The Interactive features of this manual are currently disabled.

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If you see a popup window do the following:

If you see a yellow banner, do the following:

Once you have completed either of the above procedures the features will be enabled for this document, and this warning won't appear again after you leave this page.
CHAPTER 12

AMMUNITION STORAGE AND HANDLING ASHORE

Ammunition storage ashore applies to the storage of explosives, ammunition, and ammunition components in two different types of environments and operational conditions. When ammunition is stored at permanently established storage locations, such as naval air stations, naval stations, or other Department of the Navy (DON) ammunition activities, extensive safety and procedural requirements exist. However, strategic operations may necessitate the establishment of ammunition storage facilities at advanced bases. Although governing regulations exist for the storage of ammunition at advanced bases, they are not as extensive as those governing permanent storage requirements and regulations. The following text covers ammunition storage ashore and ammunition storage ashore for advanced bases.

LEARNING OBJECTIVES

When you have completed this chapter, you will be able to do the following:

1. Identify ammunition magazines used ashore. Recognize the explosive safety quantity-distance (ESQD) requirements. Recognize the hazards posed by various classes of ammunition.
2. Identify storage capability groups and their use. Identify the facilities used to store ammunition at advanced bases.
3. Identify ammunition storage ashore for advanced bases to include facilities, magazines, and handling requirements.
4. Identify the types of procedures used for magazine maintenance, storage, and handling to include personnel requirements, lightning protection systems, magazine security, and ammunition handling and shipping.

AMMUNITION STORAGE ASHORE

The safe storage of ammunition and explosives at DON shore activities, including tenant activities (Coast Guard, Federal Bureau of Investigation, etc.), regardless of ammunition and explosives ownership, is under the cognizance of Naval Ordnance Safety and Security Activity (NOSSA) as delegated by Naval Sea Systems Command (NAVSEASYSCOM). It also includes DON ammunition and explosives stored at other locations.

All DON shore activities should store only ammunition and explosives for which there is a clear audit trail and reason for storage at the activity. DON shore activities should not store any ammunition and explosives that is in excess to their ammunition storage allowance or to their research, development, testing, or manufacturing needs, unless specifically directed to do so, in writing by the inventory control points or by the designated Disposition Authority (DDA).

Ammunition and explosives may deteriorate in storage. The method of packaging, magazine environment, the length of time the material is stored, the nature of the deterioration, and the explosive compositions used are factors in the rate and criticality of the deterioration. Any deterioration which decreases the stability of the material, thereby increasing the risk of auto-ignition or a handling mishap, creates a safety
hazard. The longer material is retained in storage, the greater the likelihood that
deterioration will occur; therefore, activities should assure that inventory management
programs identify and prioritize older stocks of ammunition and explosives for issue or
use.

A red Bravo flag should be prominently displayed at a facility when explosives and
personnel are present. A Bravo flag should be prominently displayed by all ships and
craft engaged in ammunition and explosives loading and unloading operations. Also a
Bravo flag should be prominently displayed by all barges, lighters, and small boats while
they are loaded with or are transporting ammunition and explosives. At night, a red light
should be used in place of a Bravo flag.

**AMMUNITION IDENTIFICATION**

Ammunition identification is an important part of ordnance handling and administration.
Ammunition identification identifies the type of ammunition, class of explosive contained
in the round, Mark (Mk) and modification (Mod) numbers, lot numbers, and color codes
representing the explosive hazards. Ammunition items are most readily identified by
size, shape, and weight. Specific characteristics of these items are further identified by
painting, marking, lettering, or combinations of these methods.

**SERVICE AMMUNITION** — Ammunition intended for operational use is classified as
service ammunition. The warhead contains explosives, pyrotechnics, or chemical agent
filler. If required, the propellant is of service or reduced charge weight. Aircraft service
ammunition is identified as either armament (kill stores) or ordnance (search stores).

**NON-SERVICE AMMUNITION** — Ammunition used for training personnel in all aspects
of a familiarization program is classified as non-service ammunition. This ammunition
may be of service quality or may be specifically modified or loaded for practice
ammunition inert training, inert dummy/drill, or exercise/recoverable ammunition.

**PRACTICE AMMUNITION** — This is ammunition specifically designed or modified for
use in exercises, practice, or operational training. Practice ammunition may be either
expendable or recoverable. Practice ammunition is not inert and may contain all the
explosive material normally contained in service ammunition. Practice ammunition may
contain additional explosive material such as pyrotechnics, spotting charges, or flotation
devices to assure destruction, location, or recovery.

**INERT AMMUNITION** — This is ammunition and components that contain no explosive
material. Inert ammunition and components include:

- Ammunition and components with all explosive material removed and replaced
  with inert material
- Empty ammunition or components
- Ammunition or components that were manufactured with inert material in place of
  all explosive material

**DRILL AMMUNITION** — This is inert ammunition which may have working mechanisms
or cut–aways and is used for training.

**Painting**

Painting (*Table 12-1*) is the application of the final body coating to ammunition,
ammunition components, or ammunition containers by authorized activities. Usually,
paint color identifies the use or explosive hazards of the ammunition; however, sometimes it has no meaning.

### Table 12-1 — Ammunition Color Code

<table>
<thead>
<tr>
<th>COLOR</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow</td>
<td><em>(1) Identifies high explosives.</em>&lt;br&gt;<em>(2) Indicates the presence of high explosives</em></td>
</tr>
<tr>
<td>Brown</td>
<td><em>(1) Identifies rocket motors and JATOs&lt;br&gt;</em>(2) Identifies low explosive items or components, or indicates the presence of a low explosive*</td>
</tr>
<tr>
<td>*Gray</td>
<td>Identifies ammunition that contains irritant or toxic agents when used as an overall body color except for underwater ordnance</td>
</tr>
<tr>
<td>Gray with Dark Red Band</td>
<td>Indicates the ammunition contains an irritant (riot control) agent</td>
</tr>
<tr>
<td>Gray with Dark Green Band</td>
<td>Identifies the ammunition containing a toxic agent other than binary agents</td>
</tr>
<tr>
<td>*Black</td>
<td>Identifies armor-defeating ammunition, except on underwater ordnance, dummy hand grenades and when used for lettering or marking</td>
</tr>
<tr>
<td>Silver/Aluminum</td>
<td>Identifies countermeasure ammunition</td>
</tr>
<tr>
<td>Light Green</td>
<td>Identifies screening or marking smoke ammunition</td>
</tr>
<tr>
<td>Light Red</td>
<td>Identifies incendiary ammunition or indicates the presence of highly flammable material for producing damage by fire</td>
</tr>
<tr>
<td>*White</td>
<td>Identifies illuminating ammunition or ammunition producing a colored light; exceptions are underwater ordnance, guided missiles, dispensers, and rocket launchers, and when used for lettering or marking</td>
</tr>
<tr>
<td>Light Blue</td>
<td>Identifies ammunition used for practice</td>
</tr>
<tr>
<td>*Orange</td>
<td>Identifies ammunition used for tracking or recovery such as underwater mines and torpedoes</td>
</tr>
<tr>
<td>Bronze, Gold, and Brass</td>
<td>Identifies dummy/drill/inert ammunition not for firing, but only used for handling, loading, assembly and testing, training, and display; Some dummy hand grenades may be painted black</td>
</tr>
</tbody>
</table>

**Nonsignificant Colors**

<table>
<thead>
<tr>
<th>COLOR</th>
<th>INTERPRETATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Olive Drab</td>
<td>All ammunition items</td>
</tr>
<tr>
<td>Black</td>
<td>For lettering</td>
</tr>
<tr>
<td>White</td>
<td><em>(1) For lettering &lt;br&gt;</em>(2) For guide missiles, dispensers, and rocket launchers*</td>
</tr>
</tbody>
</table>

*NOTES: The following colors, or when applied as stated, have NO identification color coding significance:*

1. The colors gray, black, white, or green on underwater ordnance, such as mines and torpedoes, and the color white on guided missiles, dispensers, or rocket launchers
2. The colors black and white when used for lettering or special marking
3. Unpainted or natural color
4. Colors specifically applied to identify the color produced by smoke ammunition or pyrotechnics
Marking

Marking is the application of colored spots, bands, or symbols on ammunition, ammunition components, or ammunition containers. Markings, by their color or shape, identify ammunition fillers or the presence of specific ammunition components.

Lettering

Lettering is the use of letters, words, abbreviations, or numerals on ammunition, ammunition components, or ammunition containers. Lettering is put on ammunition by die stamping, stenciling, decaling, etching, or rubber-stamping. Lettering identifies the type, mark and modification, ammunition lot number, and loading information of the ammunition item. Lettering applied in black or white has no color-code significance.

Mark and Modification Designation

Each particular design of Navy ammunition, ammunition component, or ammunition container is assigned a Mark (Mk) and Modification (Mod) designation. Rockets and guided missile are assigned Department of Defense (DOD) designations.

The Mk number is an Arabic numeral and represents a basic design, followed by a Mod number to represent a less than major change in design. For example, the Mk/Mod number assigned to a general-purpose (GP) bomb without a change to the basic design is Mk 82 Mod O. If a minor change to the basic design is incorporated, it is designated as Mk 82 Mod 1. If further changes are incorporated, the modification designations are assigned in sequence, Mod 2, Mod 3, Mod 4, and so forth.

Marks and Modifications are assigned sequential Arabic numerals. Aeronautical support equipment, including explosive devices and ordnance or armament, use groups of letters and numbers (e.g., BLU-110, BLU-111) to identify the type of unit and its serial.

U.S. Army ammunition retains the Army identifier that uses a letter; numeral; and letter and numeral system. For example, the model is designated M23. The first modification of this model is designated M23A1, and subsequent modifications are designated by M23A2, M23A3, etc. If the Navy and Army jointly developed an item, the letters AN (Army/Navy) precedes the model identifying designation. For example, a model is designated AN-M173. The first modification of this model is designated AN-M173A1. Later modifications are designated as AN-M173A2, AN-M173A3, etc.

