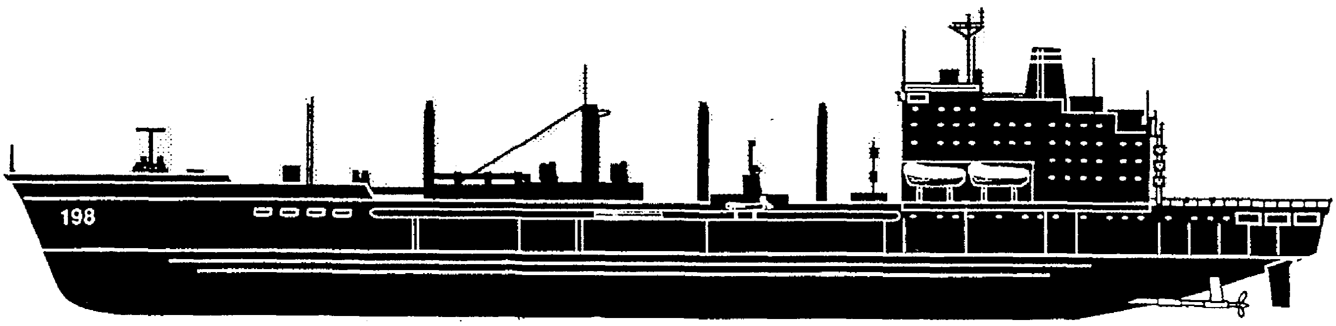
Military Sealift Command
Washington Navy Yard Bldg. 210
901 M Street SE
Washington, D.C.
20398-5540

COMSC Instruction 3541.5D

DAMAGE CONTROL MANUAL



RECORD OF CHANGES

CHANGE NO.	DATE OF CHANGE	DATE ENTERED	ENTERED BY

DEPARTMENT OF THE NAVY
COMMANDER MILITARY SEALIFT COMMAND
WASHINGTON NAVY YARD BLDG 210
901 M STREET SE
WASHINGTON DC 20398-5540

REFER TO:

COMSCINST 3541.5D
N7
21 FEBRUARY 1994

COMSC INSTRUCTION 3541.5D

Subj: DAMAGE CONTROL MANUAL (DC MANUAL) FOR MSC SHIPS

1. Purpose. To provide MSC shore-based and shipboard personnel a comprehensive source document that implements MSC policy regarding damage control procedures, equipment, organization and training. This is a complete revision and should be read in its entirety.

2. Cancellation. COMSCINST 3541.5C. COMSCINST 3400.2A is also cancelled except for Appendices A, B, C and D of enclosure (1) which should be retained and filed with this manual.

3. Applicability. This instruction is applicable to all MSC Force ships and commands. When ship damage control provisions of an operating contract or charter agreement vary from this instruction, the contract or charter agreement will govern. Nothing in this document is construed to be a modification of the contract.

4. Background. The DC Manual consolidates applicable COMSC policies and procedures regarding shipboard casualty prevention, response, control, emergency repair, personnel protection and general damage control training. This instruction is divided into three parts; Part 1, Damage Control Policies and Procedures; Part 2, Emergency Bills and Part 3, General Information. Part 1 provides an overview of established damage control policy. Part 2 is intended as a foundation which each MSC ship should use to develop ship's specific Emergency Bills. Part 3 provides background information related to damage control equipment and procedures. Sources of more detailed information and other applicable COMSC instructions are referenced within each part.

5. Action

a. All MSC commands and Masters shall utilize this DC Manual as a standard for damage control organization, emergency preparation and damage control training.

b. Nothing in this instruction relieves the Master, Chief Engineer or any member of the ship's force of his/her responsibility as defined by law, nor does it relieve them of the requirement to exercise good judgment at all times.

c. The DC Manual is a dynamic document. It will be amended as necessary to respond to changing operational, maintenance and technological requirements. Feedback from the users of this document is essential to ensure that it is kept accurate and current. Comments are encouraged and are to be directed to COMSC (N7) with a copy to the Administrative Commander. Changes are to be submitted as proposed page changes to the manual.

