CHAPTER 11

AMMUNITION STORAGE AND HANDLING AFLOAT

The ammunition used by the U.S. Navy must be maintained in a state of readiness at all times. Improper, rough, or careless handling, storage, and shipping can result in malfunctioning ammunition, material damage, and loss of life.

LEARNING OBJECTIVES

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

1. Identify the purpose of the Navy Personnel Ammunition and Explosives Handling Qualification and Certification Program.
2. Describe the types of ammunition stowage afloat.
3. Identify the types of stowage spaces afloat, to include types of magazines, magazine designations, ammunition stowage requirements, environmental control systems, sprinkler systems and auxiliary equipment, and magazine temperature requirements.
4. Identify ammunition handling equipment used aboard ship.
5. Recognize the purpose of ammunition handling equipment used aboard ship.
6. Identify the purpose of weapons elevators.
7. Recognize the hazards of electromagnetic radiation to ordnance (HERO) classification standards.
8. Identify HERO hazards.
9. Identify the uses of the emission control (EMCON) bill.
10. Recognize the importance of safety precautions while working with ordnance.

AMMUNITION AND EXPLOSIVES HANDLING QUALIFICATION AND CERTIFICATION

The Navy Personnel Ammunition and Explosives Handling Qualification and Certification (QUAL/CERT) Program was established by the Chief of Naval Operations (CNO) as a result of the catastrophic Mark (Mk)-24 parachute flare accident on the USS Oriskany in 1966 that led to significant loss of life and major ship damage. The Flag Board of Inquiry concluded that the accident was attributed to a lack of training, the absence of direct supervision, and no method in place to determine personnel qualifications prior to being authorized to handle explosives. The Navy’s QUAL/CERT program, with proper oversight and management, can prevent similar accidents.

Although QUAL/CERT has been in effect since the late 1960s, improper handling, loading, processing, or testing of explosive devices continues to result in death, injury, and extensive high-dollar damage to property and the environment. Research continues to show that the majority of explosive mishaps are caused by personnel error due to inadequate training, lack of adequate supervision, lack of or inadequate standard operating procedures (SOPs), complacency, or just plain failure to follow the governing technical directives. The Navy Personnel Conventional Ammunition and Explosives Handling Qualification and Certification Program, Office of the Chief of Naval Operations Instruction (OPNAVINST) 8023.24(series), is the governing document that provides the guidelines to establish and maintain an effective QUAL/CERT program.
The QUAL/CERT program is intended to:

- Provide each command having a mission or task involving ammunition and explosives (AE) with an effective administrative tool for assisting the command in maintaining a successful explosives safety program
- Ensure that the command’s QUAL/CERT process can be validated through documentation
- Define a process that will prepare personnel to safely perform tasks involving AE, with each person being trained found qualified by the command’s QUAL/CERT board, and subsequently certified by either the commanding officer (CO) or the designated QUAL/CERT board chair
- Provide guidance for administering the QUAL/CERT program

Each Navy command or activity having the task to manufacture, handle, transport, store, or assemble AE should establish an explosives handling QUAL/CERT program. The program will be subject to periodic reviews by explosives safety officers (ESOs), explosives safety inspectors, and other Department of the Navy (DON) personnel who are conducting an assessment of the command’s or activity’s explosives safety management program (ESMP).

The term commanding officer, as used throughout this chapter, is synonymous with commanders; COs; directors; supervisor of shipbuilding, conversion, and repair (SUPSHIP); and officers-in-charge (OICs) of a command or activity.

**Applicability**

The QUAL/CERT program is applicable to personnel who are directly involved in or observe AE handling evolutions. The QUAL/CERT program includes personnel listed below who physically interact with the AE as well as personnel performing supervisor, quality assurance (QA), or safety observer (SO) (pier side and aboard ship) functions:

- All Navy personnel under the scope of this program, including officers, enlisted, and Government employees
- Government contractors providing direct support (i.e., contractor personnel performing tasks with Navy personnel) at Navy commands or activities
- Command- or activity-appointed QUAL/CERT board members
- Dog handlers for handling the canine explosives scent kit
- Personnel performing the duties of QA and SO as defined in Naval Sea Systems Command (NAVSEA) Ordnance Publication (OP) 5 and the NAVSEA OP 4 because they directly influence the AE handling evolution
- Aircrew personnel who, during the performance of in-flight duties, are required to handle, prepare, and launch explosive sonobuoys, explosive signal underwater sound (SUS), explosive mine neutralization devices, marine location markers, or signaling and marking devices, or who are involved with the ground handling of ordnance items

The following personnel meet the requirements of the program, provided individual records are available to support or indicate the individual as being qualified by another suitable, recognized program for the tasks noted:

- Personnel required to bear arms in the course of their duties; arms include all AE borne by these personnel in the course of their duties; the following are qualified under this definition: small arms crew-served weapons personnel and teams; security alert teams; reaction forces; backup alert forces; auxiliary security forces; Naval Criminal Investigation Service agents; or
other security personnel who are trained and qualified through a current, approved training program and who do not perform logistical functions of receipt, segregation, storage, and issue (RSSI) or otherwise handle AE except as an end user

- In-flight aircrew, and 7.62 millimeter (mm) and .50 mm caliber operators and door gunners who are trained and qualified through a current, approved training program

The following personnel do not require QUAL/CERT per the OPNAVINST 8023.24(series) instruction, but are not exempt from ensuring the required standards of explosives safety are in place:

- QUAL/CERT board chair, provided the chair does not handle AE or perform in the capacity of QA, SO, team leader (TL), or team member (TM)
- Board advisors

**NOTE**

Thorough training must be provided by a qualified and certified individual at the TL level or above for the explosive device and work task. A record of this special training shall be maintained and used for watch assignment.

- Ship's lookouts, in port and underway watch standers, visit boarding search and seizure (VBSS) members, connected replenishment (CONREP) station operators, and shore station runway wheels watches required to handle, prepare, and launch marine location markers or fire signaling devices, including safety of life at sea (SOLAS) devices, while underway
- Working party personnel used to supplement qualified and certified personnel for the purpose of ammunition (AMMO) loading or offloading, or during replenishment operations; the TL or SO of the evolution should provide all working party personnel with a thorough safety brief before and as necessary during the operation; direct and constant supervision from a qualified and certified TL and SO is mandatory
- Personnel whose sole responsibility, when working in and around AE, is to conduct tests or inspections of magazine sprinkler systems, grounding, bonding, and lightning protection systems
- Personnel whose sole responsibility, when working in and around AE, is to use pneumatic nailers to secure dunnage to explosive conveyances, or to inspect and certify the blocking and bracing of AE loaded in a ship’s cargo hold, magazine, locker, railcars, or trucks prior to movement
- Operators of material handling equipment (MHE), cranes, weapons elevators, and conveyors who are qualified by other means (e.g., personnel qualification standards (PQS))
- ESOs and explosives safety specialists provided they do not handle or physically interact with AE
- Naval Ordnance Safety and Security Activity (NOSSA) representatives (conventional ordnance safety review (COSR) inspectors and explosives safety inspectors (ESIs)), fleet weapons support teams (FWSTs), mobile ordnance training teams (MOTTs), weapons safety assistance teams (WSATs), mine readiness certification inspection teams, shipboard weapons integration teams (SWITs), ammunition and hazardous (AMHAZ) material review board members, ordnance handling safety assistance teams (OHSATs), board of inspection and survey (INSURV) weapons inspectors, and other personnel who are required to review and inspect as part of official duties
• Aircrew personnel whose only association with explosive devices is during the use of personal survival devices and life-saving equipment (e.g., pencil flares, distress signals, and life rafts)

• Guards, electricians, carpenters, and other personnel who are not regularly employed in handling AE, but may come in contact with these materials; these personnel shall be thoroughly briefed regarding hazards to which they are exposed; the possible causes of fires and explosions should be carefully explained to them

• Navy divers who are part of the mobile diving and salvage units (MDSUs); sea, air, and land (SEAL) personnel; explosive ordnance disposal (EOD) personnel; special warfare command (SPECWARCOM)/special warfare combatant-craft crewmen (SWCC); and personnel who do not perform logistical functions of RSSI or otherwise handle AE except as an end user

• Personnel who are required to handle and prepare bird and wildlife aircraft separation hazard (BASH) nonlethal control devices, such as launchers, blanks, and cartridges

Certification

Procedures, Guidance, and Requirements
The CO, QUAL/CERT board chair, and board members shall use the guidance contained in the applicable enclosures of the OPNAVINST 8023.24(series) instruction for training personnel, administering the QUAL/CERT program, and conducting an annual self-assessment of the QUAL/CERT program utilizing the Ammunition and Explosives Qualification and Certification Self-Assessment, Office of the Chief of Naval Operations (OPNAV) 8020/7. Each activity will establish a training plan (TP) to codify the training required for qualification of individuals.

