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**SAFE OCEAN TRANSPORT
OF
MILITARY EXPLOSIVES AND HAZARDOUS MUNITIONS**



Prepared By

**NAVAL WEAPONS STATION
CONCORD, CALIFORNIA**

For


**NAVAL ORDNANCE SYSTEM COMMAND
WASHINGTON, D.C.**

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FOR
NAVAL ORDNANCE SYSTEMS COMMAND
WASHINGTON, D. C.

SAFE OCEAN TRANSPORT
OF MILITARY EXPLOSIVES AND HAZARDOUS MUNITIONS

10 November 1966


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Commanding Officer
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RECORD OF CHANGE

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From: Commanding Officer, Naval Weapons Station, Concord, California
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1. By direction of Commander, Naval Ordnance Systems Command, the subject manual has been prepared and is distributed in accordance with reference (a).
2. All commands receiving this publication are encouraged to use it in conjunction with a preloading conference. It has been designed to indoctrinate new and refresh experienced deck officers of vessels assigned to operate as munitions and explosives carriers.
3. This manual outlines and discusses loading and offloading techniques and selected items of hazardous nature in a general manner. It is not regulatory in content. Detailed information on the manual's subject matter can be obtained by referring to the bibliography listed in Appendix I.
4. Additional copies may be ordered by directing your request through the Naval Ordnance Systems Command to the Commanding Officer, NWS Concord, Attn: Code 17400.
5. The users of this manual are encouraged to provide feedback for the updating of its material by comments, recommendations and pictures which may be forwarded as outlined in paragraph 4 above.

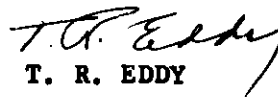

T. R. EDDY

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CHAPTER I - INTRODUCTION

Section I - PURPOSE

111. The proper stowing and securing of explosives or other dangerous articles and substances is the basic concern of this publication. Proper stowage and securing of such cargo permits maximum utilization of the space available. It prevents damage in transit and reduces the possibility of disaster from such damage. It avoids unnecessary delay in loading or unloading. It preserves the time, effort, skill, and scientific research of many persons and the expense of the manufacture and assembly of each item of munitions. In time of war or emergency, it assures arrival of vital material in an undamaged and usable condition.
112. This publication is intended for the officers and crews of merchant ships carrying ammunition. It is required reading prior to the start of loading operations. This should be studied in conjunction with CG 108, Rules and Regulations for Military Explosives and Hazardous Munitions. It must be understood that much of the material herein is based upon Federal regulations and that it is presented in this simplified form for information only. The regulations shall be used for specific requirements.

CHAPTER I - INTRODUCTION

Section 2 - APPLICATION

121. This manual covers an ocean voyage beginning with loading the vessel, continuing with security in shipboard emergencies, and ending with offloading. Read it carefully in preparation for discussion of these procedures with the ammunition depot/station officers before loading munitions. Any questions you may have will be answered by these officers at this time or by the safety officer at any time during loading. Complete understanding of these concepts is essential and free discussion with the safety officer is encouraged. Make sure you know your munitions cargo, its characteristics and safety precautions. This knowledge may save your ship and your life. Study this manual now; there's no time to break it out in an emergency!