6. Short Title. The approved short title of this instruction is the DC Manual.

R.J. MALOIT JR.
Chief of Staff

Distribution:
COMSCINST 5000.19
List I (Case A, B)
SNDL 41B (MSC Area Commanders) (LANT & PAC only) (50)
41B (MSC Area Commanders) (FE & EUR only) (5)
41C (MSC Subarea Commanders) (10)
41D3 (MSC Offices)
41F (MSCCENTACT)
T-100 (Masters, civil service manned ships) (5)

FOREWORD

To carry out the mission of each MSC ship, the ship's crew must be properly trained, organized and outfitted to combat fire, flooding and structural damage and to minimize the effects of damage on the ship, its equipment, crew and cargo.

Damage control, both at sea and in port, is an ALL HANDS responsibility. The ship's Station Bill assigns each crewmember specific damage control jobs for which he/she must become proficient. Because a ship at sea must be self-sufficient in all respects, if even one person fails to perform his assigned emergency duty, it could result in loss of the ship or injury to a person.

To accomplish damage control duties efficiently, crewmembers must be thoroughly familiar with emergency equipment and well-drilled in its use. Proper organization and training will ensure that each crewmember responds to an emergency with correct, positive action.

This manual contains the standard emergency bills which provide an appropriate and tested plan of action for foreseeable emergency conditions. These bills shall be followed during drills and emergency conditions.

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

TABLE OF CONTENTS

PART 1

POLICIES AND PROCEDURES

CHAPTER 1

INTRODUCTION AND PHILOSOPHY

1-1-1 INTRODUCTION

The objective of this Manual is to provide MSC shore-based and shipboard personnel with a comprehensive source material that promulgates MSC Damage Control policy and provides a baseline to develop and implement Damage Control procedures aboard ship.

1-1-2 BACKGROUND

a. MSC is self-insured against ship damage and personnel injury. If a casualty is not controlled so as to limit damage and safeguard against personnel injury, the burden and cost of repairs and replacement of equipment are borne by the Government. The design of each ship provides only a limited degree of protection against damage and, therefore, the crew must always be ready and able to respond to and control shipboard casualties. Providing the crew with proper damage control training and equipment, and ensuring that they are prepared to control potential casualties will help to ensure that correct and quick actions are taken to respond to the numerous emergencies that may be encountered while aboard ship.

b. Damage control is an ALL HANDS responsibility. All members of the ship's force and other personnel embarked on the ship must be aware of their damage control assignments and responsibilities.

1-1-3 MSC SURVIVABILITY AND DAMAGE CONTROL PHILOSOPHY

a. Survivability

(1) MSC ship survivability philosophy shall be based on providing the necessary resources to maintain ship operational readiness and preserve mission capabilities to the greatest extent practical in both peacetime and hostile environments. The degree of ship survivability shall be predicated upon risk assessment and prudent risk management. MSC ships have a limited self-defense

capability and are, therefore, vulnerable to enemy attack. In hostile environments, survivability depends mainly on the response and assistance of escort forces.

(2) Ship construction and systems meeting American Bureau of Shipping (ABS) and US Coast Guard (USCG) requirements will be the baseline on MSC ships, flexibility must be maintained and cost effective survivability enhancements considered, if warranted and feasible. Modification or upgrading solely to comply with General Specifications for Construction of Navy Ships, the Naval Ships Technical Manuals or other military specifications is neither required nor desired.

b. Damage Control. MSC damage control philosophy shall be based on providing the necessary combination of resources and manning to adequately and confidently prevent, respond to, contain, control and correct shipboard damage in both peacetime and hostile environments. Damage control measures shall be appropriate to the desired degree of ship survivability being sought.

c. Priority of Ship and Personnel Safety. MSC ship and personnel safety priorities are as follows.

(1) Safety of personnel

(2) Safety of the ship

(3) Safety of ships equipment

(4) Safety of cargo

Depending on the circumstances and severity of each casualty, priorities may change. Although protection of equipment and cargo are important, they are secondary to preventing death or serious injury to personnel. Personnel responding to a casualty must reduce risk by taking time to assess the situation and react with common sense.

d. Goals. The immediate goal of shipboard damage control and survivability is preservation of life. The overall goal is to maintain operational readiness and preserve mission capability in both hostile and peacetime environments.

1-1-4 OBJECTIVES

The objectives of shipboard damage control are:

a. Preventing damage

(1) Maintaining watertight integrity.

(2) Eliminating fire hazards.

(3) Maintaining ship and emergency equipment.

(4) Training shipboard personnel in DC actions and the proper use of equipment through formal instruction and realistic drills.

b. Controlling damage

(1) Combating fire.