Certification and Recertification
Certification and recertification, unless revoked for cause, is valid to the last day of the 12th month following the certification or recertification. Individual certification and recertification must be documented using the Personnel Ammunition and Explosives Handling Qualification and Certification, OPNAV 8020/5 (Figure 11-1). Lapsed certifications, regardless of duration, are invalid. In cases where a certification has lapsed, the individual must be recertified.

Initial Certifications
When activities or commands are assigned a new or upgraded AE process or task, weapon, or major modification to a weapons capability or platform, the CO must initially certify a board member for this new capability.

QUAL/CERT Transfers
Although qualifications may be transferred, transfer of certification for military or civilians from one command to another for purposes of permanent change of duty station is prohibited. However, the receiving CO may use the previous qualification documentation from the transferring command for certification at the gaining command.

Decertification and Revocation of Certification
The CO is responsible for decertification and/or revocation of individual certification whenever such action is considered to be in the best interest of safety.
## PERSONAL AMMUNITION AND EXPLOSIVES HANDLING
QUALIFICATION AND CERTIFICATION

### CERTIFICATION LEVELS:

<table>
<thead>
<tr>
<th>IT - In Training</th>
<th>TM - Team Member</th>
<th>T - Individual</th>
<th>TL - Team Leader</th>
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<tbody>
<tr>
<td>QA - Quality Assurance</td>
<td>SO - Safety Observer</td>
<td>QA/SO - Quality Assurance/Safety Observer</td>
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### WORK TASK CODE:

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<tr>
<th>Work Task Code</th>
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<tbody>
<tr>
<td>1 - Handling</td>
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<tr>
<td>2 - Storage/Stowage</td>
</tr>
<tr>
<td>3 - Assembly/Disassembly</td>
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<tr>
<td>4 - Load/Download</td>
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<tr>
<td>5 - Arm/De-Arm</td>
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<tr>
<td>6 - Install/Remove</td>
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<tr>
<td>7 - Testing</td>
</tr>
</tbody>
</table>

### EXPLOSIVES FAMILY AND/OR DEVICE

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<th>EXPLOSIVES FAMILY AND/OR DEVICE</th>
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Certifications shown above are effective for the first year of qualification. Subsequent yearly reviews and re-certifications are to be entered in the blocks below.

**NOTE:** ITEMS NOT REQUIRED FOR RECERTIFICATION SHALL BE LINED OUT, INITIALED, AND DATED BY THE BOARD CHAIRMAN

### INDIVIDUAL BEING RECERTIFIED SIGNATURE:

<table>
<thead>
<tr>
<th>BOARD MEMBER SIGNATURE:</th>
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<tr>
<td>BOARD CHAIRPERSON SIGNATURE:</td>
</tr>
<tr>
<td>BOARD CHAIRMAN SIGNATURE DATE:</td>
</tr>
</tbody>
</table>

PRINTED NAME OF INDIVIDUAL BEING RECERTIFIED (LAST, FIRST, MI): RANK/RATE/GRADE:

COMMAND: UIC:
Training Documentation Requirements

The purpose of the training documentation requirements is to standardize the AE handling QUAL/CERT program documentation, the use of training devices, and the training record requirements.

Training

All personnel involved with handling AE must have a rigorous explosives safety training program. The training necessary to achieve the qualifications for certification must be formalized, both for the individual requiring certification and for the QUAL/CERT board to assess during its decision or recommendation process. Individual training and documentation will be accomplished using the Ammunition and Explosives On-the-Job/Informal/Professional Training Record Sheet, OPNAV 8020/4 (Figure 11-2).

Formal Training

Use formal training to the maximum extent possible. Personnel can attain an understanding of the theory and hazards associated with handling AE through formal classroom courses, where certified instructors present material; through self-paced instruction manuals; or while learning from computer-based programs, such as Navy Knowledge Online (NKO) or Defense Ammunition Center (DAC) AMMO courses. Certificates (or copies) of formal training will be retained and included as part of the individual’s training jacket.

Informal Training

Informal training is needed by an individual but has not been identified as a formal training requirement. Informal training can be documented when an individual demonstrates a satisfactory understanding of a subject through research, practice, rehearsal, and/or participation in question-and-answer periods with subject matter experts.

On-the-Job Training

An aggressive on-the-job (OJT) training program must be established. OJT ensures that personnel being trained achieve and maintain the level of expertise necessary to ensure an accident-free explosives safety program.
Figure 11-2 — Ammunition and Explosives On-the-Job/Informal/Professional Training Record Sheet.
Training Plan

Commands and individuals should attempt to use every training means available to achieve and maintain the desired level of QUAL/CERT. A formal QUAL/CERT TP should be developed and used as a guide for qualification.

The TP shall include all applicable training necessary to achieve and maintain QUAL/CERT of personnel to the required explosive devices or family group consistent with the missions and tasks of the command, as applicable, to include lists of the following items:

- Required training and lectures
- Required OJT
- SOPs, qualification cards, or check sheets
- Formal schools and education

The type commander (TYCOM) or regional commander (RC) will establish baseline community and class standard TPs as appropriate to achieve community and ship class consistency. The TP should be developed and approved in writing by the activity CO. Contractor TPs should be developed and approved in writing by CO or contractor management, as appropriate.

The TP shall be reviewed annually for accuracy to ensure processes and procedures are consistent with approved technical manuals and higher directives for ordnance handling, maintenance, assembly, transportation, and storage operations.

Training Devices and Inert Ordnance

Training devices and inert ordnance shall be used as the primary means of training to achieve qualification. Inert items should be requisitioned or requested in a similar manner used to obtain live items.

Where a training device or inert ordnance does not exist for an explosive or explosive device requiring QUAL/CERT, a similar family type inert device is the preferred alternative.

In the event that no similar family type inert device is available, mock-ups, pictures, manuals, films, etc., of the explosive ordnance may be used with the written approval of the TYCOM or RC, as appropriate.

The TYCOM or RC, as appropriate, must provide written approval for the breakout and use of live AE for training to achieve qualification. The written approval should be retained as part of the individual training record for a period of 2 years.

Maintenance of Training Records

AE handling qualification training records should include, at a minimum, documentation of the following and shall be maintained at the activity or command:

- Formal training
- Informal training
- OJT and PQS (if applicable)
- Copy of explosives driver’s license (if applicable)
- Copy of MHE license (if applicable)
- For board members, a copy of QUAL/CERT board member designation letter
• Any special TYCOM or RC authorizations for use of live ordnance for the purposes of training or qualification
• Arms, Ammunition and Explosives (AA&E) Personnel Screening, OPNAV 5530/1
• Copy of Personnel Ammunition and Explosives Handling Qualification and Certification, OPNAV 8020/5s from current command
• Copy of Personnel Ammunition and Explosives Handling Qualification and Certification, OPNAV 8020/5s from previous commands (if applicable)
• Current Handler/Explosive Material Handling Equipment Medical Examiner’s Certificate, OPNAV 8020/2 stating date of last medical examination and signed by competent medical authority; use of a digital signature is authorized
• Current Department of the Navy Explosive Operator/Department of Transportation Medical Examiner’s Certificate, OPNAV 8020/6 (if applicable); use of a digital signature is authorized

QUALIFICATION AND CERTIFICATION GUIDELINES
The following QUAL/CERT guidelines provide guidance for conducting a standard and effective QUAL/CERT program.

QUAL/CERT Board Membership and Responsibilities
The QUAL/CERT board administers a process that will prepare and enable personnel to safely perform tasks involving AE.

Board Chair
The CO is responsible for the command’s QUAL/CERT program and should act as board chair or designate, in writing, a competent commissioned officer, or civilian equivalent, who has both the knowledge and understanding of AE safety needed to perform and administer the duties as the QUAL/CERT board chair.

A senior site manager should perform the administrative duties of CO for Government contractor QUAL/CERT programs.

Board Chair Responsibilities
The board chair oversees the command QUAL/CERT program and ensures the provisions of the OPNAVINST 8023.24(series) instructions are carried out. The board chair also serves as the principal advisor to the CO on all matters involving the QUAL/CERT board and its actions.

The board chair should be aware of all AE operations at the activity or command and ensure involved personnel are in full compliance. The board chair should also establish and maintain a QUAL/CERT board and ensure sufficient numbers of qualified and certified board members are maintained on the board at all times. Adequate preplanning before transfer of key board member(s) will eliminate problems with the lack of qualified board members.

It is important for the board chair to ensure that members of the QUAL/CERT board review the qualifications of the candidate prior to making a determination for certification.