Department of Defense Identification Code (DODIC), Navy Ammunition Logistic Code (NALC) and National Stock Number (NSN)

The Department of Defense Identification Code (DODIC) is a four-digit code assigned by the Defense Logistics Information Service Center (DLISC) or Naval Operational Logistics Support Center (NOLSC). It identifies ammunition and explosive items (non-nuclear) within the supply system applicable to all the armed forces. The Navy Ammunition Logistic Code (NALC) is a four-digit code assigned by DLISC or NOLSC-AMMO, prospectively. It identifies Navy-unique items of ordnance. The DODIC and NALC are interchangeable terms and are included as part of the letter identification contained on ammunition and ammunition components. These codes are used specifically for logistic control and ammunition administration.

If an ammunition item or ammunition component has been modified, a DODIC/NALC code is assigned to the modified item. For example, Mk 105 Mod O is assigned code A811 and Mk 105 Mod 1 is assigned code A894. A complete listing of DODICs and
NALCs is contained in *Navy Ammunition Logistics Codes*, NAVAIR 11-1-116B/TW010-AA-ORD-030.

For Navy Ammunition Logistics Code (NALC) Item/Family Reporting—even though each item has its own unique National Item Identification Number (NIIN)/National Stock Number (NSN) for item management purposes, items that are interchangeable as to form, fit, function, and use are assigned a four digit, family-unique DODIC or NALC.

**Ammunition Lot Number**

An ammunition lot is a quantity of ammunition assembled from uniform components under similar conditions. A lot is expected to function in a uniform manner. Each ammunition lot (*Table 12-2*) is assigned a code number (ammunition lot number) that identifies all ammunition items assembled as part of that lot. For specific ammunition lot numbers, you should refer to *Identification of Ammunition*, NAVSEA SW010-AF-ORD-010/NAVAIR 11-1-117.

**Table 12-2 — Derivation of Lot Number**

<table>
<thead>
<tr>
<th>KEY</th>
<th>DEFINITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>Lot sequence number</td>
</tr>
<tr>
<td>b</td>
<td>Manufacturer’s identification symbol</td>
</tr>
<tr>
<td>c</td>
<td>Month of production (two digit)</td>
</tr>
<tr>
<td>d</td>
<td>Year of production (two digit)</td>
</tr>
<tr>
<td>e</td>
<td>Month of production (single alpha)</td>
</tr>
<tr>
<td></td>
<td>JAN—A     MAY—E     SEP—J</td>
</tr>
<tr>
<td></td>
<td>FEB—B     JUN—F     OCT—K</td>
</tr>
<tr>
<td></td>
<td>MAR—C     JUL—G     NOV—L</td>
</tr>
<tr>
<td></td>
<td>APR—D     AUG—H     DEC—M</td>
</tr>
<tr>
<td>f</td>
<td>Interfix number</td>
</tr>
</tbody>
</table>

Example:

Lot Number,

Method 1: 11 ABC 0588

Key: (a) (b) (c)(d)

(Note that (c) and (d) will be used to compute service life.)

Example:

Lot Number,

Method 2: XYE 88 E 001-011A

Key: (b) (d) (e) (f)(a)(g)

(Note that (d) and (e) will be used to compute service life.)
MAGAZINES

Explosives and ammunition are stowed in magazines or areas designated for the specific materials. NAVSEASYSCOM designs and designates all magazines or storage areas. The type and amount of material that may be stowed in any magazine depends on the type of magazine in relation to the explosive safety quantity-distance requirements.

Types of Magazines

Magazines located at naval air stations and other naval installations are of various sizes, types of construction, and classes, depending upon the nature of the material to be stowed. Magazines are designated as high-explosive magazines, smokeless-powder magazines, and ready-service magazines according to their intended use. Magazines are further classified by type of design—surface, subsurface, arch-type, earth-covered, or barricaded.

It is not practical to describe all the types of magazines here. Therefore, only selected types are described in this chapter.

Magazines Currently in Navy Use

Magazines at naval ammunition storage activities are of various sizes and types of construction. Magazines are classified depending on their design or construction as aboveground, arch-type (igloo), box-type, earth-covered, or barricaded. Existing magazines described by definitive drawings are approved for storage of ammunition and explosives. The following represent several types found at most activities:

EARTH-COVERED MAGAZINES (ECMs) – This magazine is any earth-covered structure that meets soil cover depth and slope requirements of OP 5 Volume 1. An ECM has three possible structural strength designations. The strength of an ECM’s headwall and door(s) determines its designation. The primary objective of an earth-covered magazine is to provide protection for its assets.

KEYPORT – The keyport magazine is earth-covered and arch-shaped with a prefabricated concrete construction. It has interior floor dimensions of 6 feet by 8 feet 8 inches. The height of the arch is approximately 6 feet.

CORBETTA – A corbetta magazine is of concrete construction and is similar to the keyport type, but is shaped like a beehive or dome.

GALLERY – A gallery magazine is a tunnel or cave, and the dimensions will vary.

TEMPORARY ARCH-TYPE MAGAZINES – These magazines are fabricated from steel and covered with earth, adopted for temporary outlying overseas stations (and some air stations) for the storage of all types of ammunition or explosives.

READY SERVICE MAGAZINES – When shore establishments require certain types of ammunition to be stored in a ready service condition in order to reduce the arming time, the ammunition may be stored in designated ready service magazines.

READY SERVICE LOCKERS – These lockers are generally used to store small quantities of belted or boxed small arms ammunition, certain pyrotechnics, and similar material that present fire, but no blast, hazard. Ready service lockers may be located in hangars or arming areas provided that construction and location are approved by NOSSA or NOSSA Explosive Safety Support Office Atlantic/Pacific (ESSO LANT/PAC) and are compatible with the regulations of the commands concerned.
PORTABLE MAGAZINES – These commercially built pre-engineered magazines may be used for storage of all Class/Division (C/Ds) of ammunition or explosives, although their application is most efficient for storage of C/D 1.3 and 1.4 materials. Commercial literature or specifications on the magazines do not qualify the magazines for a particular type of storage or explosive limit.

TRIPLE-ARCH – The concrete triple-arch, earth-covered magazine was designed to economize uses of critical material and to provide flexibility of stowage assignments. When combined, the arches constitute a single magazine. The standard floor size of each arch is 25 feet by 80 feet, giving a total usable floor space of approximately 3,650 square feet exclusive of aisle and inspection space. The arches are usually separated at least 10 feet from each other at the floor and the space between is filled with earth.

REINFORCED CONCRETE – An example of a reinforced concrete magazine is an arch-type ECM.

OPEN STORAGE – The type and amount of explosives stowed in open stowage depend on the size and location of the storage area.

Explosive Safety Quantity-Distance (ESQD) Requirements

Explosives safety quantity-distance (ESQD) requirements apply to ammunition and explosives and other hazardous material (HAZMAT) at DON shore activities. These requirements apply to all explosives development, manufacturing, testing, as well as maintenance, storage, loading and offloading of vehicles, railcars, ships and aircraft, disposal, and handling operations where an energetic response (that is, detonation; burn) is not expected.

The requirements are based on records of actual fires and explosions involving ammunition and explosives, the American Table of Distances, and the laws of the State of New Jersey. Standards of the Department of Defense Explosives Safety Board (DDESB) that takes these factors into consideration are periodically reviewed and updated.

The requirements are designed to provide the inhabitants of nearby communities, the personnel of DON shore activities, and adjacent public and private property reasonable safety from serious injury or destruction from accidental fires or explosions, and to minimize the loss of valuable ammunition stores (including inert ordnance items), through accidental fires or explosions.

The DDESB standards and criteria, contained in DOD 6055.9-STD using the United Nations Organization (UNO) hazard classification system, have been incorporated in NAVSEA OP 5 publications in compliance with DOD directives.

The DOD uses the UNO classification system for dangerous materials to identify the hazardous characteristics of ammunition and explosives. The UNO classification system contains nine hazard classes identified in Table 12-3.
### Table 12-3 — United Nations Organization Hazard Classes

<table>
<thead>
<tr>
<th>DIVISION DESIGNATOR</th>
<th>TYPE OF HAZARD</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Class 1. Explosives</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mass explosion</td>
</tr>
<tr>
<td>2</td>
<td>Fragment producing; non-mass explosion</td>
</tr>
<tr>
<td>3</td>
<td>Mass fire, minor blast and/or minor fragment; non-mass explosion</td>
</tr>
<tr>
<td>4</td>
<td>Moderate fire, no significant blast or fragment; non-mass explosion</td>
</tr>
<tr>
<td>5</td>
<td>Very insensitive explosive substance with a mass explosion hazard</td>
</tr>
<tr>
<td>6</td>
<td>Extremely insensitive explosive article; non-mass explosion</td>
</tr>
<tr>
<td><strong>Class 2. Gases</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Flammable gas</td>
</tr>
<tr>
<td>2</td>
<td>Nonflammable, nonpoisonous compressed gas</td>
</tr>
<tr>
<td>3</td>
<td>Gas poisonous by inhalation</td>
</tr>
<tr>
<td><strong>Class 3. Flammable Liquids</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Class 4. Flammable Solids</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Flammable solid</td>
</tr>
<tr>
<td>2</td>
<td>Spontaneously combustible material</td>
</tr>
<tr>
<td>3</td>
<td>Dangerous when wet material</td>
</tr>
<tr>
<td><strong>Class 5. Oxidizing Substances and Organic Peroxides</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Oxidizer</td>
</tr>
<tr>
<td>2</td>
<td>Organic peroxide</td>
</tr>
<tr>
<td><strong>Class 6. Toxic and Infectious Substances</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Poisonous material</td>
</tr>
<tr>
<td>2</td>
<td>Infectious substance</td>
</tr>
<tr>
<td><strong>Class 7. Radioactive Materials</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Class 8. Corrosive Materials</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Class 9. Miscellaneous Hazardous Materials</strong></td>
<td></td>
</tr>
</tbody>
</table>

The numerical order of the classes and divisions is not that of the degree of danger.
CLASS/DIVISIONS

Hazard classes are further divided into divisions that indicate the primary characteristic and associated hazards. These divisions are indicated in Table 12-3.

