrounding locations to preclude the possibility of ammunition being washed toward the shore by tidal action.

c. In transit, the boat or barge will display a large red flag at least 10 feet above the deck and a competent person will be constantly on the alert to warn approaching craft of danger. When necessary, a War Department representative, who is familiar with the hazards involved in handling ammunition, will accompany commercial vessels contracted to dump such material in the capacity of a safety adviser.

226. SAFETY PRECAUTIONS.

a. **General.** Safety is the major consideration in destroying ammunition and explosives. It is highly advisable to test all safety devices beforehand by subjecting them to the severest test they may be called upon to withstand, provided that such test is reasonable and practicable. Only after safety requirements have been met should salvage and economy be considered. It may be necessary to improvise apparatus to accomplish the desired results, and it is essential that the destruction procedure be analyzed and planned in detail for compliance with the general safety precautions in chapter 3, section I. The general safety precautions that must always be complied with in destroying ammunition are described below.

b. **Selection of site.**

(1) FOR DESTRUCTION BY BURNING. The selection of a site for destruction of explosives by burning should be based on the principle of obtaining the maximum practicable distance from all magazines, inhabited buildings, operating buildings, public highways, and railways. Consideration should be given to the direction of prevailing winds. Wherever possible, natural barricades should be utilized between the burning site and operating buildings and magazines. The burning site should be approximately inhabited-building distances from all structures and public thoroughfares.

(2) FOR DESTRUCTION BY DETONATION. The selection of a site for destruction of ammunition by detonation is based on the same principles as in step (1), above. Such a site should be 3,600 feet from public highways, public railways, inhabited buildings, magazines, and operating buildings. Where this distance cannot be obtained, a pit or trench should be used to limit the range of missiles. The 3,600-foot limitation does not apply where substantially constructed destruction chambers are used. Pits will not be required when the destruction takes place on an artillery range or similar site where a cover of earth 2 feet thick should be used to limit the range of fragments. Combustible rubbish should be destroyed at a location removed from those places where explosives and explosive-contaminated material are destroyed. Where limited space does not permit separate burning grounds, a part of the explosive destruction may be reserved for burning rubbish, provided the two areas are not operated simul-

taneously. Such an area should be enclosed by a substantial wire mesh, not over ½-inch mesh.

c. **Maintenance of grounds.** All dry grass, leaves, and other inflammable materials within a radius of 200 feet from the point of destruction will be removed. Fire-fighting facilities for combating grass fires should be kept readily available and, if practicable, the ground at the point of destruction should be wet down with water at the close of each day's operations. The use of concrete mats for burning or detonation is not permitted.

d. **Protection for personnel.** Personnel engaged in demolition work should always have ample time to reach shelter affording substantial overhead cover and splinter-proof protection. The signal for detonation should be given by the individual setting the blastings, and only after all personnel in the vicinity are protected by substantial cover or have reached a safe distance. If an electric blasting machine is used, the wires will not be connected to the terminals until all persons have reached cover and the person in charge of the blasting is assured that the area is properly cleared of all personnel. Dependent upon local conditions, temporary or permanent barricades will be provided and safety distances will be observed by all persons.

e. **Safety distance requirements for preparation of primers and demolition charges.** It is extremely important that personnel take adequate precautions to prevent accidental explosions while preparing primers for demolition activities. In addition to the general safety precautions currently in force, the following safety rules for the preparation of primers and demolition charges *will be strictly observed.*

(1) Test-burning of time fuse (safety fuse), for determination of rate of burning of the roll, will be done at a minimum safety distance of 25 feet from exposed blasting caps or explosives in the direction toward which the air current is moving.

(2) Cutting square across end of time fuse (safety fuse), remove and discard 2 or 3 inches of fuse from each roll.

(3) Cut off and test a 1-foot length from each roll for determination of burning time. *All fuse in the same roll should burn at a uniform rate, though rate of burning may vary from approximately 30 to 45 seconds per foot in different rolls.*

(4) The supply of blasting caps for the required operation will be at minimum of 25 feet from the supply of explosives.

(5) The preparation of nonelectric primers will be performed not less than 25 feet from the supply of blasting caps or explosives.

(6) Cut sufficient time fuse (safety fuse) to permit firer to reach a place of safety before the charge explodes.

(7) Select one nonelectric blasting cap, hold it open end down,

and shake *gently* to remove dirt or other foreign matter. Hold the desired length of time fuse (safety fuse) vertical and gently slip the cap down over the fuse until the explosive is in contact with the end of the fuse. If the fuse appears too large to enter the blasting cap easily, the end to enter the cap may be rolled between the fingers. CAUTION: *Do not use force.*

(8) When the fuse is properly seated within the cap, place a standard-type cap crimper over the cap at the fuse end; hold by the fuse and crimp cap to fuse.

(9) No more than six blasting caps will be permitted at the site selected for preparation of primers at any one time.

(10) The priming of explosives will be performed at a distance of not less than 25 feet from the site of any other permissible storage or operation point involved in connection with the preparation of primers and demolition charges.

(11) Not more than one primed charge of explosives will be permitted at any site at any one time.

(12) The preparation of primers and the priming of explosives will not be performed in advance of requirements for use of same, in view of possible atmospheric effects.