Board Members
Board members should be in the grade of E-6 or higher, or civilian equivalent, and designated by name, in writing by individual letter, by the CO or OIC. Board members should be certified in the
same AE and work task codes (WTCs), and possess the same certification level(s) for which they are qualifying and recommending for certification.

**Board Member Responsibilities**

Board members should observe and evaluate the skill and proficiency of personnel being considered for certification or recertification. A board member must personally witness a skill and proficiency demonstration (PD) on a specific AE or task, by the person being considered for certification or recertification. There must be at least one board member observing for any AE task or evolution.

Board members must ensure that qualification training requirements have been met prior to recommendation for certification. The board member must review and verify the accuracy of all pertinent training documentation of personnel being nominated for certification and make recommendations to the board chair during the QUAL/CERT board.

Board members should review the command’s TP and submit changes via the chain of command. Inform the division officer, military or civilian supervisor, and board chair when personnel who are being considered for certification require additional training or experience before being certified.

**QUAL/CERT Board Responsibilities**

The purpose of the QUAL/CERT board is to provide the CO with the primary means of ensuring adequate training and qualification of personnel assigned duties involving AE.

The QUAL/CERT board will consist of the board chair, one or more board members, and the candidate(s) being considered for training or certification. There is no limit on the total number of board members who can participate on the QUAL/CERT oral board. However, a QUAL/CERT board will have at least one board member who is fully qualified and certified in the same AE and WTCs, and possess the same certification level to which the candidate is being certified.

Evaluate all explosives safety-related infractions, incidents, events, mishaps, and accidents that occur within their respective or like commands (e.g., ship class, type/model/series aircraft, and naval installations). Apply the lessons learned to the activity's TP, QUAL/CERT exams (oral and written), and PDs. The QUAL/CERT board should ensure that applicable reports reflect the QUAL/CERT level of personnel involved, and whether or not to retain, decertify, or revoke the individual(s) certification, as appropriate.

The QUAL/CERT board should consult the CO on all issues of culpability, decertification, or revocation.

**Qualification Procedures**

The candidate must meet the physical qualification and medical examination requirements for explosives handler and explosives vehicle operator.

The QUAL/CERT board must review and verify that the individual has completed required reading, received applicable lectures covering general ordnance safety training, completed specific device training, and possesses adequate knowledge of ordnance safety precautions and procedures, which are essential standards that will allow a PD and subsequent certification.

Prior to certification or recertification, qualification should be verified through PDs observed by a board member for each explosive, explosive device, WTC, and recommended certification level to be performed (e.g., assembly, testing, and fuzing) with the specific explosive, explosive device, or similar device.
It should be verified, by oral or written means, that the candidate clearly understands applicable documentation, such as technical, assembly, and maintenance manuals, ordnance publications, and SOPs, and has knowledge of ordnance safety precautions and procedures.

**Certification Procedures**

The certification process begins with the identification of all billets requiring certification and a determination of the WTCs required of each billet, the certification levels, and the AE to be handled.

When the division officer or civilian supervisor determines that an individual is fully qualified and recommended for certification, the following steps are required:

- Individual’s Personnel Ammunition and Explosives Handling Qualification and Certification, OPNAV 8020/5 is annotated with recommended certifications and forwarded to the board for review
- Board members review the training record per the applicable TP to ensure adequate training on AE, WTCs, and certification levels have been properly conducted within the past year
- If certification or recertification is to be granted, the individual, a board member, and the board chair should sign in all appropriate blocks of the Personnel Ammunition and Explosives Handling Qualification and Certification, OPNAV 8020/5
- Recertification, whether issued at the time of expiration or before, should be granted only after the individual has been validated by the QUAL/CERT board
- Certification is valid to the last day of the 12th month

**Medical Standards and Physical Qualifications**

Because the medical standards and physical requirements are intended to cover the full spectrum of AE handling evolutions, all physical qualification requirements may not apply to every position.

Some cases may require SOPs, training, or job control modification to avoid or accommodate medical or physical restrictions. A waiver may be granted when there is sufficient evidence that a person, with or without reasonable accommodation, can perform the essential duties of the position without endangering the health and safety of that person or others.

On a case-by-case basis, personnel determined by the physician to be not physically qualified (NPQ) because of a permanent medical condition may be given administrative relief, in the form of a waiver of the individual medical standards and/or physical qualifications leading to certification. The waiver of medical standards and physical requirements for handlers and MHE operators must be approved by the CO or OIC.

The QUAL/CERT board chair should coordinate the review of all waivers of medical standards and physical requirements requests.

The CO or OIC shall grant any waiver of medical standards or physical requirements in writing, and the waiver letter must include a provision stating that the worker must notify the supervisor of any new or changed physical or medical conditions. The waiver letter and supporting documentation from the waiver request should be maintained in the applicant’s medical record.

**Revocation and Decertification**

The CO is responsible for decertification and revocation of individuals.

Revocation of certification is mandatory if:

- An explosive mishap is caused by gross personal negligence or carelessness
- Reckless operation of equipment is used to handle AE
- Flagrant disregard of procedural and/or safety precautions occurs
- Behavior indicating incompetence or unreliability, including unresolved drug abuse and/or alcohol dependence, occurs
- There are other instances where the CO or board chair deem the individual to be a detriment to maintaining a safe handling environment

Decertification is applicable if:

- An explosive mishap is caused by an individual who is subsequently determined to be NPQ due to a previously unidentified disqualifying medical condition; when considering decertification relating to a medical condition, the following guidelines apply:
  - If the medical condition is determined to be temporary, decertification may be required until the medical condition is resolved
  - If the medical condition is determined to be permanent, but not causally associated with the mishap, then the individual should be decertified pending review and approval of any request for waiver of medical standards and physical qualifications
  - Permanent decertification is mandatory if the disqualifying condition is considered permanent and a waiver is not recommended or the medical condition is determined to be causally associated with the mishap
- The individual is determined to be NPQ and a waiver of medical standards or physical qualifications is not possible
- There are other instances where the CO or board chair may deem the individual to be a detriment to maintaining a safe handling environment

For guidelines and procedures on decertification or revocation, consult the applicable personnel AE handling and certification program instruction.

**Work Task Codes**

The WTCs standardize the use and definition of each applicable task. The WTCs are applicable to family groups for specific commands.

**WTC 1 Handling**

The WTC 1 is the physical act of breaking out, unpacking, counting (inventory control), inspecting, sentencing, segregating, lifting, transporting, repositioning, or packaging of AE by hand or with the use of powered or pneumatic equipment. WTC 1 handling does not include explosives drivers qualified in accordance with Motor Vehicle Driver and Shipping Inspector’s Manual for Ammunition, Explosives and Related Hazardous Materials, NAVSEA SW020-AF-HBK-010.

**WTC 2 Storage and Stowage**

This WTC is the physical act of storing or stowing explosives and explosive devices in designated and approved locations, such as holding areas, explosive magazines, and ready-service lockers. This WTC includes the physical act of inspecting magazines and ready-service lockers for improperly secured storage and stowage, unsatisfactory packaging, compatibility, abnormality of protective sprinkler and alarm systems, unusual odors or fumes, and other abnormal conditions, to include appropriate maintenance requirement cards (MRCs).
WTC 3 Assembly and Disassembly
This WTC is the physical act of mating or unmating components to or from an all-up-round (AUR) configuration. This WTC is used when assembly and disassembly is authorized in applicable weapons assembly manuals, technical manuals, SOPs, and checklists.

WTC 4 Load and Download
This WTC is the physical act of mating an AUR with its launching device, to include racks and launchers, fixed gun systems, automatic loading systems, torpedo tubes, etc., from which delivery and initiation can be accomplished. WTC 4 also includes the installation and removal of cartridge-activated devices (CADs) used as part of the weapon release system. The process includes all operations incidental to aircraft loading, clearing, and downloading included in those portions of the governing technical manuals, SOPs, checklists, and MRCs.

WTC 5 Arm and De-Arm
This WTC applies to those procedures contained in the arm and de-arm section of the applicable governing technical manuals, checklists, and MRCs that place an explosive, explosive device, or system in an armed or safe condition.

WTC 6 Install and Remove
This WTC is the physical act of installing and removing explosive devices, such as aircraft egress systems, cable cutters, fire extinguisher cartridges, nonaircraft support cartridges, and CADs.

WTC 7 Testing
This WTC is the physical act of conducting a test on AUR or AE components. Built-in-test (BIT), programming, reprogramming, and presetting are included in this WTC.

Qualification Standards and Certification Levels
The following certification levels are universally applicable.

In Training
The in training (IT) level is used to document a process by which the individual is learning how to perform the associated certification level. Direct supervision is mandatory. Individuals in an IT status can only perform the function to which he or she is being qualified to do while under supervision of an individual who is qualified and certified to that level.