C/Ds are designated using decimal notation. A Class 1, Division 1 hazard, for example is designated by C/D 1.1. Placards which identify the C/D are used to identify the material during storage, handling, and transportation. In the event of an accident or a fire, the personnel who respond will know what type of material is involved.

In reviewing Table 12-3, you can see that some items are placed in classes other than Class 1. An AO is involved with the storage of Class 1 material; therefore, the information contained in this section only deals with Class 1 classifications.

DOD Hazard Class 1 is subdivided into divisions 1 through 6, based on the character and predominance of the associated hazards and the potential for causing personnel casualties or property damage. These subdivision are not based upon compatibility groups or intended use.

FIRE DIVISIONS

The fire divisions correspond to the explosive hazard C/D 1.1 through 1.6, and are numbered serially by Arabic numerals from 1 to 6.

Fire division 1 indicates the greatest hazard. The hazard decreases with ascending fire division numbers from 1 to 4; fire divisions 5 and 6 refer to explosion hazards from less sensitive substances and extremely insensitive articles, respectively. The degree of hazard is based on the burning or explosive characteristics of the materials involved.

The divisions are as follows:

<table>
<thead>
<tr>
<th>Fire Division</th>
<th>Hazard Involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mass explosion</td>
</tr>
<tr>
<td>2</td>
<td>Fragment-producing</td>
</tr>
<tr>
<td>3</td>
<td>Mass fire</td>
</tr>
<tr>
<td>4</td>
<td>Moderate fire</td>
</tr>
<tr>
<td>5</td>
<td>Mass explosion (very insensitive explosive substance)</td>
</tr>
<tr>
<td>6</td>
<td>Non-mass explosion (extremely insensitive explosive article)</td>
</tr>
</tbody>
</table>

MASS-DETONATING HAZARD MATERIALS (CLASS/DIVISION 1.1) — Damage from mass-detonating hazard materials is caused by concussion or blast or by sympathetic detonation. Prescribed distances listed in NAVSEA OP 5 Volume 1 between piles of these materials and between magazines containing these materials must be maintained to minimize the possibility of sympathetic detonation or propagation. Ammunition and explosives that are considered mass-detonating hazards are Hazard Class 1, Division 1.

NON-MASS-DETONATING HAZARD, FRAGMENT-PRODUCING MATERIALS (CLASS/DIVISION 1.2) — The principal hazards for items within this division are fragment and blast, either individually or in combination, depending on such factors as storage configuration, type of packing, and quantity. The designated minimum distances
are based upon the limited range of fragments. These are the distances that must be used for protection of inhabited buildings and public traffic routes.

MASS FIRE HAZARD MATERIALS (CLASS/DIVISION 1.3) — Items in this division burn vigorously. There is little or no possibility for extinguishing them in a storage situation. Normally, explosions will be confined to pressure ruptures of containers and will not produce propagating shock waves or damaging blast overpressure beyond specified distances. A severe fire may result from the tossing about of burning container materials, propellant, or other flaming debris. Toxic effects, such as burning pyrotechnic items, will not normally extend beyond the inhabited building distances specified for this division.

MODERATE FIRE HAZARD, NO BLAST MATERIALS (CLASS/DIVISION 1.4) — Items in this division present a fire hazard with minimal blast, fragmentation, or toxic hazard. Devices that contain explosives are not considered Class 1 if an inadvertent or accidental ignition during storage or transport will not result in fire, smoke, heat, loud noise, or visible damage to the outer packaging.

VERY INSENSITIVE SUBSTANCE (CLASS/DIVISION 1.5) — Items in this division are substances that although mass detonating, are so insensitive that there is negligible probability of initiation or transition from burning to detonation in transportation or storage.

EXTREMELY INSENSITIVE DETONATING ARTICLE (CLASS/DIVISION 1.6) — Items in this division contain extremely insensitive detonating substances (EIDS) that have been demonstrated through tests described in NAVSEAINT 8020.8 (series), that mass and confinement effects of the ammunition case are negligible on the probability of initiation or transition from burning to detonation.

Normally, technical manuals do not present the hazard class, division, and compatibility group as they are written in previous paragraphs. For example, an item classified as Class 1, Division 5, Compatibility Group D, is written as Class 1.5D; or an item in Class 1, Division 4, Compatibility Group S is written as Class 1.4S.

Storage Compatibility Groups

Ammunition and explosives may not be stored together with dissimilar materials or items that present positive hazards to the munitions. Thus, they cannot be stored with flammable or combustible materials, acids, or corrosives unless they have been assessed to be compatible.

Different types of ammunition and explosives (by class and division) may be mixed in storage provided that they are compatible. Ammunition and explosives are assigned to a storage compatibility group (SCG) when they can be stored together without significantly increasing either the probability of an accident—or for a given quantity—the magnitude of the effects from such an accident.

Thirteen groups are established (A, B, C, D, E, F, G, H, J, K, L, N, and S). Compatibility group are described as follows:
**Group A** – This group is described as initiating (Primary) explosives; bulk initiating explosives that have the necessary sensitivity to heat, friction, or percussion to make them suitable for use as initiating elements in an explosive train; and materials in this group are prohibited aboard combatant ships. Examples include bulk lead azide, lead styphnate, mercury fulminate, tetracene, dry cyclonite (RDX), and dry pentaerythritoltetranitrate (PETN).

**Group B** – This group is described as detonators and similar initiating devices not containing two or more effective protective features and items containing initiating explosives that are designed to initiate or continue the functioning of an explosive train. Examples include detonators, blasting caps, small arms primers, and fuzes.

**Group C** – This group contains bulk propellants, propelling charges, and devices containing propellant with, or without, its own means of ignition. Examples include bulk single-, double-, or triple-base, and composite propellants, rocket motors (solid propellant), and propelled ammunition and explosive with inert projectiles.

**Group D** – This group included bulk black powder; bulk high explosive (HE); and ammunition and explosives without a propelling charge, but containing HE without its own means of initiation; that is, no initiating device is present or the device has two or more effective protective features. Examples include bulk trinitrotoluene (TNT), Composition B, and black power; bulk wet RDX or PETN; bombs, projectiles, cluster bomb units (CBU), depth charges, and torpedo warheads.

Where sufficient stowage space is available, it is desirable to store bulk HE separately from ammunition containing HE even though they are both in the same compatibility group.

**Group E** – This group is defined as ammunition and explosives containing HE without its own means of initiation (that is, no initiating device is present or the device has two or more effective, protective features), and either containing, or with, a solid propelling charge. Examples include artillery ammunition and explosives, rockets, or guided missiles.

**Group F** – This group is defined as ammunition and explosives containing HE with its own means of initiation; that is, the initiating device present has less than two effective, protective features, and with or without a solid propelling charge. Examples include HE grenades, sounding devices, and similar items having explosive trains with less than two effective, protective features.

**Group G** – This group includes illuminating, incendiary, and smoke (including hexachlorethane) or tear-producing ammunition and explosives excluding those that are water-activated (without safety feature) or that contain White Phosphorus (WP) or a flammable liquid or gel. Examples include flares, signals and pyrotechnic substances.

Some compatibility group G articles may contain air activated (pyrophoric) material. These articles are assigned a “G” only if they are designed such that the pyrophoric properties in the storage and transportation configuration do not present a special risk.
**Group H** – This group is defined as ammunition and explosives containing WP. Ammunition and explosives in this group contain fillers that are spontaneously flammable when exposed to the atmosphere. Examples include WP and plasticized WP.

**Group J** – Ammunition and explosives in this group contain flammable liquids or gels other than those that are spontaneously flammable when exposed to water or the atmosphere. Examples include liquid- or gel-filled incendiary ammunition and explosives, fuel-air explosive (FAE) devices, and flammable liquid-fueled missiles and torpedoes.

**Group K** – This group contains ammunition and explosives containing toxic chemical agents. Ammunition and explosives in this group contain chemicals specifically designated for incapacitating effects more severe than lachrymation (tear-producing). Examples include artillery or mortar ammunition and explosives (fuzed or unfuzed), grenades, as well as rockets and bombs filled with a lethal or incapacitating chemical agent.

**Group L** – Ammunition and explosives not included in other compatibility groups are categorized as Group L. This group contains ammunition and explosives having characteristics that present a special risk that does not permit storage with other types of ammunition and explosives, or other kinds of explosives, or dissimilar ammunition and explosives of this group. Examples include water-activated devices (without safety feature), pyrophorics and phosphides, and devices containing these substances, prepackaged hypergolic liquid-fueled rocket engines, triethyl aluminum, plasticized triethyl aluminum, and damaged or suspect ammunition and explosives of any group.

**Group N** – This group includes ammunition and explosives containing only EIDS. An example is hazard Class/Division 1.6 ammunition and explosives.

**Group S** – Ammunition and explosives that present no significant hazard are classified as Group S, and includes ammunition and explosives packaged or designed so that any hazardous effects from accidental functioning are limited to the extent that they do not significantly hinder firefighting.

Ammunition and explosives are assigned to compatibility groups. When stored within their assigned group, ammunition and explosives can be stored together without significantly increasing either the probability of an accident or, for a given quantity, the magnitude of the effects of such an accident. The mixing of storage compatibility groups is permitted by NOSSA, as shown in Table 12-4. The mixing of storage compatibility groups other than those shown must be approved by NOSSA.
# Table 12-4 — Storage Compatibility Chart for Shore Activities.