(13) Bring to the site of the operation only sufficient explosives to meet the requirement of the operation involved.

f. **Removal from containers.** Explosives or ammunition to be destroyed by burning will be removed from containers, as any attempt to burn explosives or ammunition under even slight confinement may result in an explosion or detonation.

g. **Determining quantity to be destroyed.** The quantity of material to be destroyed at one time will depend upon local conditions. This quantity will be carefully determined by starting with a limited number and then gradually increasing that number until the maximum which can be destroyed without damage to surrounding property or causing disturbance to civilian areas is determined. The responsible individual will make sure before he gives the signal for detonation that there is no unauthorized person in the danger area and that all authorized persons are protected by adequate distance and cover.

h. **Collection of unexploded ammunition.** As some types of ammunition are comparatively difficult to explode, a search of the surrounding grounds should be made after each blast and any material which has been thrown from the pit and not detonated should be collected and included with the next charge to be destroyed.

i. **Segregation of material awaiting destruction.** Explosives or ammunition awaiting destruction will not be piled within 200 feet of the point of destruction and will be protected from grass fires, burn-

ing embers, and flying fragments. All dry grass, leaves, and other inflammable material will be removed from the area within a radius of 50 feet of the pile.

j. **Caution against re-ignition.** In repeating burning operations, care will be taken to guard against material being ignited from burning residue or heat in the ground.

k. **Improvising.** The use of improvised methods for exploding blasting caps is prohibited.

l. **Misfires.** In case of a misfire, personnel will not approach the pit, trench, or point of detonation until a period of 30 minutes has elapsed.

m. **Use of trained personnel.** Destruction of ammunition will never be attempted by inexperienced or untrained personnel. The number of personnel engaged in such operations will be kept at a minimum consistent with safety, but no person will be permitted to work alone.

n. **Guarding demolition area.** Guards, safety signals, and warning signs will be used as required to keep unauthorized personnel from danger areas during destruction operations.

o. **Additional instructions.** In the absence of specific regulations or information covering any phase of the destruction of explosive material, instructions will be requested from the Chief of Ordnance.

227. BULK EXPLOSIVES.

a. **Black powder.** The safest method of destroying black powder is to dump it in a stream or body of water; if no suitable body of water is convenient, it may be burned. Only tools of wood or non-sparking metal will be used in opening the containers. The contents of one container only will be burned at one time provided that quantity does not exceed 50 pounds. The powder must be removed from the container and spread out on the ground in a train about 2 inches wide, care being taken that no part of the train parallels another part except at a distance of more than 10 feet. A train of inflammable material, such as excelsior, about 25 feet long and extending to windward must be used to ignite the powder, as the resulting flare of explosion is so quick that there will be no opportunity to withdraw. The emptied containers will be thoroughly washed on the inside with water, as serious explosions have occurred with supposedly empty black-powder cans. Safety precautions, particularly those in paragraph 226, should be observed. Wet black powder on drying may resume its explosive properties.

b. **TNT, explosive D, and tetryl** will be destroyed by burning. They must not be dumped into water, as they poison it. The explo-

sive to be burned will be removed from containers and spread in a thin layer, not more than 3 or 4 inches thick, on another layer of inflammable material, such as excelsior. A train of inflammable material will be used to ignite the explosive. Safety precautions in paragraph 226 should be observed. High explosives should not be burned in lump form. If explosives must be burned in lump form, the quantities should be less than stipulated below for loose explosives, and an explosion may occur. Instances are on record of explosives below (which in most instances burn), detonating while being burned. The maximum amounts of loose high explosives which may be burned at one time shall be limited as follows:

(1) DNT, TNT, explosive D—500 pounds.
(2) Pentolite, tetrytol—250 pounds.
(3) Tetryl, composition A, B, and C, RDX, halcite—50 pounds.

c. Smokeless powder. Small quantities of smokeless powder (a few boxes) up to 500 pounds may be destroyed with safety if the powder is removed from the containers and spread out on bare ground in a train of limited width and thickness dependent upon the granulation of the powder. A train of inflammable material about 25 feet long on the windward side, should be used to ignite the powder; this allows personnel sufficient time to get away from the intense heat which is generated when smokeless powder burns. Safety precautions in paragraph 226 should be observed.

d. Dynamite. Not more than 100 pounds are to be destroyed by burning at one time. To destroy by burning, dynamite cartridges, except frozen cartridges, should be slit lengthwise into halves with an ordinary knife; knives with closing blades should not be used. The slit cartridges are placed in a single layer, not greater in width than the length of one cartridge, on hay, excelsior, or other combustible material. The combustible train should be of sufficient length to allow personnel to reach cover at a safe distance before the dynamite begins to burn. The dynamite containers should be burned at the same time. Dynamite awaiting destruction should be shielded from the direct rays of the sun. Frozen cartridges shall be carefully thawed in accordance with instructions contained in FM 5-25, prior to burning.

e. Other explosives. If it is necessary to destroy other explosives, such as mercury fulminate, lead azide, picric acid, etc., special instructions will be requested from the Chief of Ordnance.

228. SEPARATE-LOADING PROPELLING CHARGES. Extreme precautions will be taken against sparks. The smokeless powder charges will be removed to the burning ground before being opened. There the powder will be removed from the bag by cutting one of the seams, care being taken not to disturb the black-powder igniting charge. The empty bag and igniter should be immediately and com-

pletely submerged in water and the igniter cut open under water. The smokeless powder will be burned as described in paragraph 227 c. The igniter and cartridge bags, after having been thoroughly soaked in water for at least 72 hours, should be removed and allowed to dry in the open; they may then be burned in a pit or trench. Soaking in water is absolutely necessary because the confinement of the black powder by the powder bag, slight as it may be, is sufficient to cause explosion and projection of the burning bags and igniters to distances of 200 feet or more. Bags and igniters awaiting destruction by fire must be kept in a securely closed container. It is permissible, when practicable, to destroy bags and igniters by dumping them in a body of water after the propellent powder has been removed and the various sections of the quilted igniter are cut open while the bag and igniter are still submerged in water. This cutting is necessary to release air trapped in the quilted igniter sections, which would cause the bags and igniters to float on top of the water.