Team Member
A TM level is aware of basic safety precautions for the task and AE concerned; has received either formal training, informal training, or OJT; and has been recommended by his or her immediate supervisor. A TM performs only under direct supervision of a TL.

Individual
The individual (I) level is the same as a TM described above, with the following additions: personnel in the I level have sufficient knowledge, have demonstrated the proficiency to be entrusted with performing the work task alone in safe and reliable operations, and must be capable of interpreting the requirements of applicable checklists, assembly and operating technical manuals, and SOPs. QA oversight is required when applicable (e.g., a checklist step that requires a QA witness for validation of a step or procedure being performed by the individual).
Team Leader

This level is the same as TM and I above, including having sufficient knowledge and being able to demonstrate the proficiency to direct others in performing the work task safely and reliably.

Quality Assurance

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<td>This definition of QA personnel for purposes of explosives safety QUAL/CERT is not the same as quality assurance personnel in the Naval Aviation Maintenance Program or personnel performing other QA-type functions that are not related to the certification and oversight of explosive work tasks and operations.</td>
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QA is the same as TL, with the following additions: Personnel in this level must have detailed knowledge to manage applicable AE, to include those personnel designated to determine AE material condition; and must be able to determine that the necessary work task procedures have been completed using applicable directives.

Safety Observer

An SO must have sufficient knowledge and experience of applicable safety procedures and functioning of safety devices, and working knowledge of work task procedures to determine potential outcomes and risks when safety procedures or devices are not properly used. This certification also applies to personnel performing the duties of designated pier or wharf SOs.

An SO is defined as the person responsible for safety assurance during handling evolutions. The pier safety loading officer, who is the individual assigned with overall responsibility for safety across the entire pier, does not fall under this definition and is not required to be certified.

The qualification of SO is not restricted to the most senior member within a unit. A junior member who possesses the foregoing standards and demonstrates maturity may be certified as an SO.

ONLY TM, I, TL, and QA are interrelated—SO stands alone.

Family Groups of Explosives and Explosive Devices

Family groups are AE with similar characteristics. Training record documentation is by specific explosive device and task. This training will be documented and must support the level of certification listed on the individual's certification form and must reflect all the individual's training.

Family groups for explosives and explosive devices are listed in the appropriate enclosure of the instruction.

AMMUNITION STOWAGE

Stowing ammunition aboard ship presents problems that will not be found in other types of storage facilities. When ships are underway, they are subjected to random motion. Ammunition is firmly and securely fastened in place when it is not being handled. Adequate ventilation is a problem. Most ammunition stowage spaces are located below the main deck. Normally, these areas require extensive piping and venting to maintain proper temperature control and vent hazardous fumes.
Access to stowage spaces often requires specialized equipment for moving ammunition quickly and efficiently. Stowage spaces are located close to other working spaces, which presents hazards to others on the ship, especially if there were a fire or explosion.

**Ammunition Stowage Spaces**

NAVSEA designates the authorized spaces and provides storage plan templates where AE are stowed, serviced, assembled, or temporarily held in readiness. Naval Air Systems Command (NAVAIR) provides stowage plan templates for aviation magazines. No alterations or modifications to magazines should be made without the approval of NAVSEA. A ship's magazines must be designed and arranged with regard to facility of supply, ammunition-unique stowage requirements, ammunition compatibility, and ship survivability.

Magazines are arranged so they are close to supply, have the best available protection, and the most favorable stowage conditions. For safety reasons, various types of explosives and ammunition are stowed in separate magazines or lockers.

The type of stowage varies with the type of ship, the space available, and the amounts of explosive involved. Label plates that designate the compartment and the types of ammunition stowed in them mark all magazines.

Magazines are marked with warnings that apply to specific special hazardous conditions and operations. Additionally, paint-stenciled labels or painted signs are installed on the outside surfaces of ammunition stowage spaces (except where the outside surfaces are visible from the exterior of the ship or interior surfaces with special decorative material). The stenciled markings must be located on the bulkheads 5 feet above the deck, and spaced 12 feet apart horizontally if possible. Markings on decks and overheads should be spaced 12 feet apart if possible.

The ammunition far side sign ([Figure 11-3](#)) is a yellow rectangle, 5 inches high by 9 inches wide. The sign has black slanted lines, 1/8 inch thick and 1 inch long not to obscure the letters. The letters are 1/8 inch thick and 3/4 inch high, with the words AMMUNITION FAR SIDE arranged as shown in [Figure 11-3](#).

Ships have several different types of magazines. Each magazine is designed for a specific type of ammunition. The magazine types include ammunition cargo holds, primary, universal, missile, ready-service, lockers, and chemical.

Ammunition cargo holds are used to hold bulk AE. Primary, universal, and missile magazines are designated to hold a ship’s allowance of ammunition.

Ready-service magazines and lockers are used to stow readily accessible ammunition. These magazines are large spaces designed to stow large quantities of ordnance. They should be located below the ship’s waterline and should be fitted with dunnage, universal tie-down, wire rope shoring, or chock-type stowage systems. Provisions must be made for securing bulk palletized or containerized AE.
These magazines are adequately equipped with thermal insulation, temperature control, and ventilation. Magazines are equipped with adequate sprinkler systems, and they are closed and locked when unattended.

**Missile Magazines**

Missile stowage should be in a magazine as an integral part of the launching system on combatant ships. Systems without integral magazines shall be provided with a magazine or locker convenient to the launcher.

Magazines designed for the stowage of missiles, rockets, or other ammunition that produces high volumes of gas should be equipped with specialized ventilation systems, such as plenum vents or relief ports, to ensure that magazine air pressure does not reach dangerous levels if a missile motor ignites. Restraining equipment may be provided to prevent movement of an accidentally ignited motor. A hatch or cover that is subject to possible external tampering should be fitted with an internal personnel obstruction grid made of welded steel or aluminum bars.

Air-launched missile magazines in aircraft carriers are usually located below the waterline and within the armor box. Air-launched missile ready-service magazines may be located either above the waterline or within the armor box. Missile magazines contain hydraulic and pneumatic power-operated handling equipment.

**Ready-Service Magazines, Lockers, and Staging Areas**

Ready-service refers to ammunition stowage area in the immediate vicinity of the launcher, gun, or aircraft where the ammunition is used. The amount of ammunition in ready-service should be minimized to quantities required to support a planned reload of a gun, launcher, or aircraft.

**Ready-Service Magazines**

Ready-service magazines (*Figure 11-4*) are designated spaces located near the weapon or area to be served. Normally, they are equipped with thermal insulation, ventilation, and a sprinkling system. They are securely locked. Certain magazines located within the armor box of aircraft carriers and used for stowage of completely assembled rounds of weapons and deployable targets are also considered ready-service magazines.
Lockers

Certain compartments or lockers are used to stow special types of ammunition and ammunition components, such as detonators, pyrotechnics, and chemicals. They are frequently located on the weather deck and as conveniently as possible to the weapon or space to be served. They may not be equipped with sprinklers, but they do have locking devices. Special flare ready-service lockers are located at outboard locations on aircraft carriers for short-term stowage of aircraft parachute flares. These flares have either been removed from the primary pyrotechnics magazines, prepared for launching, or they have been returned intact after a mission. If necessary, these lockers are manually jettisoned. A label is installed on the locker identifying the type of explosives that are stowed within each locker. Where stowage for ammunition is provided by lockers, chests, or racks that are permanently secured to the ship's structure, their location cannot be changed without prior approval of NAVSEA.

Chemical Magazines

Chemical ammunition classified as lethal or incapacitating is not carried aboard ships unless specifically authorized by NAVSEA or higher authority. If authorized, specific stowage instructions are issued by NAVSEA, and personnel involved in handling procedures must receive appropriate training. Specific spaces aboard ship may be designated as chemical magazines by NAVSEA. The decks and bulkheads of a chemical magazine are coated with an impermeable material, and the magazine contains a provision for sampling its internal atmosphere from an adjacent compartment. Facilities for personnel decontamination should be located near the magazine.
Ammunition Stowage Requirements

Generally, there are magazines for each type of ammunition stowed aboard ship. Ammunition, explosives, and explosive components are stowed in specifically designated stowage spaces. Ammunition stowage spaces aboard ships are limited, and in certain classes of ships, extremely limited. Therefore, ammunition stowed aboard ship should stay within authorized ammunition allowances. It is important for shipboard ammunition to be stowed so that maximum effectiveness is achieved. For these reasons, strict compliance with ammunition stowage by compatibility groupings aboard ship, while desirable and observed when practical, may not be feasible. When mixed stowage is used, it must conform to the stowage tables listed in Ammunition and Explosives Safety Afloat, NAVSEA OP 4.