(2) Controlling flooding.

(3) Maintaining stability and buoyancy.

c. Accomplishing emergency repairs

d. Protecting personnel in emergencies

(1) Providing proper personnel equipment.

(2) Safeguarding personnel.

(3) Providing first aid treatment.

(4) Following proper abandon ship procedures.

e. Training of ship's force

(1) Instructing in damage control organization and techniques.

(2) Maintaining personnel awareness and equipment readiness.

(3) Ensuring ALL HANDS participation.

(4) Practicing egress and evacuation.

1-1-5 USCG, USN AND MSC DAMAGE CONTROL (DC) PRACTICES AND PROCEDURES

a. Most MSC ships are built to commercial standards in accordance with USCG regulations and ABS Rules and operate to support mission requirements of the U.S. Navy (USN) and other U.S. Government sponsor organizations.

b. Although MSC ships may operate with USN ships, MSC ships do not have a combat capability and USN damage control (DC) procedures and policies are not fully implemented aboard ship. MSC's shipboard organization and manning levels do not permit implementation of the Navy DC Program. Although USCG regulations address DC outfitting requirements and procedures for commercial ships, USCG requirements establish minimum standards and are used only as a baseline for MSC's DC program. The implementation of only USCG DC requirements is not adequate for the active DC program desired by MSC. Some of the philosophy and many of the proven procedures of the Navy DC Program have been incorporated in MSC's DC Program, but altered and consolidated to suit unique mission requirements, manning constraints, use of commercial equipment and the implementation of commercial ship design practices.

c. Damage control is a collateral duty for all MSC crewmembers vice being a primary function as is the case for certain personnel aboard USN ships.

d. MSC ships have two conditions of readiness, Cruising and Emergency. Cruising is set before getting underway and maintained while underway. Emergency is set when all hands are called to emergency stations or when the ship is in imminent danger. The Cruising condition is similar to the Navy condition Yoke, which is set before getting underway and while in port after working hours. The Emergency condition is similar to the Navy condition Zebra, which is set before entering combat and when danger is imminent. USN ships have a special condition called Circle William, which is set for CBR-D protection. During CBR-D on MSC ships, an Emergency condition is maintained where all ship closures and ventilation are secured, except for ventilation required for ship's power. The Master may modify each condition as required by ships operations or other requirements. Conditions of readiness are described in Part 2, Chapter 1, Damage Control Bills.

PART 1

POLICIES AND PROCEDURES

CHAPTER 2

DAMAGE CONTROL ORGANIZATION

1-2-1 INTRODUCTION

Timely response to an emergency or casualty, the limiting of damage and control of a casualty requires a well organized and trained DC team.

1-2-2 POLICY

MSC crews shall be organized as stated herein to quickly and correctly respond to shipboard emergencies and casualties. This DC organizational structure shall be implemented by each ship during shipboard DC training and drills. The Ship's Station Bill assigns responsibility for various emergency situations and general crew DC duties are cited the Emergency Bills contained in Part 2 of this manual.

1-2-3 DISCUSSION

The DC organization (Figures 1-2-2 and 1-2-2) is determined by the following functional and personnel considerations.

a. Quick Response Team. Over ninety percent (90%) of all shipboard fires could be extinguished with a portable fire extinguisher if responded to during the incipient stage of the fire. Other casualties are also more easily controlled by quick action. Because mustering and outfitting a repair party takes time, the delay between fire and other casualty detection and response can be reduced by augmenting the repair party structure with a quick response team. Quick response team personnel, upon hearing the report of a casualty, should immediately report directly to the scene, equip themselves with portable DC equipment in route and combat the casualty. See paragraph 1-2-4c(4) for more details regarding this team.