229. ARTILLERY SHELL.

a. The following general instructions for destroying artillery shell by detonation also apply to bombs, mortar shell, rocket shell separated from their motors, and other relatively large components containing high explosive. However, it must be kept in mind that bombs, mortar shell, rocket shell, and antitank mines are composed of as much as 60 percent by weight of explosive and have relatively thin walls, as compared with the 10 to 15 percent of explosive and the relatively heavy walls of artillery shell. Therefore, the number of units of bombs, mortar shell, rocket shell, and mines destroyed in one operation should be reduced accordingly. Shaped charges require extreme care in destruction and should be accomplished in small quantities or singly. Fixed shell and rocket shell (heads) will be disassembled from complete rounds and destroyed in the same manner as separate-loading shell (see below). Before undertaking any demolition operation, the proposed procedure will be checked against the safety precautions prescribed in paragraph 226.

b. The following general instructions contemplate the use of a pit or bombproof hut. An artillery range or similar site, when available, may be used. Note especially paragraph 226 b (2).

c. The projectile to be destroyed will be placed on its side in a trench or pit about 4 feet deep. The number of TNT blocks (or their equivalent) specified in the following table will be placed in contact with the side of the projectile and held in position by earth packed around the projectile. The TNT block is placed on its side; if two blocks are used, one is placed on top of the other. If three blocks are used, two are placed close together on the shell and the third on top of these. If five blocks are used, there will be two layers of two blocks each, with a fifth on top. The demolition blocks are

detonated by means of an electric blasting cap or miner's safety fuse and cap.

DESTRUCTION OF SHELL BY DETONATION

Caliber of Shell To Be Destroyed	No. of ½-pound TNT Blocks or Their Equivalent
[illegible] mm, [illegible] mm	1
75-mm, 76-mm, 3-inch	2
120-mm, 155-mm, 6-inch	3
8-inch, 240-mm	4
10-inch, 12-inch	5
14-inch, 16-inch	6

d. One end of the required length of time fuse (safety fuse) (par. 226 e) will be cut and inserted in a C of E special blasting cap until it just touches the charge. The cap will then be lightly crimped to the fuse with a fuse crimper or suitable tool, care being taken not to press the fuse too tightly against the fulminate charge of the blasting cap. A No. 8 electric blasting cap with the necessary length of lead wire and a hand exploder may be used instead of the blasting cap with miner's safety fuse. The blasting cap will be placed in the hole drilled in the TNT block (the top block when more than one block is used), and if necessary tied around it to hold it securely in place. In no case should a cap weaker than the ordinary commercial No. 8 blasting cap be used.

e. In case of a misfire, the precaution in paragraph 226 l should be observed. After the blast, comply with paragraph 226 h.

f. Point-fuzed shell fitted with Mark series adapters and boosters can be detonated without the use of TNT blocks. A No. 8 blasting cap securely held in place in the fuze cavity with a small amount of mud packed around the top of the cap will usually insure complete detonation of loaded shell.

230. BLANK AMMUNITION FOR CANNON. Rounds of blank ammunition which have misfired will be destroyed locally under the supervision of a commissioned officer or personnel designated for this purpose by the service command ordnance officer. All precautions for handling black powder, chapter 1, section IV, and for destroying ammunition, paragraphs 226 and 227, should be observed. An extractor (brass) having a wood-screw thread can be used to remove the closing cap and wad; the black powder pellets may be removed by tipping the cartridge case forward and catching them in the hand; and the primer may be removed by means of a press having a hollow guide and/or ram to carry force of possible primer functioning away from the operator. Before removing the primer with a press, be sure that corrosion will not bind the primer and cause the application of too much pressure. Also, be sure to take all possible precautions to see that no powder dust adheres to the primer.

231. **BOMBS.** Bombs should be destroyed in accordance with paragraph 229. However, bombs have much thinner walls and contain so much more explosive than shell of corresponding weight and usually detonate so completely that extreme precautions must be taken to avoid structural damage to buildings and injuries to personnel. The destruction of bombs larger than 100 pounds should not be undertaken without the specific approval of the Chief of Ordnance. Bombs awaiting destruction should be segregated in small piles 100 feet or more apart and at least 300 feet from the detonating pit. Extreme precautions must be taken to protect bombs awaiting destruction against accidental detonation by fire, fragments, or sympathetic detonation.

232. **MORTAR SHELL.** Mortar shell should be destroyed in accordance with the instructions in paragraph 229. Care will be taken to limit the number destroyed at any one time and to protect shell awaiting destruction from flying fragments.

233. **ROCKET SHELL.** Rocket shell, which are separated from their motors, should be destroyed in accordance with the instructions in paragraph 229. Care will be taken to limit the number destroyed at one time and to protect shell awaiting destruction from flying fragments. Rockets having motors attached thereto will be destroyed in accordance with instructions from the Chief of Ordnance.

234. **PENTOLITE- AND TETRYTOL-FILLED AMMUNITION.**

a. Ammunition filled with pentolite or tetrytol have shaped charges. These include high-explosive antitank shell, grenades, and rocket shell, and demolition shaped charges. Extreme care should be observed in destroying this type of ammunition, and the following precautions should be observed:

(1) Only small quantities or single items should be destroyed at one time.

(2) Fragmentation as well as blast effect should be expected and guarded against.