Environmental Control Systems

Magazines are fitted with environmental control and safety features to protect ammunition from excessive temperatures and humidity. Most magazines have either mechanical cooling or ventilation systems. However, there are a few magazines that do not have either of these features. If a magazine without controls shows a temperature in excess of 100 degrees Fahrenheit (°F), use portable ventilation systems to prevent overheating or condensation of moisture.

Supply and Exhaust Ventilation

Ventilation ducts and exhaust ventilation outlets to and from magazines provide forced-air ventilation. Air is forced through the ducts by electric fans installed within the ductwork. Standard covers maintain water tightness. These covers should always remain closed during combat (general quarters) conditions, unless otherwise directed.

Exhaust Vents

Aboard ship, most magazines—particularly missile magazines—are vented to the atmosphere. When missile motors burn, they rapidly produce large volumes of smoke and gas. To avoid spreading smoke and gas to other areas of the ship if a missile motor in a magazine accidentally ignites, the exhaust ducts are vented to the atmosphere. The area on the weather deck in the vicinity of an exhaust vent is potentially hazardous, and it is marked to warn personnel not to loiter in the area.

Sprinkler and Alarm Systems

Primary and missile magazines, ammunition handling rooms, and ready-service magazines are fitted with sprinkler systems. Sprinkler systems consist of spray heads or sprinkler-head valves arranged to dash water directly on the munitions and completely cover the magazine's interior. Sprinkler systems for spaces located below the damage control deck are arranged for local control at the valve and for remote control from the damage control deck. On aircraft carriers, the remote controls are normally divided into two groups—forward sprinkler control board and aft sprinkler control board. The forward magazine group and the aft magazine group sprinklers can be remotely activated from the two control boards. Sprinkler systems for spaces located on and above the damage control deck are arranged for local control only from a position outside the access entrance to the space.
Sprinkler Systems

Sprinkler systems are classified by the type or location of the control exercised over the valves that restrain the flow of water. These valves may be operated manually or by remote control (manually or automatically). There are three types of remote operation:

- Manual, by operating valves
- Hydraulic, by means of control valves and water from the fire system by use of the energy of either the pressure from sea water at firemain or from manually generated hydraulic oil pressure to obtain rapid actuation or securing of the magazine sprinkler system
- Automatic, by means of a rate of rise or combined rate of rise and fixed temperature thermopneumatic control system

Alarm Systems

Three alarms are commonly associated with all magazine sprinkler systems—a sprinkling (FH circuit) alarm, a flooding (FD circuit) alarm, and a high-temperature (F circuit) alarm.

High-temperature alarm systems (F circuits) are installed in all of the following magazines or spaces:

- Ammunition and propellant stowage areas
- Ammunition handling spaces
- Ammunition assembly, disassembly, and checkout areas
- Cargo ammunition holds

The F circuit should not be confused with the FH circuit. The F circuit detects a high temperature, while the FH circuit detects the sprinkler activation.

A minimum of two thermostats should be installed in each space. A minimum of one thermostat should be installed for each 250 square feet of deck area, or fraction of a deck area. If high temperatures occur in any of the spaces containing thermostats, the high-temperature occurrence is indicated on an alarm switchboard installed in an area continuously manned when the ship is underway. Usually, this area is damage control central.

Audible alarm systems are also installed in the pilothouse, officer-of-the-deck (OOD) area, secondary damage control station, and each interior communications room. The audible alarm systems work in conjunction with the F and FH circuits.

Tests and maintenance of the magazine sprinkler systems are performed periodically according to NAVSEA and applicable preventive maintenance system (PMS) instructions.
Magazine Internal Arrangement

The internal arrangement of each magazine may vary considerably. The arrangement depends on the stowage space available and the type of ammunition stowed. Weapons are loaded onto handling equipment and ready for immediate issue. Stanchions are also used to divide a large magazine area into smaller areas or bins (Figure 11-5) to hold various sizes of ammunition with a minimum loss of space. The stanchions are fitted with slots or have other means for receiving battens.

The battens (which run horizontally) provide the walls that form the bin.

No matter which stowage method is used, the stowage area should be arranged so that access to as much ammunition and as many containers as possible is provided, and so that adequate space is provided for ventilation and handling operations. Stow AE stow on dunnage to provide airspace so all parts of the magazine receive maximum ventilation and exposure to the sprinkler system.

Mk 3 or Mk 12 metal pallets are used as dunnage aboard ships. These pallets have the correct space between the deck and stowed material. They also provide adequate grounding. Additionally, there should be an air space of not less than 2 inches between any ammunition stowage stack and the surface of adjacent plating or sheathing. The stacks of ammunition should be stacked so that sprinkler systems, F-circuit sensors, or air escape lines are not obstructed.

When different lots and/or types of ammunition are stored in the same magazine, segregate the ammunition by lot, size, and type. Where more than one type of ammunition is stowed in a magazine and where portable battens or alternate stowage facilities have been provided to receive the various types of ammunition, a stowage chart should be posted. The chart should show the stowage locations, including ammunition types, quantities, and the arrangement of the stowed ammunition.

Ships at sea move randomly; therefore, all hazardous munitions and explosives should be securely fastened in place, except when they are actually being handled. In some cases, stanchions and battens provide adequate security. Other types of ammunition stow, such as palletized bombs or missile containers, should be secured by tie-down chains especially designed for this purpose. The tie-down chains should be connected to the load and the deck tie-down points, so even the slightest movement of the ammunition is prevented.

Ammunition and Stowage Inspection

Ammunition and stowage inspection consists of two parts: the inspection of the ammunition and the inspection of the magazine space. They apply to the inspection of magazines and their contents. Aboard ship, these inspections are mandatory according to The Ships’ Maintenance and Material Management (3-M) Manual, OPNAVINST 4790.4(series), other Navy regulations, and NAVSEA instructions.
Magazine inspections are part of the ship's PMS, and these inspections should only be conducted by qualified personnel using an MRC to ensure that a hazard or abnormal condition is not overlooked.

**Ammunition Inspection**

Ammunition stowage inspection aboard ship will verify that ammunition in stowage has not been affected by loss of environmental control, handling damage, ship's movement, or other factors. Ammunition in stowage includes ammunition maintained in launch systems, such as torpedo tubes, vertical launching systems, and gun systems.

The frequency and extent of the inspection of the ammunition shall be determined by weapon system technical manuals or by ship's personnel and will be based on magazine environmental control history, inventory control history, type of ammunition, ship's movement, etc. Notices of ammunition reclassification (NARs), ammunition information notices (AINs), and overhead fire (OHF) information messages are used to update Ammunition Unserviceable Suspended and Limited Use, Naval Supply Systems Command (NAVSUP) Publication (P)-801. Prior to any receipt, stowage, and issue evolution, verify AE material against NAVSUP P-801 and any recent NAR, AIN, or OHF message.

**Magazine Inspection**

Inspect the magazine itself daily and prior to securing the magazine after any loading, downloading, or magazine maintenance.

Generally, the daily visual inspection of magazines consists of checking for the following conditions:

- Improperly secured stowage
- Unsatisfactory protective packaging
- Unusual fumes or odors
- Magazine cleanliness
- Other abnormal conditions

Abnormal conditions in a ship's magazine or ammunition stowage space include evidence of tampering to gain access, evidence of theft, evidence of temperature or humidity fluctuations, and the presence of unauthorized materials. Abnormal conditions also include evidence of localized overheating from adjacent compartments on decks, bulkheads, and overheads indications of leaks from sprinkler or flood pipes, nozzles, control valves, and regulators; and inoperable or damaged reach-rods, linkages, automatic fire alarm devices, and other similar equipment in the specific hazard stowages. Record the results of all magazine inspections on the appropriate PMS schedule.

An important requirement of the daily magazine inspection is observing, recording, and reporting maximum and minimum temperature conditions in each stowage space. Magazines should be fitted with thermometers and temperature record cards and holders, or temperature-sensing devices. They must be capable of recording minimum and maximum temperatures.

Where no functional automated temperature indication system is present, at least one bimetallic thermometer (Figure 11-6) should be placed in each designated ammunition magazine or locker. The thermometer should be located in a readily accessible area where maximum variations of temperature would normally occur. Where installation of the thermometer and bracket interferes with stowed material or equipment, the thermometer should be mounted in a boss on the outside with the stem projecting inside the stowage space.
These thermometers should be direct-reading, bimetallic thermometers with maximum and minimum index pointers and a reset knob. They should meet the specifications of Military Specification: Indicators, Temperature, Direct-reading, Bimetallic, (3 and 5 inch dial), MIL-I-17244. Thermometers should have a temperature range of –40 to 180 °F, a 3-inch back-connected dial, and a 4-inch stem. For applications that do not require recording of minimum temperatures, a bimetallic thermometer with a maximum index pointer only is also acceptable. The thermometer should be mounted in an L-shaped bracket in accordance with Naval Ship System Command (NAVSHIPS) Drawing 810-1385917 and attached to the supporting structure.