CHAPTER II - INSPECTIONS

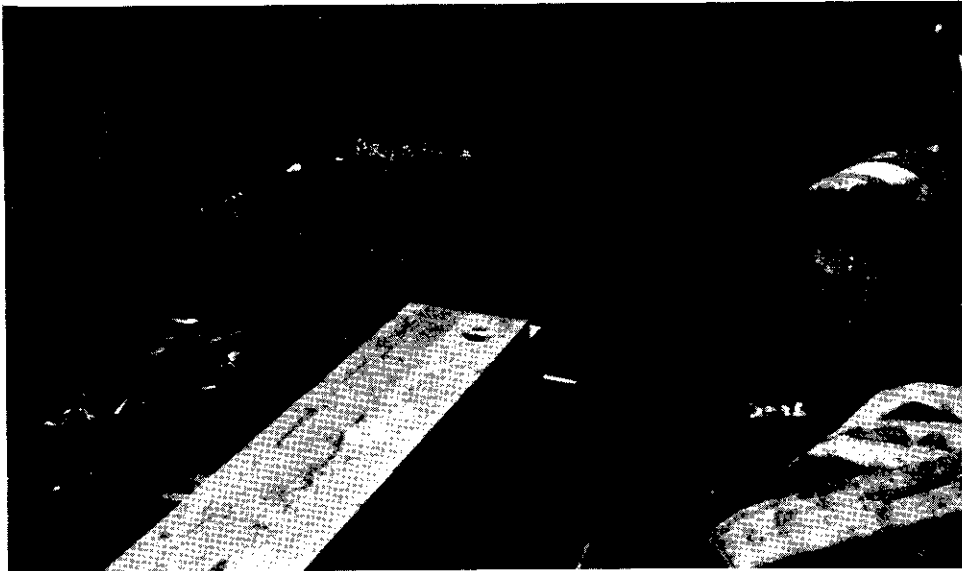
Section 1 - SCOPE

211. Preparation for loading or actual loading, underway operation, and unloading requires constant inspections as listed below:
 - a. Preloading inspections.
 - b. Loading inspections.
 - c. Underway inspections.
 - d. Offloading inspections.
 - e. Final discharge inspections.
212. All pertinent details of the above listed inspections must be entered in the ship's log.

CHAPTER II - INSPECTIONS

Section 2 - PRELOADING INSPECTIONS

221. A preloading inspection with the correction of all discrepancies noted should be conducted by the master or person in charge of the vessel prior to applying for a loading permit. Representatives of the Captain of the Port will then conduct a preloading inspection which will include fire equipment, cargo working gear, holds, magazines, engine room, bilge, shaft alley and general housekeeping condition.



Safety is paramount. Housekeeping of this type presents both fire and tripping hazards.

222. The Captain of the Port issues a loading permit after all deficiencies noted during the inspection have been corrected.
223. Military explosives, except small arms without explosives, shall not be handled, stowed, stored, loaded on, or discharged from a vessel except at a designated explosive anchorage, or explosive ordnance facility (CG 108, 146.29-15(a)).
224. A vessel subject to the regulations of CG 108, Rules and Regulations for Military Explosives and Hazardous Munitions, may load or discharge military explosives at any designated Naval or Army depot, arsenal, navy yard, port of embarkation or other facility under the direct control and operation of

the Navy or Army; provided a permit authorizing such loading has been granted by the Captain of the Port. (CG 108, 146.29-15(b)).

225. In an emergency arising by reason of military necessity or casualty, a vessel, when authorized by a Captain of the Port, may load or discharge military explosives in any location (CG 108, 146.29-15(c)), except that no naval loading or discharging activity is authorized to load or discharge a ship for which Coast Guard Waiver of CG 108 has been obtained until it has applied for and received specific CNO approval (OPNAVINST 8023.7B).