235. **SMALL-ARMS AMMUNITION.**

a. All unserviceable caliber .22 and shotgun ammunition will be destroyed locally. Ordnance field representatives, within their jurisdiction, are charged with the disposition of all other unserviceable small-arms ammunition and accumulations from firings. Reference to WD SB 9-AMM 4 should be made for procedure to be followed in disposition.

b. Small-arms ammunition should be destroyed in a pit which is approximately 6 feet square and 4 feet deep. An inclined chute such as a piece of 2-inch pipe should be provided, and this chute should be placed so that one end is over the center of the pit and the

other behind the barricade. Precautions should be taken to baffle the open end behind the barricade so that the operator cannot look down the pipe. A hot fire should be built in the pit, and then the pit should be covered with a piece of sheet iron or other suitable material to confine flying fragments. The cartridges should be fed into the fire through the pipe, and care should be taken to prevent an accumulation of unexploded ammunition in the pit. A furnace or burning kettle designed to accomplish the above destruction by burning is also satisfactory. Approved equipment and building drawings showing barricades will be supplied by the Chief of Ordnance on request.

236. SMALL COMPONENTS EXCEPT PRIMERS.

a. These components, artillery and grenade fuzes, boosters, detonators, and similar material, may be destroyed either by burning or by detonating. For destruction of primers see paragraph 237.

b. In destruction by burning, the same instructions given in paragraph 235 *b* for the destruction of small-arms ammunition should be followed. Caution should be exercised in introducing components into the fire because normal action cannot be expected under intense heat. The explosion of a previously introduced component should be heard before introducing another.

c. When destroying these components by detonation, a small number of components, depending upon the type and kind, should be placed in contact with one another in an open container. This container should then be placed in a pit or trench approximately 4 feet deep. On top of each container and in contact with the components, one or more TNT blocks fitted with an electric blasting cap or with a C of E special blasting cap and time fuse (safety fuse) should be placed. The pit should then be covered with a layer of logs and earth or other suitable cover, and the components should then be detonated in accordance with the safety precautions outlined in paragraphs 224 and 226.

d. The following method of destruction of unserviceable HE antitank mine fuzes should be followed:

(1) The available safety distances will determine the number of fuzes that may be destroyed at one time (based on actual fragment distances reported from destruction of fuzes in quantities) together with recommended minimum safety distances for each, as set forth below:

(*a*) Where pile is covered with earth (2 feet):

No. of Fuzes	Fragment Distance (approximate yards)	Recommended Safety Distance (minimum yards)
12	200	400
56	350	525
152	525	800
702	525	800

(b) Where pile is not covered with earth:

No. of Fuzes	Fragment Distance (approximate yards)	Recommended Safety Distance (minimum yards)
702*	800	1200

*Other quantities may be selected for detonation at one time, although 702 was adopted as reaching the upper limit of efficiency in piling.

(2) Between storage point and destruction area, handle all fuzes with striker end up; exercise extreme care and caution.

(3) Make a double pyramid pile of the quantity selected for destruction; the bottom row should be on level ground or on a wooden board of sufficient length to carry the bottom row of the pile. Place the fuzes on the side with the rows base to base, in intimate contact and with the projecting portions of the safety fork fitted into the grooves carrying the same component in the adjacent fuzes. The fuzes must be kept in contact with each other.

(4) Place two No. 6 or No. 8 blasting caps (lightly taped if necessary to hold them in position) side by side between the bases of the two top fuzes of each pyramid so that the end of the cap is at the approximate center of the base of the fuze. A slight "mud-capping" of the caps is desirable if carefully applied. The pile is then ready for detonation.

237. PRIMERS.

a. Large primers, 100-grain or more, may be destroyed by burning according to the instructions for destruction of small-arms ammunition in paragraph 235 b. Primers, other than small-arms primers, are dropped one at a time into the fire. Large primers will be destroyed only in this manner because they are subject to explosion in mass if destroyed by burning in large quantities.

b. Primers, except the 100-grain or larger primers, may be burned in a trench approximately 2 feet deep, 1 foot wide, and of sufficient length to accommodate the number of primers to be burned at one time. The trench should be prepared with a quantity of excelsior or similar combustible material sufficient to insure a hot fire throughout its length. The primers should be removed from boxes and placed on the excelsior before the fire is lighted. Pasteboard cartons need not be opened before they are placed in the trench. To confine fragments as much as possible, a piece of sheet metal should be placed over the trench. After the primers and cover are in place, a train of combustible material leading into the pit should be prepared and lighted. Personnel should then take cover or withdraw to a safe distance.

c. If a suitable tank or kettle is available for use, a smaller number of primers may be placed in it and a small-mesh screen placed over the top. By building a fire underneath, the primers will be exploded. A convenient receptacle is an iron tank cut in half

longitudinally and the open side placed on railroad iron or other suitable grating that will not let the primers drop into the fire. A large hole, approximately 12 inches in diameter, with a pipe located above the height of a man's head, should be provided and about 50 primers put in at one time. The boiler should be equipped with a smokestack so that a draft will be formed through the grating. Packing material, if inflammable, need not be removed from the primers.

d. If a burning pit constructed of railroad iron or similar material is available, a fire may be built in it and a box of primers destroyed at one time (provided the packing is inflammable) by throwing the box into the pit and taking cover.

e. The smaller end vent primers may be destroyed by building a firebox, over which a basket of primers may be pulled on railroad iron from behind a barricade. The fire should be started before the primers are pulled over it. When all primers have been fired, the basket should be pulled off, emptied, cooled, reloaded, and again pulled over the fire.

f. The stock of primers awaiting destruction will not be allowed within 300 feet of the burning operations, and great care will be taken to protect the pile from accidental ignition by flying fragments or sparks. This stock will be limited to 1 day's supply. Other applicable regulations contained in paragraph 226 will be strictly observed.