**Magazine Temperature Log**

A magazine temperature record card (Figure 11-7) should be located in each magazine and posted near the thermometer for recording daily magazine temperatures. Replace these cards on the first day of each month. Remove the completed cards from the magazine, and post the temperatures for each month in a permanent log.

Retain the magazine temperature record cards on file for a period of 1 year. When recording magazine temperatures in the permanent log, record temperatures that exceed 100 °F so that they stand out, such as by using red ink. If the temperature exceeds 110 °F in smokeless powder, rocket motor, and jet-assisted takeoff (JATO) magazines, check the temperature hourly and record it in a separate notebook. Transfer these recorded temperatures to the permanent log on a daily basis. Report any magazine with a temperature consistently above 100 °F to NAVSEA.
**Magazine Security**

Unless work is actually being performed within the space, all ammunition stowage spaces containing ammunition or explosives should be secured and locked. Current directives and instructions require this action. Properly securing an ammunition stowage space includes the following actions:

- Properly set all environmental controls
- Close all hatches, doors, or accesses
- Properly set all dogs on watertight closures
- Lock the space with an adequate locking device

Some ammunition and explosive items, such as small arms ammunition, small arms, and pyrotechnics, are highly pilferable. Stow these items in high-security stowage spaces. These spaces should be equipped with an unauthorized entry alarm system and a specially designed, high-security locking device (Figures 11-8 and 11-9).

**Figure 11-8 — High-security hasps.**

The ship's gunner maintains and controls the magazine keys, including the high-security keys. The keys must be logged out to authorized personnel only. During emergencies, such as fire and flooding, the ship's gunner provides access, as necessary, to locked ammunition spaces. If the ship's gunner is absent, the weapons department duty officer performs this function.

**AMMUNITION HANDLING**

Handling ammunition requires detailed planning, precise execution of details, and strict compliance with safety regulations. When ammunition aboard a ship is being handled, these requirements cannot be overemphasized. The working space is limited, and a large number of personnel are contained within the ship. All personnel (both
military and civilian) who handle ammunition must be qualified and certified in their areas of responsibility.

**Installed Handling Equipment**

Aboard ship, weapons elevators service most large magazine and weapons assembly areas. These areas have provisions for the use of hoists. A brief description of handling equipment and its purpose is discussed in the following text.

**Hoists**

Hoists are used during weapons assembly to lift a weapon from the handling equipment or pallets to the assembly stands and from the assembly stand to the handling equipment.

There are three basic types of hoists—manually powered, electrically powered, and pneumatically powered *(Figure 11-10)*.

![Figure 11-10 — Typical pneumatically powered hoist.](image)

A hoist may be attached to the overhead by a stationary fitting, or it may be mounted onto an overhead monorail to move the load laterally. Use the correct sling, hoisting beam, and bomb carrier when connecting the hoisting cable to the load. Hoists have an established safe working load (SWL) that must be considered when a hoist is selected for a particular job. Also, the SWL of the interfacing equipment (bomb carrier, sling, etc.) should be considered. For example, consider the following: A hoist has been selected with an SWL of 4,000 pounds and a bomb carrier with an SWL of 2,000 pounds. The maximum weight this configuration can safely lift is 2,000 pounds.
Inspect hoists before they are used, periodically load test the hoist. Mark equipment that has satisfactorily passed periodic load tests to indicate its SWL. As a minimum, the marking includes the following information:

- The equipment or system designator
- The name of the testing activity
- The test expiration date
- The SWL

If the test period has expired or if documentation is not available to verify the latest load test status, the equipment should be tested before it is used. If the equipment fails the load test specifications, the equipment should be destroyed or, if economically feasible, repaired.

**Weapons Elevators**

The size, type, and location of these weapons elevators will vary among the different classes of ships. These elevators are used to vertically transport ordnance and cargo to and from magazine spaces, handling spaces, and ships' holds to various decks in support of the ships' mission.

Transported ordnance can either be moved in the AUR Ready-For-Issue (RFI) configuration or the component configuration, or palletized as a Fleet Issue Unit Load (FIUL).

Personnel are not authorized to ride on weapons elevators except for certain PMS requirements, and when evacuating personnel in a mass casualty or medical emergency situation. When elevators are used in this manner, special operating procedures must be followed.

The following text contains a brief description of the two major classifications (lower stage and upper stage) of weapons elevators. Regardless of the type of installation, a weapons elevator provides a safe and efficient means for weapons and weapons components among the magazines and various assemblies, staging, and arming areas within the ship to be handled.

An operator-attended control panel is located next to all elevator doors. All operator control panels have a display of selector switches, push buttons, and indicator lamps suited for the control functions required at the station served. All control panels have an emergency stop-run switch from which all operations of the elevator can be stopped.

**Lower Stage Weapons Elevators**

The lower stage weapons elevator (Figure 11-11) services magazines and ammunition handling areas from the seventh deck level up to and including the main deck (hangar deck).

The elevator system is controlled by a programmable controller that continually tracks the location of the platform to within one-twelfth of an inch. Because of the complexity of the elevator system, elevator operators and maintenance personnel are extensively trained in hydraulics, electricity, and electronics.

Four cables attached at the corners lift the platform. The platform machinery is located at the third deck level. The hatches are opened hydraulically. They are designed to automatically undog-open-latch and unlatch-close-dog. The elevator doors are also operated hydraulically.

The system incorporates the following safety features:

- An over-speed governor slack-cable device
- An over-speed governor device
- A hydraulic interlock to prevent two hatches from being opened at the same time
Figure 11-11 — Typical lower stage weapons elevator.

- A hydraulic interlock to prevent hatches from closing when dogs are in the dogged position
- An electrical interlock to prevent the opening of a magazine door unless the platform is at that level
- An electrical interlock to prevent the opening of more than one magazine door at a time
- A pressure switch to prevent operation of the elevator when the hydraulic pressure is below 1,200 pounds per square inch
- An electrical interlock to prevent platform high-speed travel beyond the sequence-level slowdown switch
- An electrical interlock to prevent platform travel beyond the sequence level until the main deck hatch is opened and latched
- An electrical interlock to prevent movement of the platform until the lock bars are fully retracted
Figure 11-12 shows ordnance being transported via lower stage weapons elevator from the ship's hangar bay to weapons magazines below decks aboard an aircraft carrier.

**Upper Stage Wire-Rope Elevators**

The upper stage, wire-rope elevators (Figure 11-13) are the only weapons elevators in the system that provide weapons transportation to the flight deck.

The second deck is the lowest level served by the upper stage elevators. The equipment of upper stage, wire-rope elevators are either similar or identical to those of lower stage, wire-rope elevators. The following discussion describes the differences between upper and lower stage, wire-rope elevators.

The elevator trunk enclosure extends from the third deck to the underside of the flight deck. Power-operated ballistic hatches in the main deck, 02 level, and flight deck allow passage of the elevator platform, and they maintain ballistic integrity within the trunk. There are power-operated doors in the trunk for elevator loading and unloading.

So that the elevator platform can be raised flush with the flight deck, the wire-rope attachment points are on extensions of the platform structure, placing them below the main hoisting sheaves. An arrangement of hoisting and idler sheaves in the upper end of the elevator trunk allows the platform to be raised flush with the flight deck. Safety devices of upper stage elevators are essentially identical to those for lower stage elevators.

Control equipment for upper stage elevators are essentially identical to those for lower stage elevators. Operator control panels are located at each station served.
Weapons Elevator Maintenance and Safety

The weapons department is responsible for maintaining all weapons elevators aboard aircraft carriers. As an aviation ordnanceman (AO), you will perform preventive maintenance and repair elevator systems. The same personnel are required to operate, maintain, and troubleshoot all types of elevators, even though elevators differ significantly in design and level of sophistication.

Although the primary responsibility of elevator maintenance rests with the AO, some maintenance procedures require the assistance of personnel within other ratings, such as machinist’s mate (MM) and electrician’s mate (EM). When this requirement exists, it should be noted on the PMS card.

All electrical power requirements for the weapons handling system come from the ship's service 440-volt, three-phase, 60-hertz power supplied throughout the system. Ship's service power is converted to other alternating current (ac) and direct current (dc) voltages by either the controllers or control panels to meet system equipment requirements.
For the safety of maintenance personnel, the tag-out and tag-in system has been established. The steps within this system are standardized throughout the Navy. To ensure safety, operators should comply with ship’s tag-out procedures.