CHAPTER II - INSPECTIONS

Section 3 - LOADING INSPECTIONS

231. Before military explosives are loaded into or unloaded from a vessel the person in charge of loading or unloading the vessel is required to ascertain by examination, the adequacy, the material condition and working order of all equipment to be used including slings, crates, boxes, and lifting tackle.
232. He shall prohibit the use of any and all equipment which in his judgment is not adequate or in safe working condition. The person in charge of loading and unloading the vessel shall maintain surveillance of all equipment used during the transfer of explosives. He will stop the use of any defective or damaged equipment and have it repaired or replaced before continuing the loading or unloading of the vessel.
233. This continuing inspection of cargo working equipment applies whether the equipment in use belongs to the ship or a contractor.
234. The Captain of the Port or his representative also has authority to prohibit the use of any cargo working gear or equipment, including stevedore equipment, which is found to be unsafe.
235. This continuing supervision of loading or offloading of explosives can only be done by a licensed deck officer. During the entire operation of handling ammunition the master of the vessel shall assign a deck officer to be in constant attendance. This does not, however, discourage the ship's crew from observing and reporting unsafe practices or conditions which constitute hazards.
236. Fire inspections are required by government regulations.
237. The master is always responsible for the safety of his ship, and he may issue such additional safety orders as he deems necessary. When, in the master's judgment, a hazardous cargo is not being handled or stowed in accordance with regulations, he may stop the operation until the improper practice or deficiency is corrected. Any disagreement which may arise in U. S. ports between the master and the terminal activity regarding proper handling or stowing, will be referred by the master to the appropriate MSTC commander or his representative and the Captain of the Port for guidance, with a full statement of the circumstances leading to the

master's stopping of the operation. When such disagreement arises in overseas ports where no MSTS representative is present, the master may refer the matter to the cognizant area or subarea commander for guidance.

238. The master, being responsible for his vessel at all times, shall conduct periodic inspections during the loading and unloading operations. He shall be alert for inadequate blocking and bracing of the cargo, unsafe cargo handling gear, and all unsafe conditions aboard the vessel. Particular attention should be given to the adequacy, arrangement, and charging of fire hoses, the installation of spark arresters and condition of the ship's fire alarm system. Emergency steel wire towing lines, one forward and one aft, with coiled heaving lines bent on, shall be led through a chock and secured for ready use. Continual attention during loading is required for good housekeeping conditions, removal of any refuse on or below decks, and any condition that might initiate or contribute to a fire. The master of the ship must assure himself that all flammable refuse is removed from the ship prior to loading. "No Smoking" signs shall be prominently displayed in accordance with instructions. Screens must be fitted on all ventilators. Off-shore lights must be installed and operable.