238. GRENADES.

a. General. Grenades may be destroyed by burning or detonation in accordance with the following instructions. Strict compliance with applicable regulations of paragraph 226 is essential for the protection of personnel and property. Destruction by detonation should generally be applied to high-explosive grenades, whereas destruction by burning is applied generally to other types of grenades.

b. Destruction by detonation. Not more than twenty grenades should be placed in a pit about 4 feet deep. They should be piled so that they come in close contact with each other; on top of the pile should be placed, in intimate contact, three ½-pound TNT blocks, one of which is provided with an electric blasting cap or cap E special blasting cap fitted with several feet of time fuse (safety fuse). The grenades and TNT blocks should be covered with a layer of earth about 1 foot thick which is tamped lightly to obtain the maximum efficiency of the TNT blocks, and the pit should be covered as prescribed in paragraph 226.

c. Destruction by burning. A pit 2 feet square by 3 feet deep fitted loosely with an iron plate or heavy board cover is used. Grenades should be put in the fire one at a time. Another should

not be put in until the previous grenade is detonated. Care should be taken in introducing explosives into the fire as normal action cannot be expected under intense heat. The only time to investigate an unusual delay in the explosion of a grenade is when the fire has burned out and the pit is cold. Instead of dropping grenades singly and covering each time, an inclined chute which is baffled at the open end may be used.

239. PYROTECHNICS.

a. General. Pyrotechnics, except photoflash bombs and parachute flares, will be destroyed in accordance with the instructions for burning of primers (par. 237 b). Loose pyrotechnic materials should be burned under the same conditions as black powder and the same precautions should be observed (par. 227 a). Water-wet pyrotechnic materials may be burned in small quantities in furnaces designed for that purpose and approved by the Chief of Ordnance.

b. Parachute flares. Parachute flares will be destroyed by burning in the open and in a vertical position on the ground. The individual flares must be located at least 4 feet apart and placed on top of a layer of combustible material. After lighting the train of combustible material, personnel should take cover and observe safety distances.

c. Photoflash bombs. Photoflash bombs are dangerous and should be handled with care. They should be destroyed by the use of TNT blocks, similar to the procedure for artillery shell (par. 229). Duds of photoflash bombs should not be handled or moved but destroyed in place in accordance with instructions in paragraph 242. Due to the thinness of the case, a single block of TNT is sufficient to accomplish destruction. A strict compliance with the applicable regulations of paragraph 226 is essential.

NOTE. *Due to the brilliance of the flash, it is injurious to vision to watch the destruction of photoflash bombs even at distances prescribed in this manual as safe against hazards.*

240. CHEMICAL AMMUNITION.

a. In general, grenades, bombs, and shell loaded with chemical filler should be destroyed in a manner similar to that prescribed in paragraph 229 for destroying artillery shell. Before destroying chemical ammunition, however, special instructions should be obtained from the Chief of Ordnance concerning any exceptional hazards. When a leaking shell or component is located, the individual in charge of the magazine will be notified in order that he may direct the disposition of the shell. As chemical shell contains a comparatively small amount of explosives, the charge of TNT blocks to be used for demolition should be as follows:

Chemical shell or Component	No. of ½-pound TNT Blocks or Their Equivalent
75-mm shell	4
155-mm shell	5
8-inch shell	6
60-mm and 81-mm mortar	2
4.2-inch chemical mortar shell	3
8-inch chemical mortar shell	3
5-lb bomb	1
25-, 30-, and 50-lb bomb	2
100-lb bomb	3

b. Dangerous chemical ammunition.

(1) Immediately hazardous unserviceable chemical ammunition may be destroyed by exploding in the open if a sufficiently isolated area is available. The point where the shell is exploded should be chosen so that for a period of approximately 48 hours personnel can be excluded from the area 1 mile downwind from the point where the shell is exploded. For a period of about 2 weeks, all personnel must be prevented from passing within a distance of 150 yards from the point where the shell is exploded. Where a sufficiently isolated area is not available, single unserviceable gas-filled shell may be destroyed in a pit 6 feet deep. The shell with its bursting charge is placed at the bottom of the pit, the pit is back-filled, and the shell exploded. Five gallons of freshly prepared bleaching solution should be poured on the fill, and sufficient dry bleach (chloride of lime) should then be scattered over the fill to cover the disturbed ground to a depth of 2 inches. A permanent sign should be placed on the fill prohibiting digging in the vicinity.

(2) Where a sufficiently isolated area is not available, chemical ammunition may be destroyed by placing in a pit, approximately 20 feet in diameter and 4 feet deep, on top of a wooden platform and surrounded by dry scrap wood. Arrange demolition charges and cover the ammunition with about 2 feet of earth; the charges are to be so arranged that they will function after the scrap wood has been ignited and the fire has gained headway; in this way the chemical filler will be burned as it comes from the item without undue contamination of the surrounding area. Under normal conditions, the chemical filler will burn clean and no shell fragments will leave the pit. As a matter of general safety, no personnel should approach the pit for 48 hours.

241. ANTITANK MINES. If marks on the mine or on the ground indicate that it has been run over by a vehicle, the mine should be considered as a dud and should not be handled or jarred, and should be destroyed in place by detonation with a TNT or nitrostarch block (par. 242). Only mines that have not been tampered with, handled, or disturbed in any manner may have the safety fork replaced and then taken up. The safety fork must be replaced

before the mine is handled or the fuze removed. Unserviceable antitank mines will be destroyed in the same manner and with the same precautions as bombs (pars. 229 and 231).