Ship's service sound-powered telephones are located at each operator control station. They are used to supplement weapons handling system control indicators and coordinate operations between various deck levels. An elevator must not be dispatched from one deck to another until communications between the sending operator and receiving operator have been established.

In addition to OJT, most commands require that all personnel operating elevators possess a valid operator’s license. The license should reflect the type(s) of elevator(s) the individual is authorized to operate. For example, an operator may be authorized to operate all elevator systems at any control station, or an individual with less training may only be authorized to operate the elevator system at any station except the second deck main control station.

WEAPONS MOVEMENT

The movement of ammunition consists of routine operations, such as intramagazine movement and movement of weapons and components in support of flight operations. It may also consist of major evolutions, such as ship rearmament or major loading and offloading operations.

Regardless of the size of the operation, anytime weapons or explosives are removed from their proper stowage environment; the opportunity for the occurrence of an ordnance mishap is much greater. Therefore, one of the most important factors of any ordnance evolution is preplanning. Additionally, a safety-first attitude must be paramount.

Weapons Movement in Support of Flight Operations

To enable squadron personnel to meet the short turnaround time of the flight schedule requirements, weapons must be preassembled and located in staging areas on the hangar deck with sufficient lead-time.

The area of the hangar deck that is to be used as a weapons staging area must be coordinated with the hangar-deck officer. The weapons cannot interfere with the movement of aircraft or obstruct fire lanes, but they must be positioned so they are protected by the hangar-bay sprinkler system. This area should be located as close as possible to the aircraft elevator doors to provide a means for jettisoning the weapons overboard in the event of an emergency. Anytime live ordnance is staged on the hangar deck, a security watch must be posted to restrict the area to authorized personnel only and to initiate movement of the weapons in case of an emergency.

The weapons staging area on the flight deck is located outboard of the island structure and inboard of the catwalk or deck edge for aircraft carriers and behind the island on amphibious-class ships. This area is commonly called the bomb farm. Anytime live ordnance is present, this area is manned by the bomb-farm watch. Bomb-farm watch personnel maintain direct communication with the aviation weapons movement control station (AWMCS), also known as aviation ordnance control center (AOCC). In addition to security of the ordnance, the bomb-farm watch issues ordnance to squadron personnel according to the ship’s ordnance load plan.

The bomb-farm staging area also incorporates an emergency jettison ramp. The emergency jettison ramp, when in the rigged position (down), forms a ramp from the flight deck edge to an opening in the outboard bulkhead of the catwalk. The ramp provides a path for jettisoning weapons overboard during an emergency. Additionally, jettison ramps are located fore and aft on the port and starboard sides of the flight deck, so during an emergency, aircraft loading crews can jettison weapons. It is important for personnel to be careful when the emergency jettison ramps are rigged; they bypass the catwalk.
and safety net. When the ramps are in the stowed (raised) position, they form part of the catwalk structure.

The bomb farm is routinely replenished with weapons from the hangar-deck staging area between the launch and recovery of aircraft. The weapons are transported from the hangar deck to the flight deck by the upper stage weapons elevators or deck-edge aircraft elevators.

**Weapons Onload and Offload**

There are three situations in which weapons onload or offload operations are normally conducted—pier side, offshore at anchorage, or at sea. The location of the ship during onload or offload operations affects manpower, equipment, time, and the degree of safety requirements.

**Pier Side**

Handling large quantities of explosive munitions at piers is limited to those designated by NAVSEA as explosive piers. The pier area is restricted during ammunition and explosive loading and offloading operations. Nonessential personnel (visitors) are not permitted access to the ship or pier area. All privately owned vehicles, ship’s vehicles, and assigned Government transportation are prohibited on a pier where ammunition is being handled. Before loading or offloading operations, the OOD is notified. The OOD makes sure that a red flag is prominently displayed to indicate that an ordnance evolution is in progress.

Pier-side ammunition handling operations are restricted to daylight hours. AE should not be loaded or offloaded from a ship at night unless the ship’s CO or Master has approved the night ordnance handling operations.

All AE operations on the pier must be approved by the installation or activity CO and the Naval Munitions Command (NMC).

Operations can only be carried out at an adequately lighted pier. Situations that may affect pier-side handling operations may include ship's sailing schedule or operational requirements. Therefore, ammunition is not staged on the pier in large quantities. Close coordination is established between the ship's weapons department and the station's NMC detachment to ensure that the rate of delivery at the pier does not exceed the handling rate of the ship’s ordnancemen.

**Explosive Anchorage**

At times, loading or offloading large quantities of AE at the pier is not practical or feasible. For example, a ship may be located at a pier that has a restricted explosive load limit due to the geographical location of other ships or occupied structures. It could also be due to the geographical location of shore-based ammunition handling facilities. For example, an aircraft carrier may be docked in Norfolk, Virginia, and the activity receiving or issuing the ammunition may be located in Charleston, South Carolina. In this situation, the most practical method would be to locate the aircraft carrier at a designated explosive anchorage (commonly called whiskey anchorage) and transport the ordnance by lighters and/or barges. The transfer of ammunition between the ship and the lighters or barges is normally accomplished by the use of a floating crane.

Even though a ship is located at an explosive anchorage, transferring ammunition is restricted to daylight hours. Normally, the ship remains at anchorage until the entire evolution is completed, which may vary from 1 to 5 days.

**Transfer of Ammunition at Sea**

The transfer of ammunition at sea (underway) presents problems not met by pier-side or anchorage operations. Normally, replenishment at sea involves the transfer of fuel, supplies, stores, and
ammunition simultaneously. Obviously, available deck space, available handling equipment, and manpower are used to the maximum efficiency. Every detail of the entire operation is preplanned and coordinated between the departments involved within the ship and the individuals within the departments.

Connected replenishment (CONREP) and/or vertical replenishment (VERTREP) methods at sea accomplish the transfer of ammunition. The CONREP method consists basically of a steel cable rigged between the supply ship and the receiving ship at the hangar-deck level. These points of contact are called conning stations, and there may be more than one conning station in operation at the same time. Cargo is attached to the cable by using approved handling equipment and conveyed from one ship to the other. The AO is only responsible for ammunition items. Each ammunition load is positioned at the conning station for transfer. As the ammunition loads are received at the conning station, the load is moved to a designated staging area until it is struck below. The ship’s deck department normally performs the operation of conning equipment.

In the VERTREP method, helicopters using slings and/or cargo nets transfer the ammunition to or from the supply ship. VERTREP operations are conducted on the flight deck. The AO is responsible for handling all ammunition and preparing and positioning empty slings and ammunition details for transfer to the supply ship. A designated aircraft elevator transfers ammunition from the flight deck to the hangar deck. The designated elevator is normally on the port side when CONREP and VERTREP operations are being conducted simultaneously.

HAZARDS OF ELECTROMAGNETIC RADIATION TO ORDNANCE

Ordnance that presents a HERO problem includes cartridges, CADs, 20 mm ammunition, and rocket motors. The ordnance electrically initiated devices (EIDs) may be accidentally initiated or their performance degraded by exposure to radio frequency (RF) environments. Ordnance is more susceptible to RF environments during assembly, disassembly, handling, loading, and unloading operations.

The term radiation hazards (RADHAZ) applies to RF electromagnetic fields of sufficient intensity to:

- Produce harmful biological effects in humans
- Cause spark ignition of volatile combustibles or actuate electro-explosive devices

Although the effects of RADHAZ are important, this chapter limits discussion to HERO hazards.

Hero Ordnance Classifications

A testing program sponsored by NAVSEA determines the susceptibility of ordnance to RF environments. Tests are conducted in the maximum RF environment the ammunition or ordnance systems may be subjected to in its stockpile-to-launch sequence (Figure 11-14).

This data is the basis for the four HERO classifications assigned to ordnance—HERO safe ordnance, HERO susceptible ordnance, HERO unsafe ordnance, and HERO unreliable ordnance.

HERO Safe Ordnance

An ordnance item is classified as HERO safe if it meets the following criteria:

- Ordnance is sufficiently shield-protected so that all EIDs contained by the item are immune to adverse effects (safe and/or reliable) when the item is used in its expected RF environments
- Percussion-initiated ordnance is exempt from HERO requirements
- General HERO requirements are observed
HERO Susceptible Ordnance
An ordnance item is classified as HERO susceptible if proved (by tests or analysis) to contain EIDs to be adversely affected by RF energy to the point that the safety and/or reliability of the system is in jeopardy when the system is used in its expected RF environments.