CHAPTER II - INSPECTIONS

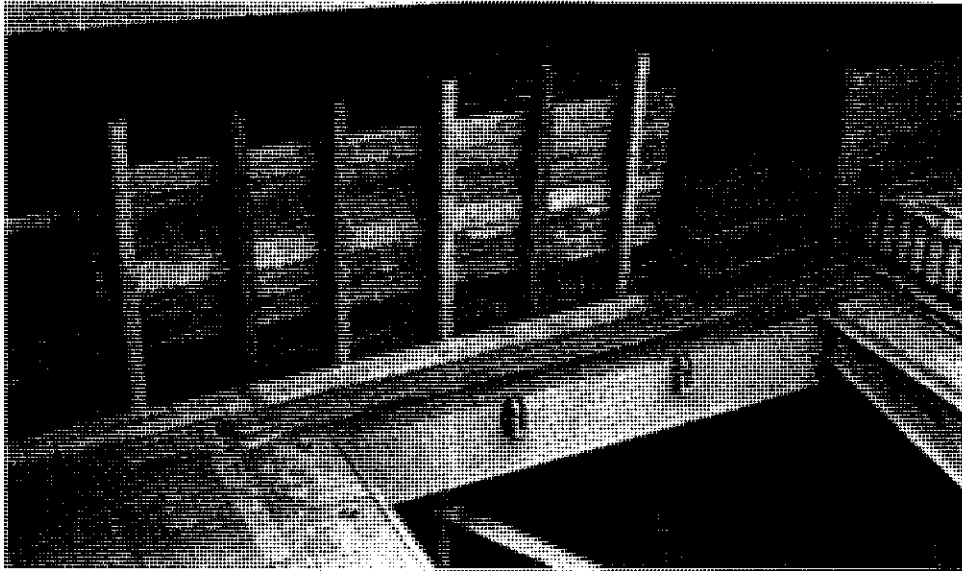
Section 4 - UNDERWAY INSPECTIONS

241. Periodic inspections of explosive cargo or other dangerous articles shall be ordered by the master during a voyage to insure that cargo remains safely stowed and that no shifting of cargo has occurred. Inspectors shall be alert for spontaneous heating and leaking or sifting of contents from containers.
242. Coast Guard regulations require daily readings of temperatures in cargo holds when a ship is carrying explosives. This may be impractical on some type vessels but sufficient means shall assure that unusual temperature changes are noticed. It is also very important that unusual atmospheric temperature changes be noted in the ship's log and upon arrival at Port, the official in charge of discharging cargo shall be notified of such changes and the duration of excess heat which might be a source of deterioration to the cargo.
243. When any cargo is discovered to be in a dangerous condition from leakage, sifting of contents, heating, wetting or other causes, such condition will be corrected as the judgment of the master may dictate. All unusual circumstances divulged during inspection of dangerous cargo and any action taken as a result thereof shall be entered in the ship's log.
244. When inspecting cargoes of dangerous articles capable of developing inflammable vapors, any lighting shall be of a vapor proof type.

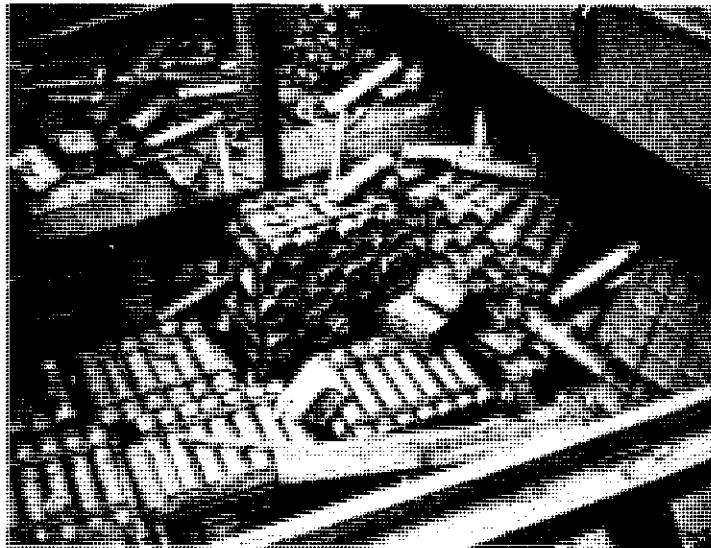
CHAPTER II - INSPECTIONS

Section 5 - OFFLOADING INSPECTIONS

251. Loading and offloading operations present similar hazards; therefore, the inspections should be identical. Attention to the accumulation of excess dunnage, cargo handling gear and safety precautions for offloading is mandatory. Personnel used as stevedores in forward areas shall be closely observed for unsafe acts, pilferage, and possible sabotage.
252. Crew members should be cautioned on remaining alert for packages that mysteriously appear in a concealed location. Personnel who wander away from the work area should be suspect. Stevedores shall be prohibited from carrying any packages into the ship's holds, regardless of their contents. Suitable storage for lunch boxes and like packages is not the responsibility of the ship.
253. If it is a partial offload and the vessel is to continue on to another port of discharge, reblocking and rebracing is required. This task shall be accomplished under the close surveillance of the master or his representative and be of sufficient strength to withstand bad weather conditions likely to be encountered enroute to the next port.



Cutting corners as pictured above, 4" X 4" uprights not secured against the overhead, may result in the shifting of cargo as seen below.



CHAPTER II - INSPECTIONS

Section 6 - FINAL DISCHARGE INSPECTION

261. Upon completion of offloading cargo, all spaces shall be carefully inspected to insure that no cargo remains on board. A close check shall also be made for explosive or inflammable residue that may have leaked from damaged containers. Notation of such inspection will be entered in the ship's log. The residue which may develop due to a decomposing action can be more dangerous than the munition from which it comes.