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>N</th>
<th>S</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X</td>
<td>Z</td>
<td></td>
<td></td>
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<tr>
<td>B</td>
<td>Z</td>
<td>X</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>C</td>
<td>Z</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Z</td>
<td>Z</td>
<td></td>
<td></td>
<td>X</td>
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<tr>
<td>D</td>
<td>Z</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Z</td>
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<td>X</td>
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<tr>
<td>E</td>
<td>Z</td>
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<tr>
<td>F</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>Z</td>
<td>X</td>
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<td>Z</td>
<td>X</td>
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<tr>
<td>G</td>
<td>Z</td>
<td>Z</td>
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<td>Z</td>
<td>Z</td>
<td>X</td>
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<td>H</td>
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<td>X</td>
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<td></td>
<td>X</td>
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<tr>
<td>J</td>
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<td></td>
<td>X</td>
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<td>X</td>
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<tr>
<td>K</td>
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<td>Z</td>
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<td>L</td>
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<td></td>
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<tr>
<td>N</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>Z</td>
<td>Z</td>
<td></td>
<td></td>
<td>X</td>
<td>X</td>
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<td></td>
</tr>
<tr>
<td>S</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## NOTES:

1. The marking “X” at an intersection of the above chart indicates that these groups may be combined in storage. Otherwise, mixing is either prohibited or restricted per note 2 below.

2. The marking “Z” at an intersection of the above chart indicates that, when warranted by operational considerations or magazine non-availability, and when safety is not sacrificed, logical mixed storage of some items of different groups may be authorized by NOSSA upon written request. Mixing of limited quantities of some groups, as authorized by note 5 below, does not require a written request. Authorization is not to be considered a waiver. Combinations that violate the principles of OP-5 paragraph 3-9 require justification by waiver or exemption. Examples of acceptable combinations of class 1 are:

   a. Division 1, group A initiating explosives with division 1, group B fuzes not containing two or more independent safety features
   b. Division 3, group C bulk propellants or bagged propelling charges with division 3, group G pyrotechnics without their own means of initiation

3. Equal numbers of separately packaged components of complete rounds of any single type of ammunition may be stored together. When so stored, compatibility is that of the assembled round; i.e., WP filler in group H, HE filler in groups D, E, or F, as appropriate.

4. Ammunition designated “practice” by NSN and nomenclature may be stored with the fully loaded ammunition it simulates.

5. Mixing of compatibility groups (except items in groups A, K, and L) is authorized when the total quantity does not exceed 1,000 pounds Net Explosives Weight (NEW). Mixed storage that exceeds 1,000 pounds NEW must be approved by NOSSA.

6. Group K requires not only separate storage from other groups, but may also require separate storage within the group. NOSSA shall determine which items in group K may be stored together and those which must be stored separately.

7. Ammunition items without explosives which contain substances properly belonging to another hazard class may be assigned to the same compatibility group as items containing explosives and the same substance, and be stored with them.
8. For purposes of mixing, all items must be packaged in approved storage/shipping containers. Items shall not be opened for purposes of issuing unpackaged munitions at storage locations. Outer containers may be opened in storage locations for purposes of inventorying; for removing munitions still inside an approved inner package in limited amounts, and for magazines storing only hazard division 1.4 items, unpacking, inspecting, and repacking the hazard division 1.4 ammunition.

9. When using the “Z” mixing authorized by note 2, articles of compatibility groups B and F each shall be segregated in storage from articles of other compatibility groups by means that prevent the propagation of group B or F articles, to articles of other compatibility groups.

10. When ammunition or ammunition components are assigned to hazard classes 2 through 9, they may be stored in accordance with the compatibility group assigned. The net explosive weight of these items is not to be considered for quantity-distance computations, since the predominant hazard is classes 2 through 9.

11. If dissimilar hazard Class/Division 1.6, group N munitions, such as Mk 82 and Mk 84 GP bombs, are mixed together and have not been tested to assure non-propagation, the mixed munitions are to be considered hazard Class/Division 1.2, group D for purposes of transportation and storage.

12. Group L items presenting similar hazards may be stored together provided NOSSA authorization is obtained. Mixing with other storage compatibility groups is forbidden.

IDENTIFICATION OF FACILITIES

Buildings and magazines, including open storage sites that contain ammunition, explosives, or chemical and inert components, are marked according to a standard system of identification so the hazards associated with their contents can be rapidly identified.

The identification system, as a minimum, consists of the Naval Facilities Engineering Command (NAVFACENGCOM) building number in accordance with NAVSO P-1000, Navy Comptroller Manual Volume 3. This number will be prominently displayed on the facility or at the entrance of an open storage site. This number will be in addition to any other number appearing on or near the facility as desired by the station or as required by other authority. The number shall be at least 6 inches high. Any other markings which appear on or near a facility shall be so displayed as to not confuse the identification of a facility.

MAGAZINE DESIGNATOR

The magazine designator system included in previous versions of NAVSEA OP 5 is not applicable to new magazine designs and use. Continued use of the three group symbol of numbers and letters on existing magazines is still authorized, but not required.

The following paragraphs describe the magazine identification system that may be in use at some DON activities.

The magazine designator is a three-group symbol, composed of numbers and letters. It identifies a magazine by location of the magazine group, the number of the magazine within the group, and the type of magazine construction.

The magazine group number, the type of magazine and capacity letter(s), and the magazine sequence number form the three-group symbol that makes up the magazine designator.
Magazine Group Number

The magazine group number is the first number of the magazine designator symbol. It shows the magazine group in which the magazine is located. Each physically separated group of magazines or, at smaller stations, each noncontiguous magazine area is assigned a number, making it easy to identify the group. The group numbers begin with 1 and continue in ascending numerical order. If only one magazine group exists, the number 1 is used. For example, the numeral 4 in the first position of the magazine designator 4XTX4 indicates that this magazine is located within magazine group 4.

Magazine Type and Capacity Letter(s)

The magazine type and capacity letter(s) shows the type and capacity of the magazine. For this reason, magazines of certain sizes are assigned a letter designation as indicated in Tables 12-5, 12-6, 12-7, and 12-8.

To show the type of magazine, for example, the letter T is added if the magazine is earth-covered and barricaded. If the magazine is earth-covered but not barricaded the letter C is added. If the magazine is not earth-covered but is barricaded, the letter S is added. Therefore, in the magazine designator 4XTX4, the letter X in the second position indicates that the magazine size is miscellaneous or nonstandard, and it is normally used for storing high explosives. Also, the normal explosive storage limit depends on the magazine's size, location, and type of construction.
Table 12-5 — Magazine Designators for Mass Detonating Hazard of High Explosives (Bulk, Depth Charges, Mines, Warheads, Bombs, etc.), Fuzes, Detonators, Exploders, and Black Powder

<table>
<thead>
<tr>
<th>DIMENSIONS (nominal)</th>
<th>NORMAL USE</th>
<th>NORMAL EXPLOSIVE LIMIT</th>
<th>LETTER DESIGNATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>25’ x 80’ arch type (igloo)</td>
<td>High explosives</td>
<td>500,000 lb</td>
<td>A</td>
</tr>
<tr>
<td>25’ x 50’ arch type (igloo)</td>
<td>High explosives</td>
<td>250,000 lb</td>
<td>B</td>
</tr>
<tr>
<td>25’ x 40’ arch type (igloo)</td>
<td>High explosives</td>
<td>250,000 lb</td>
<td>B</td>
</tr>
<tr>
<td>39’ x 44’ or 32’ x 44’ (warhead type)</td>
<td>High explosives</td>
<td>500,000 lb</td>
<td>W</td>
</tr>
<tr>
<td>12’ x 17’ (box type)</td>
<td>Black powder</td>
<td>20,000 lb</td>
<td>E</td>
</tr>
<tr>
<td>Miscellaneous or nonstandard size</td>
<td>High explosives</td>
<td>Dependent upon size, location, construction</td>
<td>X</td>
</tr>
<tr>
<td>Open storage</td>
<td>High explosives</td>
<td>Dependent upon size, location</td>
<td>R</td>
</tr>
<tr>
<td>25’ x 20’ arch type (igloo)</td>
<td>Fuze and detonator</td>
<td>70,000 lb</td>
<td>F</td>
</tr>
<tr>
<td>52’ dome (Corbetta type)</td>
<td>High explosives</td>
<td>500,000 lb</td>
<td>D</td>
</tr>
<tr>
<td>Dimensions vary (gallery or tunnel type)</td>
<td>High explosives</td>
<td>250,000 lb</td>
<td>G</td>
</tr>
<tr>
<td>10’ x 14’</td>
<td>Fuze and detonator</td>
<td>15,000 lb</td>
<td>H</td>
</tr>
<tr>
<td>10’ x 7’</td>
<td>Fuze and detonator</td>
<td>7,500 lb</td>
<td>H</td>
</tr>
<tr>
<td>6’ x 8’8” (Keyport type)</td>
<td>High explosives</td>
<td>4,000 lb</td>
<td>K</td>
</tr>
<tr>
<td>52’ x 97’ (box type A)</td>
<td>High Explosives</td>
<td>500,000 lb</td>
<td>A</td>
</tr>
<tr>
<td>62’ x 76’ (box type B)</td>
<td>High Explosives</td>
<td>500,000 lb</td>
<td>A</td>
</tr>
</tbody>
</table>

The explosive limits contained in Tables 12-5 through 12-8 are maximum capacities. They are based on magazine design and construction characteristics. These limits are further subject to the ESQD considerations discussed previously. Additional limitations are shown in the magazine designator. When the ESQD relationship, as indicated in the tables, doesn’t permit using the explosive capacity design of a standard magazine because of insufficient separating distances, the letter X, Y, or Z is added to the designator. These letters indicate the magazine contains mass detonation hazards, mass fire hazards, or fragment-producing hazards, respectively. For example, in the magazine designator 4XTX4, the letter X in the fourth position tells you that the magazine doesn’t have a sufficient separating distance from other structures or magazines.
Table 12-6 — Magazine Designators for Fire Hazard of Powder (Bulk or Semifixed Ammunition), Pyrotechnics, Ignition Fuzes and Primers, Small Arms, Smoke Drums, and Explosive-Loaded Chemical Ammunition