HERO Unsafe Ordnance
An ordnance item is classified as HERO unsafe if it meets the following criteria:

- Its internal wiring is physically exposed
- Tests are being conducted on the item that result in additional electrical connections to the item
- EIDs that have exposed wire leads are handled or loaded when the item is being assembled or disassembled
- When such ordnance items are damaged, it causes exposure of internal wiring or components or the destruction of engineered HERO protective devices

HERO Unreliable Ordnance
Any ordnance item, including those having a HERO safe ordnance or HERO susceptible ordnance classification, whose performance is degraded due to exposure to the RF environment, is defined as being HERO unreliable ordnance when its internal wiring is physically exposed; when tests are being conducted on the item that result in additional electrical connections to the item; when EIDs having exposed wire leads are present, handled, or loaded in any but the tested condition; when the item is being assembled or disassembled; or when such ordnance items are damaged, causing exposure of internal wiring or components or destroying engineered HERO protective devices.

Hero Emission Control Bill
Ordnance items classified as HERO unsafe are protected from electromagnetic radiation by putting them in a completely enclosed all-metal container. HERO unsafe ordnance should NEVER be
exposed to an RF environment. However, the requirement for assembly, disassembly, handling, loading, and unloading exposes ordnance to some degree. If exposure cannot be avoided, ordnance should be exposed only in essentially RF-free designated regions, such as below deck or in RF-shielded buildings.

The HERO EMCON bill is a set of directions for mitigating the HERO restrictions on ships and shore stations. An EMCON bill’s development and implementation are often the responsibility of the combat system officer (CSO), electronic warfare officer (EWO), or for shore stations—the explosives safety officer (ESO).

Its purpose is to prescribe, through advance planning, the easiest and most efficient method of managing the conflict between the electromagnetic environment (EME) created by transmitting equipment and HERO-classified ordnance.

The CO is responsible for making sure that HERO unsafe ordnance is not handled in RF environments. Sometimes operational commitments require HERO unsafe ordnance to be exposed to RF environments, such as the flight deck, hangar deck, or weather decks.

A degree of relief from HERO RF restrictions is obtained by following the command HERO EMCON bill.

The HERO EMCON bill depends upon two factors—the amount and type of ordnance that is involved and knowledge of the RF environment at locations where exposure occurs during presence, handling, loading, storage, assembly, and transportation operation.

The HERO EMCON bill contains a list of all HERO susceptible and HERO unsafe ordnance items onboard and their allowable RF environmental levels. It also includes a list of all transmitter-antenna combinations on board and their output power. Reducing or securing certain transmitter-antenna combinations can maintain allowable RF environmental levels.

Normally, to ensure that proper conditions are met in a given ordnance-handling situation, two actions are taken:

- All on board transmitters are listed
- The operator follows appropriate steps when a given HERO EMCON condition is set

For example, in HERO condition 1, a transmitter operator may switch the transmitter to STANDBY. In HERO condition 2, the same operator may restrict transmission to 100 watts, or perhaps there is no transmission restriction at all.

The AO is the most important factor in avoiding a HERO unsafe situation. The AO determines if an ordnance item is HERO safe, HERO susceptible, or HERO unsafe. Before moving a HERO unsafe item from an RF-free environment, the proper HERO condition must be requested through strike operations, AWMCS or AOCC. The AO must ensure that the ordnance item remains in an RF-free environment until the word has been passed that the proper HERO condition has been set.

For detailed information concerning all aspects of electromagnetic radiation hazards, refer to Electromagnetic Radiation Hazards, NAVSEA OP 3565/NAVAIR 16-1-529, volumes I and II.

**SAFETY PRECAUTIONS**

Preplanning, ordnance training, and carefully handling ordnance prevent accidents caused by explosives. The phrase "The life you save may be your own" is a good one, especially for ordnance handling. It is the AO’s responsibility to make sure precautions and approved practices and procedures are used when handling ordnance.
Review Questions

11-1. The majority of explosive mishaps are caused by personnel error due to inadequate training, lack of adequate supervision, and what other reason?

A. Complacency and failure to follow the governing technical directives
B. Failure to meet timelines and standards of personnel inspection
C. Limiting ordnance movements and magazine space
D. Following standard operating procedures

11-2. What instruction governs the Navy Personnel Ammunition and Explosives Handling Qualification and Certification Program?

A. OPNAVINST 8023.24
B. OPNAVINST 8025.24
C. NAVSEAINST 8023.24
D. NAVAIRINST 8023.20

11-3. Other than officers and enlisted, what other Navy personnel, if any, are included under the scope of the qualification and certification instruction?

A. Government employees
B. Civilian magazine construction engineers
C. Officers and enlisted who fall under the instruction
D. None

11-4. Which of the following personnel works under the qualification and certification program?

A. Security guards and magazine sprinkler maintenance crews
B. Weapons Safety Assistant Teams and Inspectors
C. Ammunition and explosives stowage/issue personnel
D. Crane operators and elevator operators

11-5. In addition to primary, which of the following types of magazines is provided on ships?

A. Ammunition cargo holds, universal, missile, ready-service, lockers, and chemical
B. Ready-service, locker, and miscellaneous
C. Miscellaneous, missile, small arms, and chemical
D. Chemical, locker, miscellaneous, and missile
11-6. Aboard an aircraft carrier, what type of magazines is capable of holding a ship's service allowance of ammunition?

A. Ready-service
B. Primary
C. Secondary
D. Pyrotechnic

11-7. What type of magazine is located within the armor box and is used for the stowage of completely assembled rounds of weapons?

A. Primary
B. Missile
C. Locker
D. Ready-service

11-8. Generally, each magazine on board a ship is designated to hold what total number of ammunition types?

A. One
B. Two
C. Three
D. Four

11-9. What Naval Sea Systems Command publication provides the stowage tables that should be referenced when mixed ammunition storage must be used?

A. OP 4
B. OP 5
C. OP 2165
D. OP 3347

11-10. What action should be taken when a magazine without environmental controls shows a temperature in excess of 100 degrees Fahrenheit?

A. Notify the EOD
B. Use portable ventilation
C. Flood the magazine with water
D. Remove all ammunition from the magazine

11-11. Mk 58 Marine Location Markers NOT in an original watertight sealed container should be stowed in a magazine with which of the characteristics?

A. With a sprinkler system
B. Located on the damage control deck
C. Without a sprinkler
D. With remote control valves
11-12. Sprinkler systems are fitted in which of the following magazines?

A. Primary only  
B. Ready-service only  
C. Missile only  
D. Primary, ready-service, and missile

11-13. What minimum number of thermostats should be installed in each magazine?

A. One  
B. Two  
C. Three  
D. Four

11-14. What minimum distance of air space, in inches, should be provided between any ammunition stowage stack and the surface of adjacent plating or sheathing?

A. 2  
B. 4  
C. 6  
D. 8

11-15. Aboard ship, magazine inspections are mandatory according to what Office of the Chief of Naval Operations instruction?

A. 3120.32  
B. 4790.2  
C. 4790.4  
D. 8023.2

11-16. The maximum and minimum temperature conditions in a magazine should be observed, recorded, and reported at least how often?

A. Daily  
B. Biweekly  
C. Weekly  
D. Bimonthly

11-17. How many basic type of hoist are available?

A. Two  
B. Three  
C. Four  
D. Five
11-18. Any piece of handling equipment that has satisfactorily passed a periodic load test should be marked with which of the following information?

A. Maximum testing weight
B. Name of the testing activity
C. Testing inspector’s name
D. Type of test conducted

11-19. What two major classifications of weapons elevators are used in the Navy?

A. Conventional and special
B. Lower stage and upper stage
C. Electrically operated and hydraulically operated
D. Manually operated and pneumatically operated

11-20. What weapons elevators provide weapons transportation to the flight deck?

A. Upper stage, hydraulic
B. Upper stage, wire-rope
C. Lower stage, hydraulic
D. Lower stage, wire-rope

11-21. An ordnance mishap is most likely to occur under which of the following conditions?

A. When seas are rough
B. When magazine hatches are not properly secured
C. When weapons or explosives are removed from proper stowage environment
D. When weapons or explosives are stored in magazines and elevator maintenance is being performed

11-22. Pier-side ammunition handling operations may be conducted after daylight hours under which of the following conditions?

A. When the pier is adequately lighted only
B. When the pier is adequately lighted and an emergency exists
C. When authorized by the supply officer
D. When authorized by the ship’s master or commanding officer

11-23. An ordnance item is classified as hazards to electromagnetic radiation to ordnance unsafe if which of the following criteria have been achieved?

A. The external paint is chipped
B. The internal wiring is physically exposed
C. The maximum captive carry time is exceeded
D. The weapons assembly area is full
11-24. Which of the following publications contains detailed information pertaining to electromagnetic radiation hazards?

A. NAVSEA OP 3347/NAVAIR 15-1-140
B. NAVSEA OP 4
C. NAVSEA OP 5
D. NAVSEA OP 3565/NAVAIR 16-1-529
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