CHAPTER III - SECURITY OF WATERFRONT FACILITIES AND VESSELS IN PORT

Section 1 - RESPONSIBILITIES

311. A major and continuing responsibility in explosive cargo carrying is security. This problem exists at every phase of the ship's operation. Two important viewpoints must be considered; the Captain of the Port's regulatory rules and the responsibility of the master of the ship.
312. The Captain of the Port through his representative at the port of loading may prescribe conditions and restrictions relating to the safety of waterfront facilities and vessels in port. Such conditions and restrictions may extend, but are not limited to, the inspection, operation, maintenance, guarding, and manning of, and fire prevention measures for, such vessels and waterfront facilities.
313. The Captain of the Port has designated waterfront facilities under control of the Army or Navy for the handling and storage of military explosives, inflammable or combustible liquids in bulk, or other dangerous articles. Owners, operators, masters, and others concerned are required to secure permits for handling, storage, loading and unloading, conditioned upon the fulfillment of such requirements for the safeguarding of waterfront facilities and vessels.
314. The Coast Guard may prevent any person, article, or thing from boarding or being taken on board any vessel or entering or being taken into any waterfront facility when it is considered that the presence of such person, article or thing would be harmful to the facility, vessel or personnel in the area at any port within the continental limits of the United States.
315. The Coast Guard Captain of the Port may at any time inspect or search any vessel or waterfront facility or any person, article or thing thereon, within the jurisdiction of the United States, may place guards upon any such vessel and waterfront facility and may remove therefrom any or all persons, articles or things not specifically authorized to go or to remain thereon.
316. The Coast Guard may supervise and restrict the movement of any MSTs or charter vessel and may take full or partial possession or control of the vessel or any part thereof, within the territorial waters of the United States under his jurisdiction, whenever it appears to him that such action is necessary to secure such vessel from damage or injury or

to prevent damage or injury to any other vessel or waterfront facility or waters of the United States, or to secure the observance of rights and obligations of the United States.

317. The Captain of the Port may enlist the aid and cooperation of other Federal or State, county, municipal, and private agencies to assist in enforcing these regulations.
318. The Master of the vessel must be cognizant of the Coast Guard's requirements, use them and, in addition, be responsible for the safe operation of his vessel and the crew.
319. Supervision: The Master of the vessel must become familiar with the regulations for the care, safe handling, and proper loading of explosives. He must insure that his crew is properly impressed with and exercises proper care in observing safety precautions.
3110. Night loading: Live ammunition and explosives should not be loaded or unloaded from a ship at night except in an emergency or at piers with adequate lighting, fire protection, and safety equipment and only when it is required by the ship's sailing schedule. If the loading or unloading operations are not completed during the day, precautions should be taken to guard and protect the cargo against fire by retaining sufficient crew on board the ship to cope with any emergency. If night operations are required, only carefully placed APPROVED electric lights, portable lanterns, or flashlights are to be used inside the ship.
3111. Passenger vessels: Transportation of ammunition or explosives, except small arms ammunition, is prohibited on passenger vessels.
3112. Explosive anchorages: All regulations and directives issued by the Captain of the Port must be observed during loading and unloading at explosive anchorages.
3113. Personal identification: No person shall enter a vessel engaged in loading, handling, or discharging military explosives within the continental United States unless he identifies himself to the satisfaction of the duly authorized representatives of the Master and the Coast Guard. Every person permitted to enter shall provide his name, address, and name and address of his firm, and also provide satisfactory identification. Any person requested to leave for any reason shall immediately obey the request and not return until permission is granted.

3114. No person who, in the judgment of the Master or the officer in charge of the Coast Guard detail, is considered to be under the influence of intoxicating liquor or drugs shall be permitted on board a vessel while operations involving the handling, loading, unloading, or transportation of explosives, are in progress except if the person is a bona fide member of the crew of the vessel, he may at the discretion of the Coast Guard detail board the vessel provided that the master or person in charge of the vessel will accept custody and full responsibility for him. Persons under the influence of intoxicating liquor or drugs shall not be permitted to perform any work on the vessel or be allowed in the immediate vicinity of the loading operations.