b. Use of Vari-Nozzle. The Repair party organization is able to take advantage of two-man hose teams due to the use of the vari-nozzle. The vari-nozzle allows a single hose team to attack a fire without requiring a second team to be outfitted with a low pressure fog applicator needed for thermal protection. Fire teams on ships equipped with the Navy or CG all-purpose-nozzle (APN) are to be organized in accordance with standards established for safe use of that equipment (i.e., use of a fog applicator to provide a thermal barrier). Each hose team equipped with a vari-nozzle can protect itself and if required lend assistance to other hose teams fighting the fire. When the On-Scene Leader determines that a two-hose attack is necessary, the teams are located close enough to each other to provide this assistance. Safety of the firefighters and other personnel shall always be the primary consideration when determining fire attack strategy. A two-hose team attack is normal shipboard practice except in small compartments or on small ships where crew size is limited. In these situations, a single hose attack with a second hose team as backup outside the space is appropriate. During foam application, a water only hose equipped with a vari-nozzle is required to augment each foam hose team equipped with an air aspirated foam nozzle. An air aspirated foam nozzle will not provide adequate thermal protection to the firefighter and a backup water hose is therefore needed. The use of air-aspirated foam equipment significantly improves the quality and therefore the extinguishing capability of the applied foam. Foam application using a vari-nozzle will provide the user greater reach, but foam quality and foam sealing properties will be reduced.

c. Firefighting Team. A five-man firefighting team consisting of a Hose Team Leader and two hose teams will be initially outfitted and respond to a fire. Five additional repair party individuals (the standby team) shall prepare their equipment to relieve the initial team. Each 1 1/2 inch hose shall be handled by a nozzle man and a hose man. The hose team leader will direct each hose team through the smoke and toward the fire with the aid of the Navy Firefighters Thermal Imager (NFTI) or Fire Finder. Allowances currently provide for one fire detection device on each ship. Where multiple fires are being fought, the Damage Control Officer (DCO) (synonymous throughout this manual with the ship's First Officer) will determine where the NFTI (or Fire Finder) is most needed. The On-Scene Leader, as advised by the Breathing Apparatus Controller, directs both the initial and standby hose teams at a site established just outside the smoke/fire boundary. The On-Scene Leader normally is not outfitted with a breathing apparatus.

d. Breathing Apparatus (BA) Controller. The BA Controller is responsible for the time management of repair party members when responding to an emergency and outfitted with either OBAs or SCBAs. The BA Controller is to record, track and monitor time information of all fire party members entering and exiting the smoke boundary. This person is responsible for ensuring fire party individuals are relieved in a safe and timely fashion.

e. Repair Party Personnel. Organizational flexibility and cross training of the entire ship's crew are needed to ensure crew confidence and readiness. However, the primary training emphasis should focus on those repair party personnel assigned by the Station Bill. The Master and First Officer must know each individual assigned to a repair party. The repair party expected to be called to an engine room fire should be staffed with licensed and unlicensed Engine Department personnel to ensure repair party familiarity with the space. Likewise, Deck Department personnel should be assigned to DC actions in cargo areas. Personnel assigned DC responsibilities are to be medically (physically and psychologically) fit to accomplish the necessary tasks. A person required to maneuver through a dark, smoke filled, confined area may have an unfavorable psychological response, endangering his life and the lives of others. Further, the crew may have individuals whose physical attributes prevent their safely wearing the firefighting outfit (i.e., beards, physical size and structure). Screening individuals at shoreside DC schools and aboard ship, before and during DC drills, is necessary to prevent the assignment of unsuitable crew members to repair parties. The Master and the other senior officers are responsible for ensuring that shipboard personnel can safely and satisfactorily accomplish their assigned DC tasks.

f. Damage Control (DC) Repair Lockers. Shipboard DC repair lockers are to be outfitted to support independent DC operations. This policy does not preclude supporting one repair team or locker with another when necessary. For firefighting, the DC lockers are to contain the complement of firefighting outfits detailed in Part 1, Chapter 6. Each standard DC repair locker is to be outfitted with twelve (12) complete firefighting outfits (ensemble and breathing apparatus). At least six (6) of the required breathing apparatuses are to be bulkhead mounted in the locker by means of quick release walk-away brackets. Reduced stowage DC repair lockers are to be outfitted with at least six (6) complete firefighting outfits (ensemble with breathing apparatus) and at least four of the breathing units are to be similarly mounted in the locker. Ships with reduced stowage are identified in Part 1, Chapter 6, DC Equipment.

1-2-4 SHIPBOARD DAMAGE CONTROL ORGANIZATION

a. The overall organization of the MSC shipboard DC structure is depicted in Figure 1-2-1.

b. This structure is optimized for a fire emergency and a fire response team, however it is simple and flexible and may be modified to react to other emergencies. Manning constraints may require modification of the structure, but the chain of command concept shall be retained.