<table>
<thead>
<tr>
<th>DIMENSIONS (nominal)</th>
<th>NORMAL EXPLOSIVE LIMIT</th>
<th>LETTER DESIGNATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>50’ x 100’</td>
<td>1,000,000 lb</td>
<td>L</td>
</tr>
<tr>
<td>25’ x 80’ triple-arch</td>
<td>1,000,000 lb</td>
<td>L</td>
</tr>
<tr>
<td>52’ dome (Corbetta type)</td>
<td>1,000,000 lb</td>
<td>D</td>
</tr>
<tr>
<td>50’ x 60’</td>
<td>300,000 lb</td>
<td>M</td>
</tr>
<tr>
<td>30’ x 50’</td>
<td>125,000 lb</td>
<td>N</td>
</tr>
<tr>
<td>25’ x 48’</td>
<td>125,000 lb</td>
<td>N</td>
</tr>
<tr>
<td>25’ x 40’</td>
<td>125,000 lb</td>
<td>N</td>
</tr>
<tr>
<td>Miscellaneous or nonstandard size</td>
<td>Dependent upon location, size, and construction</td>
<td>Y</td>
</tr>
</tbody>
</table>

Table 12-7 — Magazine Designators for Fragment Hazard of Projectile and Fixed Ammunition

<table>
<thead>
<tr>
<th>DIMENSIONS (nominal)</th>
<th>MAXIMUM EXPLOSIVE LIMIT</th>
<th>LETTER DESIGNATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>50’ X 100’</td>
<td>500,000 lb</td>
<td>P</td>
</tr>
<tr>
<td>25’ X 80’ triple-arch</td>
<td>500,000 lb (total for three arches)</td>
<td>P</td>
</tr>
<tr>
<td>25’ dome (Corbetta type)</td>
<td>500,000 lb</td>
<td>D</td>
</tr>
<tr>
<td>Miscellaneous or nonstandard size</td>
<td>150,000 lb</td>
<td>Z</td>
</tr>
</tbody>
</table>

Table 12-8 — Magazine Designators for Miscellaneous Magazines

<table>
<thead>
<tr>
<th>DIMENSIONS (nominal)</th>
<th>TYPE</th>
<th>LETTER DESIGNATOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>All inert storehouses</td>
<td>SH</td>
<td></td>
</tr>
</tbody>
</table>
**Firefighting Hazard Identification**

**Fire Hazard Symbols** – Each fire division and chemical hazard can be identified by a corresponding symbol. Four fire symbols cover the six explosive divisions described. Because of similar firefighting hazards, the C/D 1.1 fire symbol is also used for C/D 1.5, and the C/D 1.2 fire symbol is used for C/D 1.6.

Each of the four fire symbols has a distinctive shape so that it is easily recognized by the firefighting personnel approaching the fire scene. For the purpose of long range identification, the symbols differ in shape as follows:

1. Octagon shape          Fire division 1 symbol
2. Cross shape            Fire division 2 symbol
3. Inverted triangular shape Fire division 3 symbol
4. Diamond shape          Fire division 4 symbol

All four symbols are colored orange. The color of the fire division identification number is black. This color scheme corresponds to that used by the North Atlantic Treaty Organization (NATO), the United Nations Organization (UNO), and the International Maritime Organization (IMO) to label class I explosives (*Figure 12-1*).
Chemical Agent and Ammunition Hazard Symbols – Chemical agent and ammunition hazard symbols are used to identify operating buildings and storage facilities that contain pyrotechnics, chemical munitions or agents, and other hazardous materials. These symbols can be used by themselves or in conjunction with fire symbols, as appropriate.

These symbols are specifically for firefighting situations and are not necessarily applicable to normal operating conditions.

Hazard symbols represent the type of agent being stored or processed. These symbols are illustrated in Figures 12-2. The hazard is designated by each symbol and the applicable firefighting precautions to be observed.

Posting of Symbols – The symbol or symbols that represent the most hazardous material present shall be posted outside hazardous materials storage sites and operating buildings unless security considerations make it undesirable to identify the materials present at the site. In these cases, the posting of firefighting symbols on nuclear and chemical sites will be at the discretion of the activity Commanding Officer (CO). The contents of magazines not posted will be identified on the activity fire map.

A posted symbol should be situated so it is visible during daylight from a distance of 500 feet. If visibility is obstructed by vegetation, curves in roads, etc., the symbol shall be placed on the roadway so as to be visible from a distance of 500 feet. One symbol
posted on or near the door end of an igloo magazine, or on the headwall of a box-type magazine, is normally adequate.

One or more symbols may be required on other buildings. When all material within a storage area is covered by one fire symbol, it may be posted at the entry control point or on the access roadway. When different classes or divisions of explosives are stored in individual multi-cubicle bays or module cells, they may be further identified by posting the proper symbol on each bay or cell. Placement of symbols shall be coordinated with the station fire department.

Empty signs – Empty signs should be posted and fire division/chemical hazard symbols removed or covered on a magazine whose contents have been removed, unless security considerations make it undesirable to identify magazines in a high security area. If empty signs are not posted for this reason, emergency procedures shall be established whereby firefighting agencies will be notified of magazine contents, or lack thereof, in case of fire.

AMMUNITION STORAGE ASHORE FOR ADVANCED BASES

Advanced base is the general term for a temporary base that is in or near a forward area outside the zone of the interior. The primary mission of an advanced base is to support wartime operations of the armed forces. Advanced bases are established to perform one or more of the following functions: to hold threatened strategic areas; to protect, or be part of, a line of communications and supply; to serve as a base for direct offensive operations; or to serve as a base for mounting or supporting further offensives.

If a valid reason for not complying with storage and handling regulations/instructions at advanced bases is not contained in NAVSEA OP 5, VOL 1, Ammunition and Explosives Safety Ashore for Contingencies, Combat Operations, Military Operations Other Than War, and Associated Training, NAVSEA OP 5, VOL 3, should be consulted.

AMMUNITION STORAGE AND HANDLING FACILITIES OF AN ADVANCED BASE

Ammunition storage and handling facilities of advanced bases are identified as Ammunition Supply Points (ASP) and Airfield Ammunition Supply Points (Airfield ASP).

An ASP is normally established to facilitate the through-put for all Class V (Ammunition) materiel received into the area responsible for consolidation and redeployment of this materiel. The Airfield ASP is established at or near airfields to provide Class V logistical support required for aircraft and defense of the aviation installation.

When an advanced base is established, the storing and handling facilities should be divided into areas. These areas should correspond to the functions required by the mission of the base to make ordnance-handling operations easier and smoother and to isolate hazards.

Areas at advanced bases are designated as storage, segregation, staging, disposal, port, enemy ammunition, administration/personnel, assembly, renovation, and embarkation/debarkation areas. These areas are discussed briefly in the following paragraphs.

Ammunition and Explosives Storage Areas – Provide two or more magazine or storage areas for each advanced base. This allows you to disperse ammunition stows,
and makes it easier to receive and issue ammunition. The primary objective in dispersing ammunition is to prevent the complete loss of a single type of ammunition because of fire, accidental explosion, or hostile action. Ample provision should be made for expansion during the initial planning of magazine areas.

**Segregation Areas** - Ammunition received in an unsegregated condition must be separated prior to storage by lot number, type, and physical condition. A location for this purpose should be provided within the ammunition explosive area.

**Ammunition and Explosives Staging Area** – Ammunition and explosives staging areas are normally used at advanced bases as a holding area for outgoing ammunition and explosives and for ready access to combat aircraft loading areas. The ammunition and explosives staging area should be located near the entrance of an ASP to allow accomplishment of administrative requirements. The ASP may also use this area to safe haven vehicles. An ammunition and explosives staging area may also be located adjacent to, or in close proximity to the combat aircraft loading area to provide a suitable holding area for all-up-round weapons to meet daily operational requirements.

**Demolition/Disposal Area** – A demolition area is used for destroying unserviceable ammunition and explosives. This area may be selected within the confines of the ASP provided that it is a minimum of 1,800 feet from any stored ammunition and explosives and 2,340 feet from any other component areas. The minimum fragment distances in NAVSEA OP 5 Volume 1, will be used when they exceed these distances.

Routine disposal operations, including burning or detonation of unserviceable ammunition, explosives, and other hazardous materials, will be performed by qualified personnel and shall be conducted in accordance with Standard Operating Procedures (SOPs) approved by cognizant ordnance group commanders and local activity commanders. A suitable shelter will be provided to protect personnel during demolition operations.

**Port Areas** – An isolated and separate ammunition pier should be provided during the initial stages of construction of an ammunition and explosives storage area at advanced bases. Such a facility should eliminate congestion, delay, and hazards caused when a single pier is used for loading and/or unloading of general cargo, fuels, and ammunition.

**Captured Enemy Ammunition Area** – A separate area should be provided for the storage of captured enemy ammunition and explosives. It should be isolated by fire breaks and at public traffic route distance from other stocks based on the quantity of explosives involved.

**Administration and Billeting Areas** – Administration and billeting areas not directly involved with routine ordnance or aircraft operations will be sited at Inhabited Building Distance (IBD) from any explosive hazard. Personnel directly related to the ordnance operations can operate from facilities.

**Weapon Assembly Areas** – A Weapons Assembly Area (WAA) is established at an Airfield ASP to facilitate assembly/disassembly of ammunition required to support the aviation mission. A WAA may also be established at an ASP when all Class V functions are supported by that activity. The WAA should be located away from other areas to facilitate operations and to isolate hazards.

**Ammunition Renovation Area** – An area may be needed for maintenance and repair of ammunition and explosives, or their containers. Such an area can also be used for surveillance, inspection, and a weapons assembly area provided that required grounding points are available.
**Point of Embarkation/Debarkation** – Both airfields and piers can serve as points of embarkation/debarkation for ammunition and explosives. Storage areas associated with points of embarkation/debarkation will be designated and should minimize risk to personnel and property.