3115. FOR FURTHER INFORMATION, see CG 108, pages 10, 146.29-21, and 13, 146.29-31.

CHAPTER III - SECURITY OF WATERFRONT FACILITIES AND VESSELS IN PORT

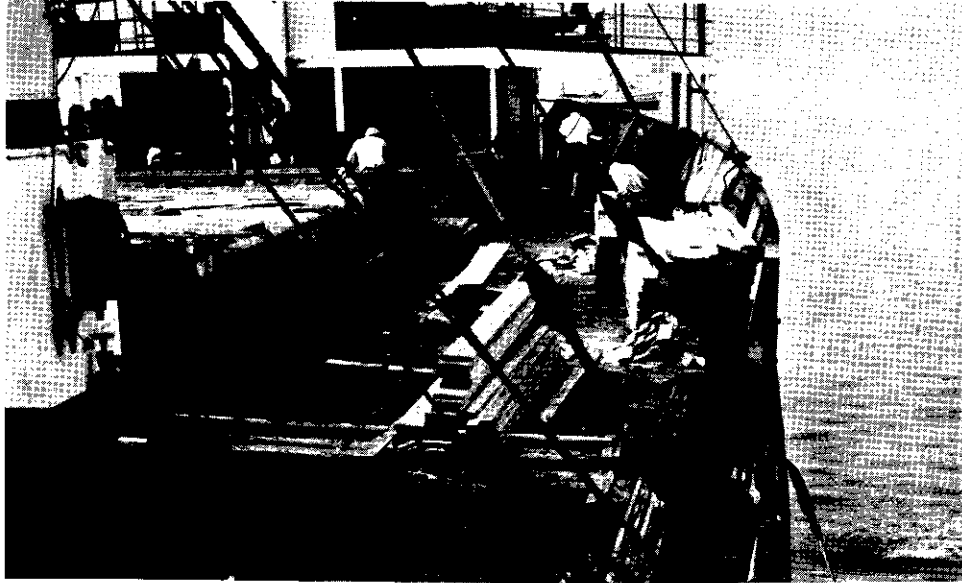
Section 2 - SAFETY

- 321. As a part of ship's security, the Master is responsible for operational safety of all personnel aboard the ship or working alongside.
- 322. All personnel must be impressed with the fact that their safety as well as that of others depends upon the intelligence and care exercised by themselves and their shipmates.
- 323. The number of persons engaged in or around an operation should be kept at a minimum. Unauthorized persons must not be permitted to tamper with or disassemble any components. Serious accidents may result.
- 324. There are two prime requisites which must be considered when determining safe practices; safety for personnel and safety for the ammunition.
- 325. The Master and his representatives shall be constantly on the alert to prevent any practice which might cause injury or death to personnel. With respect to ammunition, the Master or his representatives shall see that it is handled, stored, and shipped in such a manner that no deterioration, damage, or destruction may result.



The results of rough handling alongside can be as destructive as on board.