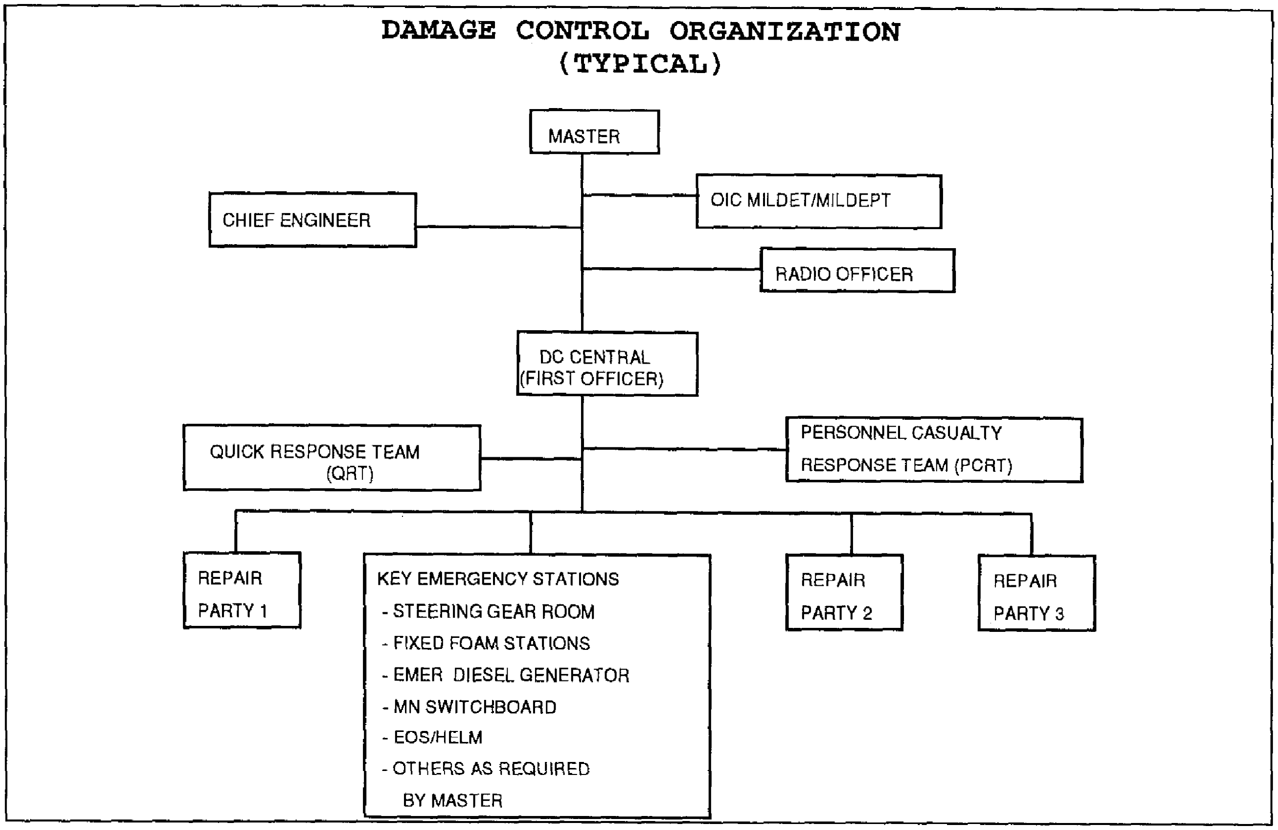


FIGURE 1-2-1

c. Key members of the ship's force have the following DC responsibilities.

(1) Master. The Master is ultimately responsible for all shipboard DC actions. The Master shall ensure that the ship's force is trained in all aspects of damage prevention and control. The Master shall keep the Station Bill accurate and current. For Engine Room main space fires on ships outfitted with single charge fixed gas extinguishing systems, the Master shall always assume the sole authority or shall delegate the sole authority to release the fixed gas extinguishing system. Once delegated, this authority cannot be re-assigned without the Master's specific direction and authorization. The individual with one shot release authority shall be identified to the crew and recorded in the Station Bill and noted in the EOS copy of the Main Space Fire Doctrine. Where a two-shot fixed gas extinguishing system is installed in the engine room and each shot is of equal size, the senior licensed engineer on watch has the authority to activate the first shot (and only the first shot) after notifying the bridge of the need to secure main engines, accounting for personnel and ensuring that the space is properly secured. Notifying the bridge is required while underway to ensure ship's power is not needed for emergency maneuvers.