242. TARGET RANGES.

a. **General.** Explosive missiles which have failed to function after firing are termed "duds." AR 750-10 prescribes that, after firing on a range has been completed and before free access to it is allowed to personnel in general, the range will be thoroughly policed and all duds destroyed by competent personnel. Duds of photoflash bombs or aircraft flares released during flight over land areas other than target ranges will be recovered and destroyed. See paragraph 239.

b. **Safety precautions.** Target ranges are dangerous because of flying missiles during target practice and unexploded ammunition which may remain on the range after target practice. Safety precautions should therefore include means for preventing trespass upon the target range by unauthorized or careless persons and for removing from the range all unexploded ammunition which has been fired. In addition to the safety measures employed at and near the firing line, such as red flags, markers, or fences, the boundary or terrain which is likely to receive missiles from the firing line should be placarded with signs which indicate the danger zone and the hazards attendant upon entering such zones at specified times. The signs should also emphasize the dangers connected with picking up unexploded ammunition and should prohibit either trespass on the range or the removal of souvenirs from areas, under penalties provided by law. The placarding of the target ranges is a matter of public safety and must never be neglected.

c. **Destroying duds.**

(1) The policing of a target range and safeguarding the command are functions of the commanding officer. Immediately after target practice is completed, the entire range should be carefully policed for unexploded ammunition, under the supervision of an authorized individual who is thoroughly familiar with the dangers incident to such operations. Unexploded projectiles and other components of ammunition which have been fired are dangerous to handle and should not be touched or jarred where it is practicable to destroy them by the use of TNT blocks. However, unfuzed duds may be handled with comparative safety.

(2) In those rare cases in which it is necessary to remove a dud from any location before destroying it, all operations connected with this procedure should be done either by or under the direct supervision of personnel who are thoroughly familiar with the dangers of such an operation and who are qualified to do this work.

(3) To move or roll an unexploded fired projectile is to invite disaster, as such an operation may cause movement of the internal

fuze parts and may cause the projectile to explode. No attempt will be made to disassemble a round of unexploded ammunition except by personnel of the Ordnance Department who are specifically assigned to such work.

(4) Duds on the target range, such as unexploded projectiles, fuzes, grenades, etc., can usually be destroyed in place with TNT or nitrostarch blocks. The dud should be approached only by experienced personnel and, without disturbing the dud, the explosive blocks carefully laid in intimate contact with it. If possible, the blocks should be placed on top of the dud because the wave of detonation tends to be propagated downward. The blocks should then be carefully mud-packed or earth-covered to direct the explosion toward the dud as much as possible. For artillery shell, the number of TNT blocks (or equivalent) to be used should follow the table specified in paragraph 229 *c*. After placing the charge, the dud should then be covered with sandbags or earth to limit the range of the fragments.

(5) Shell exploded on the ground surface without an earth cover of at least 2 feet, may send fragments 1,000 yards, and all within this danger zone will take cover when the charge is fired. Personnel should never be within 300 feet of a projectile when it explodes, even if suitable protection is at hand. The general instructions for destroying duds on the target range are similar so far as possible to those described for destroying artillery ammunition (par. 229). Duds of photoflash bombs are destroyed in accordance with this paragraph and paragraph 239. The safety precautions in paragraph 226 will be carefully observed.

(6) Gas shells or bombs should be handled in the same manner as other projectiles. Holes or trenches in which gas shells have been exploded must be filled or decontaminated and gas masks worn during the work. Work should always be done on the windward side of the area where gas shells are exploded.

(7) Destruction of duds of spotting-charge assemblies, for the 100-pound practice bomb M38A2 (black powder) will be accomplished by detonation in place. This can be done by the use of demolition blocks or a 15-inch length of primacord which is coiled, placed on top of the charge, taped in place, and detonated with a blasting cap. Destruction of individual unserviceable spotting charges of this type can readily be accomplished by winding a 20-inch length of primecord twice around the charge, taping it in position, and initiating detonation by means of a blasting cap as above.

(8) After the destruction of duds has been completed, the officer in charge of the work will personally superintend a thorough search of the area to insure that no duds have been overlooked.

(9) Additional information on destruction of unexploded projectiles and bombs may be found in FM 9-40 and FM 5-25.

CHAPTER 5

REFERENCES

243. PUBLICATIONS INDEXES. The following publications indexes should be consulted frequently for latest changes or revisions of references given in this chapter and for new publications relating to materiel covered in this manual:

a. Introduction to Ordnance Catalog (explaining SNL system) ..... ASF Cat. ORD 1

b. Ordnance Supply Catalog Index ..... ASF Cat. ORD 2

c. Ordnance Major Items and Combinations, and Pertinent Publications ..... WDSB 9-1

d. List and Index of War Department Publications FM 21-6

e. List of War Department Films, Film Strips, and Recognition Film Slides ..... FM 21-7

f. Military Training Aids ..... FM 21-8

g. Index to Bombing Tables (listing current bombing tables for bombs, clusters, and flares) ..... Index to BT's

244. STANDARD NOMENCLATURE LISTS.*

a. Ammunition for small arms.

Ammunition, revolver, automatic pistol, and submachine guns ..... ASF Cat. ORD 11 SNL T-2

Ammunition, rifle, carbine, and automatic gun ASF Cat. ORD 11 SNL T-1

Ammunition, small-arms, obsolete and nonstandard ..... ASF Cat. ORD 11 SNL T-6

Miscellaneous service components of small-arms ammunition and instruction material for Field Service Account ..... ASF Cat. ORD 11 SNL T-4

Packing materials used by Field Service for small-arms service ammunition ASF Cat. ORD 11 SNL T-5

Shells, shotgun ..... ASF Cat. ORD 11 SNL T-3

b. Bombs, grenades, pyrotechnics, and rockets.