**Ammunition Storage Facilities**

Ammunition and explosives at advanced bases may be stored in existing magazines, buildings, and in dry caves and tunnels. Ammunition may also be stored in the open, in quarries, pits, and similar areas. Ammunition must not be put in caves, tunnels, quarries, or pits if there is not adequate drainage.

When possible, available magazines and buildings should be assigned for storing the more fragile and perishable ammunition, such as pyrotechnics, ammunition containing smokeless powder, fuzes, and similar components. The more durable ammunition, such as aircraft bombs and depth charges, should be stored in the open, provided it affords maximum protection against corrosion and deterioration.

**Magazine Storage**

When the local situation allows, the magazine storage criteria and peacetime Quantity – Distance (Q-D) of chapter 7 of NAVSEA OP 5 Volume 1 should be followed. This level of protection limits the risk to the civilian and unrelated military population from death or serious injury from blast overpressure and fragments due to an explosion, protects vital facilities from serious damage, and protects ammunition from propagation. When preservation of mission capability is essential, asset preservation distances should be selected.

Existing magazines used for storing ammunition and explosives shall be as prescribed in NAVSEA OP 5 Volume 1, and OP 5 Volume 3. Existing ECMs may be considered (undefined) ECMs if the 2 feet earth-covered requirement can be verified.

Existing buildings may be used for the storage of ammunition and explosives. Buildings should be of fire-resistant construction, afford good protection against moisture and dampness, have means for adequate ventilation, have substantial flooring to support the ammunition, and in all respects afford adequate protection to adjacent areas. Intermagazine separation will be based on aboveground (not earth-covered) distances.

Caves and tunnels may be used to store ammunition and explosives if they are dry and free of moisture seepage. In hot climates ammunition and explosives containing smokeless powder should not be stored in caves and tunnels unless they can be ventilated to prevent the accumulation of ether fumes. In dry climates, ammunition and explosives stored in caves or tunnels should be above the ground water level. Intermagazine separation distances based on ECMs should be used to the extent possible. Primary concern for propagation is the front-to-front orientation of the cave or tunnel opening.

When ammunition and explosives are stored in the open, as aboveground magazines, Field Storage Units (FSUs), or modulars, special considerations must be given to protect the material from the elements.

Storage should be in magazines (aboveground or earth-covered) or in open stacks, which would be considered aboveground (not earth-covered) magazines for determination of intermagazine distance. Commercial shipping containers used for ammunition storage will be considered an aboveground magazine unless 2 feet of earth
Conversion of Shipping Containers Into Earth-Covered Magazines – The skin of a shipping container is not designed to support the weight of 2 feet of earth without causing deformation of the roof. Procedures in OP 5 Volume 3 provide a method to reinforce the container, allowing the roof to support 2 feet of earth. When containers can be limited to a maximum explosive limit of 8,820 pounds of hazard Class/Division (C/D) 1.1, 1.2.1, 1.2.2 and 1.3 materials, and the application of conventional earth cover is not practicable, they can be used as ECMs, using sandbag-filled containers to provide fragment protection. C/D 1.4 material can be stored without being included in the total weight. Figures 12-3 and Figures 12-4 provide two options for using sandbag-filled containers for overhead protection. Figures 12-3 uses conventional earth slopes on the sides and rear, while Figures 12-4 uses sandbag-filled containers on the sides and rear.
FIELD STORAGE UNITS

When it becomes impractical to manage ammunition separation distances by NEW, short tons calculated on gross package weight may be used. This concept designates the storage areas as FSUs consisting of one or more stacks of ammunition. The principal objective of the FSU concept is the dispersion of ammunition to minimize the loss in case of fire, accidental explosion, or enemy action.

Each type of ammunition must be stored in at least two widely separated FSUs to prevent the loss of any one FSU from seriously handicapping military operations by the loss of the entire supply of any item. The FSU concept does not provide the degree of protection from propagation afforded by magazine storage arrangements.

Organization of Field Storage Units – The following criteria must be followed to establish an FSU.

- Short tons should be considered gross weight to include the weight of both ammunition and packing material.
- Each FSU is limited to a maximum of 400 short tons (800,000 lbs.) with spacing between units established by OP 5 Volume 3.
- Each stack within an FSU is limited to a maximum of 20 short tons.

Figure 12-4 – Shipping container as earth-covered magazine.
• Stacks must be separated by a minimum of 50 feet. This distance only provides protection against fire. It does not provide complete protection from propagation of detonation by blast over pressure or fragments. The loss of stacks is viewed acceptable within an FSU. Separation between FSUs provides viable protection against propagation. To ensure asset preservation, apply distance between all storage sites using NEWs.

• Only one type of ammunition should be stored in a stack. If more than one type is stored in a stack, the ammunition should be arranged in a manner to facilitate inventory and inspection.

MODULAR STORAGE

This type of open storage for conventional ammunition is storage on pads with earth-barricaded areas called “cells.” These cells are joined to form modules, which in turn may be arranged to form blocks.

Modular storage reduces real estate, security, internal road network, and transportation requirements. In addition, this system provides protection from direct hostile fire; however, modular storage sites will require additional engineering support for initial construction of barricades. The modular storage system is limited to the storage of high explosive bombs and other similarly cased Class/Division (C/D) 1.1 and 1.2 ammunition, 30 mm and smaller ammunition in non-flammable shipping containers, inert munitions and components, and C/D 1.4 ammunition.

Authorization to store other ammunition or explosives in modular cells must be obtained as a waiver from the area commander during wartime operations. Deviations from these restrictions at training sites require a Chief of Naval Operations (CNO) waiver.

The danger of fire and explosions spreading from cell to cell because of heat or fragments, and the danger from indirect fire and aerial bombs is increased by the minimal distance between ammunition stacks and the storage of materials other than those listed above. Modular storage does not provide the degree of protection afforded by magazine storage sited in accordance with OP 5 Volume 3.

SIGNS

Signs should be used throughout advanced bases to indicate traffic routes to ammunition and explosives storage locations. Enough signs should be erected to ensure that vehicles carrying ammunition and explosives will not have difficulty in finding storage locations and while passing through the area.

MAGAZINE MAINTENANCE, STORAGE, AND HANDLING REQUIREMENTS

Proper explosives and ammunition storage facilities are only a part of the overall storage system. Among the most important aspects of the storage of ammunition is the proper maintenance of magazines and magazine areas.

PERSONNEL REQUIREMENTS

Normally, all personnel engaged in operations that involve ammunition, explosives, and other hazardous materials are trained and qualified to perform their assigned duties. In
addition to being qualified and certified, personnel involved with hazardous explosive operations are certified by a physician as physically qualified.

Personnel aren't knowingly permitted or required to work when their ability or alertness is impaired because of fatigue, illness, or other reasons. This would expose them and other personnel to injury.

Occasionally, manpower shortages cause a need for assistance by personnel from other Navy ratings to join working parties to handle or transport ammunition and explosives. These working parties are referred to as augmentation crews.

Before using augmentation crews, it is important to be sure that personnel in the working party are trained so mistakes aren't made or safety factors violated. Furthermore, enough ordnance qualified and certified representatives that are senior in rank to any member of the working party should be present to detect or prevent violations of safety orders and other unsafe practices. They should take whatever action is required to correct the situation.

**LIGHTNING PROTECTION SYSTEMS**

Lightning protection is required for all ordnance handling, operating, and storage facilities or areas. The purpose of a lightning protection grounding system is to dissipate lightning current into the earth by providing a low impedance path to earth.

A lightning protection system consists of an air termination network, down conductors, primary and secondary grounding systems, and bonding conductors to interconnect conductive bodies attached to or inside the structure.

There are two types of lightning protection systems—primary and secondary. The primary system prevents damage from direct lightning strikes by diverting the strike and providing a low-impedance path to ground. The secondary system maintains all metal objects within its system at the same electrical potential. This prevents the possibility of sparking between the objects.

**Primary Systems**

**AIR TERMINATION SYSTEMS**

An air termination system is that part of the lightning protection system designed to provide a primary attachment point for a lightning strike. There are four types of air termination systems approved for the protection of explosives areas: Faraday shield, mast, catenary, and integral systems.

**Faraday Type System and Faraday Shield** — The best method to protect extremely sensitive operations from all sources of electromagnetic radiation (not just lightning) is to enclose the operations or facility inside a faraday cage. However, a faraday cage is difficult to construct and is economically justified only for “one-of-a-kind” facilities where extremely sensitive operations warrant the level of protection it provides.

A faraday cage is a lightning protection system where the volume is enclosed by a heavy metal screen or a continuous metal structure with all metallic penetrations bonded. The lightning current flows on the exterior of the structure, not through the interior. A faraday shield is a lightning protection system that is not an ideal faraday cage, but is formed by a contiguous conductive matrix that is properly bonded and grounded. Examples include:

- Electrically continuous steel arches and reinforcing bars of the concrete end-walls and floors of steel arch magazines
Reinforcing bars of ECMs
Metal shell of pre-fabricated portable magazines and metal buildings

**Mast System** – A mast-type lightning protection system uses masts (either metallic or wood) that are remote from the structure to provide a primary attachment point for a lightning discharge. If the mast is constructed of wood, an air terminal or metal cap connected to two down conductors must be installed. These down conductors shall be placed symmetrically (on opposite sides, 180 degree separation ±10 degrees) about the mast. The height (and spacing, if more than one is necessary) of the masts must be adequate to ensure that the entire structure is enclosed within a zone of protection for a 100-foot striking distance. The minimum diameter of the mast shall be 5/8-inch and must be sturdy enough to withstand the expected wind and ice loads.

**Catenary (Overhead Wire) System** – A catenary lightning protection system consists of grounded, elevated, horizontal, metallic wires stretched between masts that surround a structure. Each catenary wire shall be a continuous run of at least American Wire Guage (AWG) No. 1/0 copper or copper-coated steel cable suspended above the protected structure and connected at each end to the primary ground girdle (or ground rods if a girdle is not necessary.