326. On board the vessel, many potential fire hazards exist due to the very nature of the operations necessary in maintaining the vessel. Many vessels are dependent upon steam for propulsion and power to operate the cargo handling gear requiring the maintenance of boiler fires. "Flare backs," "Blow backs," or "Flash backs" are likely to occur when burners are ignited, particularly if improper methods are employed. Members of the crew living on board require the use of galley fires, etc. There is the ever present possibility of unauthorized smoking resulting in the careless disposal of cigarette butts and matches. The transfer of fuel oil between the vessel's tanks may result in oil leaks or spills. The Master must be constantly alert for situations that could develop into a fire.
327. In addition to the fire hazard inherent in cargo handling and operating methods, there is the constant threat of fire from human carelessness or perverseness, sabotage or pyromania. Although "No Smoking" is the rule on all explosive loading piers, specific areas on the pier and/or compartments on the ship may be designated as smoking areas by the Captain of the Port.
328. During the handling, loading, or unloading of military explosives the vessel shall "run out" or otherwise make ready for quick use a minimum of two lines of fire hose on the weather deck, one fore and one aft. These hoses shall be of sufficient length so that one or the other can reach all areas of the weather deck.
329. The fire hose valves controlling the lines shall remain "cracked open" (except in freezing weather) so casual observation may indicate that water is available. Where the hose is equipped with an all-purpose fog nozzle, the hydrant valve should be opened and the nozzle valve cracked to show there is pressure in the hose.
3210. Additional fire lines shall be "run out" or otherwise made ready at each hold or compartment working or containing military explosives when the hatch serving the hold is open. These lines shall be of sufficient length to reach all portions of the hold or compartment.
3211. The most important factors in eliminating or reducing the frequency of fires and/or minimizing the damage caused thereby are constant vigilance and prompt effective action in time of emergency.



Provide for immediate availability in the event of need.

3212. It will be noted that all additional material on specific operations which follow will stress specific security and safe operational practices.

CHAPTER III - SECURITY OF WATERFRONT FACILITIES AND VESSELS IN PORT

Section 3 - IDENTIFICATION AND DISPOSITION OF DAMAGED MUNITIONS

331. Any container of explosives or chemical warfare agents or other hazardous cargo showing evidence of failure, leaking of a liquid ingredient or inability to retain its contents shall not be accepted for stowage or transportation on board any vessel.
332. Any containers of explosives or other hazardous material when offered for transportation, storage, or stowage, showing excessive dampness or which is moldy or shows outward signs of any oil stain or other indications that absorption of the liquid part of the explosive is greater than the absorbent can carry, shall not be accepted for transportation. The shipper must substantiate any claim that a stain is due to accidental contact with grease, oil, or similar substances. In case of doubt, the container shall be refused.
333. Ammunition found to be defective while being unloaded from a barge, freight car, or other vehicle, shall not be allowed onboard a vessel. If found to have developed a defect while on board the vessel, it shall, if at all possible, be removed from the vessel to an isolated location as soon as possible.
334. Defective packages shall not be recoopered in the hold of the vessel. Such packages shall not be recoopered elsewhere on board the vessel except upon conditions authorized by the Captain of the Port. Replacing bomb shipping bands, loose covers, nose plugs or strapping containers is not classed as recoopering.

CHAPTER III - SECURITY OF WATERFRONT FACILITIES AND VESSELS IN PORT

Section 4 - REPAIRS OR WORK INVOLVING WELDING OR BURNING OR OTHER HAZARDS

341. A vessel having explosives or other dangerous articles as cargo shall not proceed to a ship repair plant or enter upon a drydock or marine railway or otherwise undertake repairs, or any work involving welding or burning, or the use of power actuated tools or appliances which may produce intense heat, in violation of any of the following provisions:
- a. No such repairs of work, except emergencies affecting the security of the vessel, emergency repairs to the vessel's main propelling or boiler plant or auxiliaries thereto, including tail shaft or propeller, or for the purpose of welding pad eyes, angle bars or other devices to the deck for securing deck cargo, shall be undertaken while explosives are on board. If in port, such work shall be done only after special permission has been obtained from, and in conformity with, the instructions of the Captain of the Port. In addition, prior to performance of required cutting, welding, or burning on board a vessel carrying navy cargo, permission must be obtained from the Naval Ordnance Systems Command and CNO.
 - b. No such repairs or work shall be undertaken in holds containing any other dangerous articles as cargo, nor in compartments adjoining holds in which other dangerous articles as cargo are stowed except as stated above.
 - c. No such repairs or work shall be undertaken in or upon boundaries of holds, after the discharge of any cargo of explosives or flammable solids or oxidizing materials, until all precautions are taken to see that no cargo or residue of cargo is left to create a hazard.
 - d. No such repairs or work shall be undertaken in, or upon boundaries of, holds that have lately contained substances capable of giving off flammable or explosive vapors, until such holds have been determined gas free.
342. None of the provisions in the paragraphs above shall apply to permitted articles of ships' stores and supplies of a dangerous nature, although provisions shall be taken to afford safe storage and protection to such stores from any risk incident to the repair work.