Ammunition instruction material for grenades, pyrotechnics, and aircraft bombs ASF Cat. ORD 11 SNL S-6

Bombs, aircraft, all types ..... ASF Cat. ORD 11 SNL S-1

*An up-to-date listing of current Standard Nomenclature Lists is maintained in ASF Cat. ORD 2.

References

Fuzes and miscellaneous explosive components for aircraft bombs ..... ASF Cat. ORD 11 SNL S-2

Fin assemblies and miscellaneous inert components for aircraft bombs . ASF Cat. ORD 11 SNL S-3

Grenades, hand and rifle, and fuzing components ASF Cat. ORD 11 SNL S-4

Pyrotechnics, military, all types ASF Cat. ORD 11 SNL S-5

Rockets, all types, and components ASF Cat. ORD 11 SNL S-9

Torpedoes and mines ....ASF Cat. ORD 11 SNL S-1

c. Cleaning, preserving, and lubricating materials; recoil fluids, special oils, and miscellaneous related items ....ASF Cat. ORD 5 SNL K-1

d. Ammunition for antiaircraft, harbor defense, heavy field, and railway artillery.

Ammunition, fixed, including subcaliber ammunition for harbor defense, heavy field, and railway artillery ..... ASF Cat. ORD 11 SNL P-6

Ammunition for antiaircraft artillery ASF Cat. ORD 11 SNL P-5

Ammunition instruction material for antiaircraft, harbor defense, heavy field and railway artillery, including complete round data ASF Cat. ORD 11 SNL P-8

Ammunition, obsolete and nonstandard, for harbor defense, heavy field, and railway artillery ..... ASF Cat. ORD 11 SNL P-9

Charges, propelling, separate-loading, 6-in. to 240-mm inclusive, for harbor defense, heavy field, and railway artillery .. .ASF Cat. ORD 11 SNL P-2

Charges, propelling, separate loading, 10-in. to 16-in. inclusive, for harbor defense, and railway artillery ....ASF Cat. ORD 11 SNL P-4

Fuzes, primers, blank ammunition, and miscellaneous items for antiaircraft, harbor defense, heavy field, and railway artillery ASF Cat. ORD 11 SNL P-7

Packing materials used by field service for antiaircraft, harbor defense, heavy field, and railway artillery service ammunition ASF Cat. ORD 11 SNL P-10

References

Projectile, separate-loading, 6-in. to 240-mm inclusive ..... ASF Cat. ORD 11 SNL P-1

Projectile, separate-loading, 10-in. to 16-in. inclusive ..... ASF Cat. ORD 11 SNL P-3

c. Ammunition for pack, light and medium field, aircraft, tank, and antitank artillery.

Ammunition, blank ..... ASF Cat. ORD 11 SNL R-5

Ammunition, fixed and semifixed, all types ..... ASF Cat. ORD 11 SNL R-1

Ammunition instruction materials ..... ASF Cat. ORD 11 SNL R-6

Ammunition, mortar, including fuzes, propelling charges and other components ..... ASF Cat. ORD 11 SNL R-4

Ammunition, obsolete and nonstandard ..... ASF Cat. ORD 11 SNL R-8

Land mines and fuzes, demolition material, and ammunition for simulated artillery and grenade fire ..... ASF Cat. ORD 11 SNL R-7

Packing materials used by field service ..... ASF Cat. ORD 11 SNL R-10

Projectiles and propelling charges, separate loading, for medium field artillery, including complete round data ..... ASF Cat. ORD 11 SNL R-2

Service fuzes and primers ..... ASF Cat. ORD 11 SNL R-3

f. Tools and supplies.

Ammunition surveillance, testing, and inspection equipment and supplies ..... ASF Cat. ORD 6 SNL N-10

General tools and supplies for ordnance ammunition company ..... ASF Cat. ORD 10 SNL N-17

Tools and supplies for ordnance ammunition renovation platoon ..... ASF Cat. ORD 10 SNL N-500GA

Tools and tool sets for ordnance bomb disposal squad (separate) ..... ASF Cat. ORD 10 SNL N-500EB

g. Other services.

Chemical Warfare Service Supply Catalog. List of Items for Troop Issue ..... ASF Cat. CW 3

Engineer Supply Catalog. Stock List of All Items ..... ASF Cat. ENG 5

245. EXPLANATORY PUBLICATIONS.

a. **Regulations.**

Administration: posts, camps, and stations	AR 210-10
Fire protection and fire fighting	AR 30-1580
Honors to persons	AR 600-30
List of current pamphlets and changes; distribution	AR 1-10
Loss, destroyed, damaged, or unserviceable property	AR 35-6640
Precautions in handling gasoline	AR 850-20
Qualifications in arms and ammunition training allowances	AR 775-10
Range regulations for firing ammunition for training and target practice	AR 750-10
Salutes and ceremonies	AR 600-25
Supplies: storage and issue	AR 700-10
Transportation by commercial means; general	AR 55-105
Transportation by water of explosives, inflammables, and chemical warfare materials	AR 55-470
Transportation of public property (except animals) and remains	AR 55-155

b. **Ammunition, all types.**

Ammunition: General	WDSB 9-AMM 1
Ammunition Supply	FM 9-6
Ammunition: Supply within Continental United States	WDSB 9-AMM 6
Ammunition Condition Report	O.O. Form No. 517
Ammunition Identification Code (AIC)	WDSB 9-AMM 5
Application of Suspensions and Releases on Ammunition	WDSB 9-AMM 11
Artillery Ammunition	TM 9-1901
Complete Round Chart	O.O. Form No. 5981
Decontamination	TM 3-220
Decontamination of Armored Force Vehicles	FM 17-59
Defense Against Chemical Attack	FM 21-40
Explosives and Demolitions	FM 5-25
First Aid for Soldiers	FM 21-11
Identification of ammunition lot number prefixes	OFSB 3-16
Inspection Guide, Ammunition	TM 9-1904