The overhead cable shall be supported by masts to ensure a minimum separation distance of 6 feet from the protected structure, including any projections. This separation shall be increased by 1 foot for every 10 feet after the first 50 feet of catenary wire run parallel to the structure. The supporting mast shall be separated from the structure by at least 6 feet.

**Integral System** – An integral system uses air terminals and conductors mounted directly on the structure to be protected. Minimum requirements for an integral system are:

- The design and installation of the system shall meet the requirements of Underwriters Laboratories (UL) 96A.
- All air terminal spacing described in UL96A shall be modified as necessary to provide a zone of protection defined by the 100-foot striking distance, including protection of lower roofs by higher roofs on buildings less than 50 feet tall.
- Since integral system material requirements differ for structures having a height greater than 75 feet, close attention to UL96A requirements must be maintained to assure correct materials such as thickness, diameter, or size, are used.
- All air terminals must be provided with a two-way path to ground unless specifically exempted by UL96A.
- A minimum of two down conductors shall be provided on all structures. Structures exceeding 250 feet in perimeter length shall have an additional down conductor for every 100 feet of perimeter length or fraction thereof. All down conductors shall be connected to the facility’s secondary ground girdle.

**DOWN CONDUCTORS**

Lightning protection system down conductors shall meet the minimum requirements of National Fire Protection Association (NFPA) 780. They shall interconnect all air terminals and shall form a two-way path from each air terminal horizontally, downward, or rising at a rate not exceeding three inches per foot to connections with the primary ground system.
Secondary Grounding System

The secondary grounding system consists of a buried copper or copper-clad, steel conductor of AWG No. 1/0 or larger that interconnects all of the grounds and conductive bodies attached to, or inside the structure that are to be bonded to a grounding system. A minimum of protection required for all structures is provided from the effects of lightning by establishing a common grounding point for any item in the structure that requires grounding. The secondary grounding system is connected to the primary lightning protection system.

MAGAZINE AND MAGAZINE AREA SECURITY

Nonclimbable fences protect magazine areas. All the entrances should be locked unless guards are posted. A sign should be posted at all the entrances to restricted areas. The sign indicates that every vehicle must stop, that each person must present proper credentials to the guard, and that all articles prohibited within the area must be given to the guard. The exact wordings of the signs are left to the discretion of the CO. However, the word explosive doesn't appear on the sign, and the sign isn't attached to the magazines.

Special precautions should be taken to guard or patrol the areas that are not protected by suitable fencing. Magazine and explosives areas where ammunition, explosives, and other items of high-security classification are stored must be adequately guarded at all times.

Unauthorized personnel should not be permitted to enter or remain in any magazine or explosives area. Personnel involved in ammunition handling operations may be authorized in magazines or buildings that contain explosives only as required, and they must enter and leave explosives areas at designated points.

Additional information on the requirements for posting, fencing, unguarded facilities and vehicles, emergency events, and security alarm systems is found in Department of the Navy Physical Security Instruction for Conventional Arms, Ammunitions and Explosives (AA&E), OPNAVINST 5530.13.

MAGAZINE/MAGAZINE AREA INSPECTIONS

The CO, or duly authorized representative, requires regular and frequent magazine inspections. These inspections include ready-service lockers, ready-service magazines, and magazine areas. Magazine inspections are conducted to make sure the following conditions are met:

- Ensure magazine repairs are made, if needed.
- Ensure that safety regulations, particularly those that involve cleanliness and elimination of fire hazards, are observed.
- Ensure that magazine contents are not deteriorating into an unsafe condition, and they are stored in an orderly, compatible, and approved manner.

The magazine area inspections are designed to make sure the following actions are being maintained:

- Firebreaks should be maintained.
- Posting of fire, chemical hazard, safety information, and explosive limits should be posted.
• Fire protection equipment, when required, must be available and serviceable.
• Roads must be in good and usable condition.
• Fences must be secure.
• Security systems and alarm systems must be operable.

At times, area inspections are performed more often than magazine inspections—particularly during seasons when grass or brush fires are most likely to occur.

**General Inspection Requirements**

Some of the types of things that should be observed when conducting general magazine inspections are security, safety, cleanliness, atmosphere (temperature and humidity), identification of contents, and posting. A checklist covering all safety regulations and requirements of magazine operations is used during magazine inspections. This helps to ensure violations or hazards are not overlooked. The checklist provides an adequate and full description of any condition that is unsatisfactory and in violation of requirements. The checklist should be properly authenticated and made a part of the magazine log.

**Frequency of Inspections**

The inspection frequency is determined by the CO or duly authorized representative. The frequency varies, depending on the number of magazines to be inspected, weather conditions, season of the year, number of magazines requiring special attention (for example, environmentally controlled), and security requirements of magazines/magazine areas. Inspections should be conducted during daylight hours to be sure there is enough light to see that any substandard condition that exists is seen and reported to the inspector. The exception to this procedure is security inspections; they are conducted during the day and at night.

**Temperature Control Considerations**

The majority of the ordnance items in the naval inventory today have been designed to withstand high temperature in the range of 130 to 160°F.

Studies have indicated that the temperature within conventional ordnance storage magazines seldom exceeds 105°F. It is no longer necessary to install thermometers and closely monitor the temperatures within magazines except for situations where the program manager for specific ammunition items has established temperature and/or humidity limits.

**Report of Inspections**

Substandard or abnormal conditions should promptly be reported to the officer or supervisor in charge of correcting such conditions.

**Magazine and Magazine Area Inspection Records** – A log should be maintained to document all deficiencies and corrective actions taken. Mandatory log entries include the date of inspection, inspection SOP used, deficiencies detected, and deficiencies corrected. All entries must be signed. If no deficiencies are found during the inspection, the entry “No deficiencies” shall be made. Records shall be maintained for four years.
AMMUNITION HANDLING

The AO must be familiar with handling ammunition. It is a repetitious task, whether at a shore station or aboard ship. Repetitious work, no matter how dangerous, often becomes routine and leads to carelessness. Therefore, attention must be paid to what is done to prevent accidents in operations dealing with ammunition and explosives.

Whenever ammunition or explosives are received, transferred, or stowed, an ordnance qualified/certified officer or petty officer should supervise the work. The supervisor should make sure that all work personnel are aware of the need to be careful when they handle ammunition and explosives.

Handling equipment should be properly maintained and frequently inspected to make sure it is in safe working condition. Also, the handling equipment must be the right equipment for the purpose. Inspections should be made before and during loading/unloading operations.

AMMUNITION SHIPPING

Ammunition shipping is a phase of ammunition handling. Instructions for the preparation and shipment of naval ordnance material are contained in Navy Transportation Safety Handbook for Ammunition, Explosives and Related Hazardous Materials, NAVSEA SW020-AG-SAF-010. The NAVSEA SW020-AG-SAF-010 instruction covers the preparation, flow, and use of all the documents that are required to ship, receive, and report shipments. Instructions for the use of ordnance transport equipment, materials to be transported, division of responsibility for carrying out inspections, and criteria for accepting or rejecting equipment are also contained in this publication. NAVSEA SW020-AG-SAF-010 contains the general information needed for personnel to safely perform the duties required when shipping ordnance materials.

Explosives Driver

An explosive driver is often an AO with an excellent safe driving record, and a person fully qualified according to Motor Vehicle Driver and Shipping Inspector’s Manual for Ammunition, Explosives, and Related Hazardous Materials, NAVSEA SW020-AF-HBK-010. To become a qualified explosive driver, an AO must meet the qualifications described in the manual. All Navy and Marine Corps military, civilian, and contractor personnel must be qualified and properly licensed to operate motor vehicles transporting AE.

STATE OPERATOR’S LICENSE — An explosives driver must hold a valid state operator’s license—not necessarily issued by the state in which the activity is located. This applies to operation of vehicles both on and off-station.

MEDICAL EXAMINATIONS — The Manual of the Medical Department (MANMED) publication, NAVMED P-117, Article 15-107, contains comprehensive guidance on the necessary medical examinations and standards for personnel to qualify as explosives drivers. The following regulations apply to all military (active duty and reservists) and civilian (employee, contractor, and subcontractor) personnel. All medical examinations shall be performed by a licensed medical examiner per NAVMED P-117 guidance.

- Military personnel must meet the standards of NAVMED P-117, Article 15-107 and comply with the medical surveillance/certification requirements listed in program 721 of the latest edition of NEHC-TM OM 6260, published by the Navy
Environmental Health Center. This special duty physical examination is required every five years until age 50, and annually thereafter.

- Civilian personnel must comply with the standards of NAVMED P-117, Article 15-107. Physical examinations shall be conducted every two years until age 60, then annually thereafter.

This certificate (Figure 12-5), in addition to the explosive driver’s permit, must be on the operator’s person while driving any vehicle transporting AE.

February 12-5 — Medical Examiner’s Certificate.

**Alcohol and Drugs** — Any applicant for explosives driver certification shall be screened for alcohol and drug use per the requirements of NAVMED P-117, Article 15-107. In accordance with the DON Drug-Free Workplace Program (DFWP), explosives drivers are considered to be in a “testing designated position.”

Explosives driver certification shall be revoked for any driver found to be under the influence of alcohol or drugs while on duty. Temporary revocation of certification may be necessary when the use of physician-prescribed drugs is likely to interfere with the ability to operate a motor vehicle safely.
U.S. GOVERNMENT MOTOR VEHICLE OPERATOR’S IDENTIFICATION CARD, OPTIONAL FORM 346 – Optional Form (OF) 346 (Figure 12-6), the U.S. Government Motor Vehicle Operator’s Identification Card, also called “driver’s permit,” is issued to qualified personnel authorizing them to operate government vehicles.

The OF 346 is issued by the designated representative of the CO when the applicant is qualified according to requirements in NAVSEA SWO20-AF-HBK-010.