343. Contrary to the provisions set forth in this section, emergency repairs may be undertaken, when in the judgment of the master, such repairs are necessary for the safety of the vessel and crew.
344. In no case should the Master of the vessel countenance any laxity in attention to, or forego or minimize any security measure in the operation of his vessel. Appropriate funds are available to assure repairs, maintenance and above minimum standards of operational safety for ammunition stowage and delivery.

CHAPTER IV - LOADING AND STORAGE ABOARD VESSELS

Section 1 - PREPARATION AND STOWAGE

- 411. To this point general procedures, rules and applicable regulations for loading operations have been outlined. Specific data on loading, ocean transport and offloading will follow.
- 412. The ship's master is responsible for having his vessel fueled and in readiness to receive cargo.
- 413. All magazine and holds must be cleared of rubbish, discarded dunnage and be swept, hosed down or cleaned by other efficient methods. Bilges, overhead deckbeams and strongbacks shall be examined and any residue from the previous cargo removed. This will insure the compartments are free of residue before commencing to load military explosives.
- 414. All decks, gangways, and hatches over or through which military explosives must be passed or handled for loading or unloading must be cleared of loose material and swept broom clean both before and after loading or unloading.
- 415. The hatches or cargo ports opening into a compartment in which military explosives are stowed shall be kept closed at all times except during the operation of loading or unloading of the compartments or during periods of short stoppages such as lunch breaks. When a hatch is normally closed with wooden hatch covers it shall be covered with tarpaulins. Hatch openings shall never be covered with a tarpaulin without the hatch boards being in place.
- 416. Debris of any description, which creates a fire hazard or a hazardous condition for persons engaged in the explosives handling operation, will not be permitted to accumulate on the decks of a vessel while military explosives are being worked.
- 417. Hatch beams and hatch covers will, where possible, be stowed on the opposite side of the hatch from that over which the military explosives are being worked. These stows shall never be higher than the adjacent hatch combing.
- 418. The hatch covers shall be stowed to form as level a platform as possible and the hatch beams must be stowed or secured in a manner that will prevent them from rolling, rocking, turning, or sliding.



All hazards shall be removed. Excess wire and line will be secured clear of the working area. Miscellaneous dunnage and debris will be removed. Hatch beams and pontoons are in order.

- 419. During the time a hatch is open and military explosives are being worked or stowed, the vessel's officer on duty supervising the handling of explosives shall warn the masters of other vessels coming alongside and the operator of any dock equipment (capable of producing sparks) to stay clear of the area adjacent to open hatches as far as practicable. Any vessel, barge, or lighter or boat engaged in loading or unloading explosives or ammunition must permanently display a red flag during daylight and a red light at night.
- 4110. The stowage of beams and hatch covers is covered in CFR 26 (Labor), Part 1504, with which Masters and ship's officers are to be familiar.
- 4111. All articles of cargo classified as military explosives are stowed on board a vessel in conformity with the provisions of CG 108, Explosives Admixture Charts, paragraph 146.29-99, which are reproduced in this publication as Annex A.
- 4112. Mixed stowage of ammunition or explosives in bulk with other ammunition or explosives, or other dangerous articles or substances, or combustible liquids or hazardous articles must conform with the provisions of the explosives and the hazardous munitions admixture charts, the classification, handling and stowage chart, and other applicable specific provisions of CG 108.

4113. Specifications governing construction and location of magazines and lockers and the preparation of cargo compartments to be used in the stowage of military ammunition are detailed in CG 108, paragraphs 146.29-71 to 146.29-95, inclusive.