References

Inspection of Propelling Charges and Bulk Powder	WDSB 9-AMM 7
Inspection of Ordnance Materiel	TM 9-1100
Magazine placard	O.O. Form No. 5991
Military Chemistry and Chemical Agents	TM 3-215
Military Explosives	TM 9-2900
Military Sanitation and First Aid	FM 21-10
Miscellaneous Chemical Munitions	TM 3-300
Ammunition; Net Prices	WDSB 9-AMM 3
Ordnance Ammunition Company, Ordnance Ammunition Battalion	FM 9-20
Ordnance Company Depot	FM 9-25
Ordnance Field Maintenance	FM 9-10
Ordnance Service in the Field	FM 9-5
Ordnance Safety Manual	No. 7224
Reports	WDSB 9-AMM 8
Storage and Shipment of Dangerous Chemicals	TM 3-250
Surveillance Manual	OFSB 3-20
Unexploded Bombs, Organization and Operation for Disposal	FM 9-40
Unsafe Ammunition	WDSB 9-AMM 2
Use of Chemical Agents and Munitions in Training	TM 3-305

c. **Ammunition, special types.**

Aircraft Armament and Pyrotechnics	TM 1-409
Aircraft Bombs and Bomb Components	OFSB 3-8
Ammunition: Antiaircraft, Heavy Field, Seacoast, and Railway Artillery	OFSB 3-2
Bombs for Aircraft	TM 9-1980
Coast Artillery Ammunition	TM 4-205
Controlled Submarine Mine Materiel	TM 4-220
Corps of Engineers Reference Data	FM 5-35
Field Artillery and Field Mortar Ammunition	OFSB 3-3
Field Artillery Trainer, M3	TM 6-225
Grenades, Hand and Rifle	TM 9-1985
Hand and Rifle Grenades; Rocket, AT, HE, 2.36-inch	FM 23-30
Incendiary Bombs	TM 3-330
Instructions for Use of Rocket Target, M2 by Antiaircraft Units	TM 4-236

References

Instruction Guide, Small Arms Accidents, Malfunctions and Their Causes ..... TM 9-2210
Land Mines ..... TM 9-1940
Land Mines and Booby Traps ..... FM 5-31
Military Pyrotechnics ..... TM 9-1981
Military Pyrotechnics ..... OFSB 3-9
60-mm Mortar M2 ..... FM 23-85
81-mm Mortar M1 ..... FM 23-90
Pyrotechnic Projectors, All Types ..... TM 9-290
Repair of Submarine Mine Cases ..... TM 9-1401
4.5-in. Aircraft Rocket Materiel ..... TM 9-395
Signal Communication ..... FM 1-45
Signal Communication ..... FM 24-5
Small-Arms Ammunition ..... TM 9-1990
Small-Arms Ammunition ..... WDSB 9-AMM 4
Small Arms, Light Field Mortars, and 20-mm Aircraft Guns ..... TM 9-2200
Standard Artillery and Fire Control Materiel ..... TM 9-2300

d. Cleaning, preserving, and lubricating materials.

Cleaning, Preserving, Sealing, Lubricating and Related Materials Issued for Ordnance Materiel ..... TM 9-850
Solvent; dry cleaning ..... Federal Specification P-S-661a

e. Transportation.

Explosives or other dangerous articles on board vessels ..... U. S. Dept. of Commerce

Regulations for transportation of explosives and other dangerous articles by land and water in rail freight, express, and baggage services, and by motor vehicle (highway) and water ..... Interstate Commerce Commission

Methods for loading and staying carload and less than carload shipments of explosives and other dangerous articles (Pamphlet No. 6) ..... Bureau of Explosives, 30 Vesey Street, New York City

References

Methods for loading and bracing carload and less than carload shipments of loaded projectiles, loaded bombs, etc. (Pamphlet No. 6A) Bureau of Explosives 30 Vesey Street, New York City

Motor carrier safety regulations (Part 7) transportation of explosives and other dangerous articles ..... Interstate Commerce Commission

I.C.C. Freight Tariff No. 3 ..... Interstate Commerce Commission

I.C.C. Freight Tariff No. 4 ..... Interstate Commerce Commission

Interstate Commerce Commission regulations for transportation of explosives and other dangerous articles by freight ..... Bureau of Explosives 30 Vesey Street, New York City

Regulations governing transportation of military explosives on board vessels during present emergency ..... U. S. Coast Guard

Regulations for the security of vessels in port ..... U. S. Coast Guard

Standard specification for marking shipments by contractors ..... U.S. Army Specification No. 100-2E

Transportation in the Zone of the Interior ..... TM 55-205

f. **Fire-fighting.**

Crosby-Fiske-Forster Handbook of Fire Protection ..... National Fire Protection Association

Fire-fighting ..... John J. McCarthy, Asst. Chief of Dept. in Command, N. Y. Fire Dept.

Fire Protection by Troop Organizations in Theaters of Operations ..... FM 5-315

Industrial Fire Brigades, 1st Edition ..... National Fire Protection Association

Suggestions for Fire Fighting and Fire Extinguishment ..... Navy Dept. Bureau of Yards and Docks

g. **Miscellaneous.**

Abbreviated Firing Tables ..... TM 6-215

Graphical Firing Tables ..... TM 9-526

Dictionary of United States Army Terms ..... TM 20-205

Bomb Racks, Tow Target Equipment, and Flare Racks ..... TM 1-500

Tactics of Chemical Warfare ..... FM 3-5

Chemical Warfare Service: Supply and Field Service ..... FM 3-15

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