Possession of this permit alone, however, does not constitute authority to drive vehicles transporting AE unless the notation “Explosives Driver - Must hold a current medical certificate” appears on the permit as shown in Figure 12-6. Without this notation, the driver cannot be assigned to transport AE.

Individuals holding an OF 346 should have the permit on their person when operating a vehicle. It is their responsibility to apply every two years for renewal of the driver’s permit. Yearly endorsement of the driver’s permit is not required. It is recommended that activities render all possible assistance to explosives drivers to ensure that permits do not expire. Refer to NAVSEA SW023-AHWHM-010 for Material Handling Equipment (MHE) operator qualifications.

AGE AND EXPERIENCE - Explosives drivers must be 18 years of age or older to operate motor vehicles transporting AE on-station, and shall be 21 years of age or older for off-station operations. They must have a safe driving record and must have had training and experience with the type of equipment being operated. Training may be provided by the employer or other private or public sources.

ABILITY TO READ AND UNDERSTAND REGULATIONS - Explosives drivers must be able to read, write, and understand the English language, and to complete the various forms for which they are responsible. They must be required to read and understand the regulations pertaining to their duties as described in the publication.

Figure 12-6 — Motor Vehicle Operator’s Identification Card, OF 346 (Front and Back).
EXPLOSIVE SAFETY TRAINING PROGRAM

NAVSEA OP 5 Volume 1, Appendix D, provides in-depth guidance on the Navy’s explosives safety training program. Military personnel (active and reserve duty) assigned to shore station positions involving responsibilities for ammunition and explosives should attempt to complete the applicable explosives safety training prior to reporting.

Ammunition and Explosives Driver 12-Hour Training Course – NOSSA maintains a course curriculum to assist activities in this training effort.

The course is available on the Explosives Safety Technical Manuals (ESTM) CDROM, distributed by the Packaging, Handling, Storage and Transportation (PHST) Center. This course is used for drivers of AE both on-station and over public highways. Instruction is provided in the following areas:

- Driving trucks, truck-tractors with semi-trailers and other vehicles
- Regulations pertaining to the handling, loading, and transportation of AE
- Proper use of fire extinguishers and instruction in emergency response procedures
- Proper completion and filing of required forms and reports

Each activity should use this curriculum or their equivalent course to satisfy the 12-hour training requirement and to develop a four-hour refresher course. Explosives drivers should take this refresher course every two years in order to maintain qualification.

Driver liability

Personnel operating Navy-owned motor vehicles should be responsible for compliance with all DOD regulations, as well as state and local traffic laws. Any driver in violation of any such regulation or law is subject to fines and/or imprisonment.

Disciplinary Action and Penalties – Drivers are subject to disciplinary actions and penalties for violation of civil and/or military regulations. The degree of disciplinary action and penalty which may be imposed by naval authority is dependent upon the individual’s past record and the discretion of the CO. Criminal penalties may also be imposed.

Reporting Traffic Violations or Accidents – All traffic violations or accidents should be reported to the supervisor, security officer, or safety officer, and shall be noted on the operator’s driving record.

Suspension or Revocation of a Navy Driver’s Permit – The CO should suspend or revoke a Navy driver’s permit if, in his/her opinion, it would be in the best interest of the Navy.

Automatic Revocation of a Navy Driver’s Permit – A Navy driver’s permit should be revoked automatically for the following violations, and notice of such action should be filed in the driver’s personnel record:

- Driving while under the influence of alcohol, illegal drugs, a derivative of a narcotic drug, or the misuse of a prescription drug
- The known transportation or possession of alcohol, illegal drugs, or a derivative of a narcotic drug
- Failure to report an accident in which the driver was involved
• Leaving the scene of an accident in which the driver was involved
• Smoking while in or within 25 feet of a vehicle loaded with AE
• Revocation of state driver's license

SAFETY PRECAUTIONS

Safety precautions prescribe the minimum requirements and regulations that should be observed when handling ammunition. These regulations may be general in nature or step-by-step procedures. Regardless of the situation, safety precautions must NEVER be ignored or bypassed, even during the simplest ammunition-handling evolutions.

The general safety precautions listed below show some of the regulations contained in publications referred to in this chapter.

• Properly stow all materials within a magazine and keep them in a safe condition. Never let trash resulting from decanning, depalletizing, or unpacking accumulate in a magazine. It presents a fire hazard and unsafe working conditions for personnel.

• Don't use improvised tools, platforms, or ladders.

• Before ammunition loading, explosives loading, or offloading operations, either at a shore activity or a ship underway, inspect all fire mains to make sure they operate properly and efficiently.

• Fire hoses must be laid out ready for use in the immediate area of operations. The hoses must be laid out so those damage control and fire boundaries are not crossed, using all risers available. Additionally, keep the valves controlling these fires hoses open so that water is readily available.

• Flame, heat, or spark-producing devices aren't permitted where explosives or flammable materials, batteries, or battery charging lockers are located. Cigarette lighters, heaters, fires, welding tools, soldering irons, cutting torches, and uncovered lights are included in this category.

• When work requiring the use of flame, heat, or spark-producing devices is urgently required in or adjacent to an ammunition stowage space, follow the procedures outlined in NAVSEA OP 5 Volume 1.

• Emphasize safety precautions applicable to in-service ammunition items or equipment by using applicable signs.

• Emergency drills requiring the use of the general alarm system, ship's bell or whistles aren't conducted aboard ship while moored to an ammunition-activity pier, unless specific approval for such drills has been granted by the CO of the ammunition activity.

• Emergency drills aren't conducted by ships nested together or at a pier where ammunition-handling operations are in progress or by a ship underway during an ammunition handling evolution.

• Ammunition evolutions involving direct contact with ammunition components are curtailed during local atmospheric disturbances, such as thunderstorms or high winds. Operations aren't resumed until non-hazardous conditions prevail.

• Ships and craft entering commercial or naval shipyards for periods longer than 6 weeks are completely offloaded of all ammunition, except the small arms
ammunition that the CO considers necessary for the maintenance of security aboard ship and inert ordnance items such as bomb fins.

- If a ship is expected to remain in the yard for less than 6 weeks, the ship offloads, as a minimum, all ammunition or explosives that can't be stowed in sprinkler-protected or floodable spaces.

- The number of personnel engaged in ammunition and explosive handling operations is limited to the minimum necessary for safe and efficient performance of the work. Unauthorized personnel aren't permitted in a magazine, missile handling, or testing area, or at any handling operation involving explosives or ammunition. A responsible escort accompanies visiting personnel.
Review Questions

12-1. Magazines ashore are designated according to their intended use. There are high-explosive magazines, ready-service magazines, and what other magazines?

A. Small-arms magazines  
B. Smokeless-powder magazines  
C. Solid-propellant magazines  
D. Liquid-propellant magazines

12-2. What type of magazine is made from concrete and is shaped like a beehive or dome?

A. Gallery  
B. Corbeta  
C. Keyport  
D. Box

12-3. The ESQD hazard classification system contains a total of how many classes of hazardous materials?

A. Four  
B. Six  
C. Eight  
D. Nine

12-4. What storage compatibility group are detonators and similar initiating devices not containing two or more effective protective features?

A. A  
B. B  
C. C  
D. D

12-5. There are a total of how many storage compatibility groups?

A. 7  
B. 9  
C. 11  
D. 13
12-6. Items containing WP or plasticized WP are in what storage compatibility group?
A. H  
B. J  
C. L  
D. S

12-7. The storage compatibility groups assigned to ammunition and explosives are approved by what command?
A. NAVAIRSYSCOM  
B. NAVAIRPAC  
C. NAVAIRLANT  
D. NOSSA

12-8. Magazine symbol-hazard placards are used for which of the following purposes?
A. To identify the persons responsible for the hazards involved  
B. To help firefighters determine the types of equipment and procedures to use  
C. To identify the work center responsible for the hazards involved  
D. To identify a magazine within the magazine group

12-9. What are ammunition storage and handling facilities of advanced bases identified as?
A. Ammunition Stock Points  
B. Ammunition Supply Points  
C. Ammunition Activity  
D. Ordnance Annex

12-10. Each advance base should have at least how many magazine or storage areas?
A. One  
B. Two  
C. Three  
D. Four

12-11. At an advanced base, ammunition modification should be performed in what area?
A. The magazine area  
B. The disposal area  
C. The renovation area  
D. The pier area
12-12. At an advanced base, the disposal area should be what minimum distance from the nearest ammunition storage site?

A. 800 feet  
B. 1,000 feet  
C. 1,200 feet  
D. 1,800 feet

12-13. Personnel engaged in operations that involve ammunition, explosives, and similar hazardous materials must meet which of the following criteria?

A. Be trained only  
B. Be qualified only  
C. Be certified as physically qualified by a physician only  
D. Be trained, qualified, and certified as physically qualified by a physician

12-14. The mast-type system and the overhead wire system are what type of lightning protection systems?

A. Primary  
B. Secondary  
C. Direct  
D. Indirect

12-15. For specific requirements regarding posting, fencing, unguarded facilities, unguarded vehicles, emergency events, and security systems, you should refer to which of the following instructions?

A. OPNAVINST 5510.15  
B. OPNAVINST 5530.13  
C. OPNAVINST 8010.12  
D. CINCLANTFLTINST 8010.4

12-16. A regularly scheduled magazine area inspection is conducted for which of the following reasons?

A. To ensure firebreaks are maintained  
B. To ensure fire protection equipment is available and serviceable  
C. To ensure roads are in good and usable condition  
D. All the answers are correct

12-17. For detailed instructions on shipping, receiving, and reporting ammunition shipments, you should refer to which of the following NAVSEA publications?

A. OP 2136  
B. OP 2142  
C. SW020-AG-SAF-010  
D. TW010-AC-ORD-010
12-18. For detailed instructions on shipping, receiving, and reporting ammunition shipments, you should refer to which of the following NAVSEA publications?

A. OP 2136  
B. OP 2142  
C. SW020-AG-SAF-010  
D. TW010-AC-ORD-010