(2) First Officer. The First Officer shall be designated by the Master as the ship's DCO. As DCO, he/she shall be responsible for coordinating all aspects of the ship's DC Program including:

(a) Coordinating overall shipboard DC response from DC Central.

(b) Supervising all DC training.

(c) Scheduling and evaluating all DC drills.

(3) Chief Engineer. The Chief Engineer is the primary authority for appropriate DC actions in the main space. The Chief Engineer shall ensure that all personnel assigned to the Engine Department are thoroughly familiar with their responsibilities as listed in the ship's Main Space Fire Doctrine and the ship's Engineering Casualty Control Manual.

(4) Quick Response Team (QRT). This team provides immediate response to emergency situations. The team is to quickly obtained nearby equipment such as OBA/SCBA and portable fire extinguishers to, for example, fight a fire. When the ship's general alarm has been sounded, members of the team are to proceed directly to the casualty location. Feedback communications from this group shall be directed initially to DC Central and then to the On-Scene or Repair Party Leader. The QRT may be composed of members of various repair teams and or zone parties as manning permits. The team should include three to five day working personnel (i.e., day Third Assistant Engineer and others with deck and engine room experience). QRT personnel assignments shall be noted on the ship's Station Bill. The normal actions and responsibilities of repair parties and zone personnel should not change.

d. Personnel Casualty Response Team. This team shall establish a treatment area with equipment necessary to provide immediate triage, life support treatment and transportation for injured personnel. The Medical Department Representative (MDR) or Medical Service Officer (MSO) shall remain in the treatment area and conduct triage at the entrance to the casualty treatment area. In the event that the MDR and the Chief Mate are the same individual, MDR responsibilities must be delegated. The team shall be comprised of the MDR (or MSO) and other personnel not specifically assigned to other emergency bills, but trained in first aid and certified in CPR. At least two crewmen shall be assigned to this team.

e. Military Detachment (MILDET) and Military Department (MILDEPT) Personnel. The Officer In Charge of the MILDET/MILDEPT shall be responsible for the direction, training, safety and DC participation of embarked military personnel. The OIC shall assign personnel to emergency stations and advise the Master on matters of military administration, operations and communications.

f. Radio Officer. The Radio Officer is responsible to the Master for all communication matters including DC communications. On those ships with only one radio officer or no radio officer, the First Officer shall become familiar with the radio equipment and its operating instructions and DC communications.

g. DC responsibilities of other personnel are described in the Damage Control Bill and other Emergency Bills in Part 2 of this manual.

1-2-5 REPAIR PARTY STRUCTURE

The repair party chain of command structure depicted in Figure 1-2-2 shall be used by the ship's force and the Administrative Commander to establish teams to combat fire, flooding, collision, grounding or other types of damage. Ship operational requirement, manning constraints and or the use of specific types of equipment aboard the ship may require modification of this structure. Nevertheless, the chain of command and communication arrangements shown shall be maintained.

a. Repair Party Leader (RPL). The RPL is responsible for managing all personnel assigned to his or her DC locker. The RPL establishes communications between DC Central and the On-Scene Leader. The RPL also directs zone personnel to make required closures and establish proper boundary watches.

b. On-Scene Leader (OSL). The OSL directs actions at the site of the casualty. He establishes a control area just outside the smoke/fire boundary, and is not normally dressed in a full firefighting ensemble. The OSL, with assistance from the BA Controller, controls both initial and standby firefighting teams. The initial attack team is relieved by the standby team when directed by the OSL and BA Controller. The standby team has the same organization as the team it is to relieve. On ships with limited manning, the RPL and OSL may be the same person.

c. Breathing Air Controller (BA Controller). As cited in paragraph 1-2-3d, the BA Controller monitors the breathing time of all persons outfitted with breathing apparatus. The BA Controller remains outside the fire/smoke boundary. Although the BA Controller is subordinate to the OSL, this individual is authorized to direct the replacement of any fire party member who's breathing time is insufficient as shown and recorded on the BA Controller tracking board.

d. Hose Team Leader. The Hose Team Leader is to be fully outfitted in firefighting gear and use the Navy Firefighting Thermal Imager (NFTI) or Fire Finder to direct the hose teams to the fire. The Hose Team Leader relies on the hose teams for protection and shall never enter a space alone.

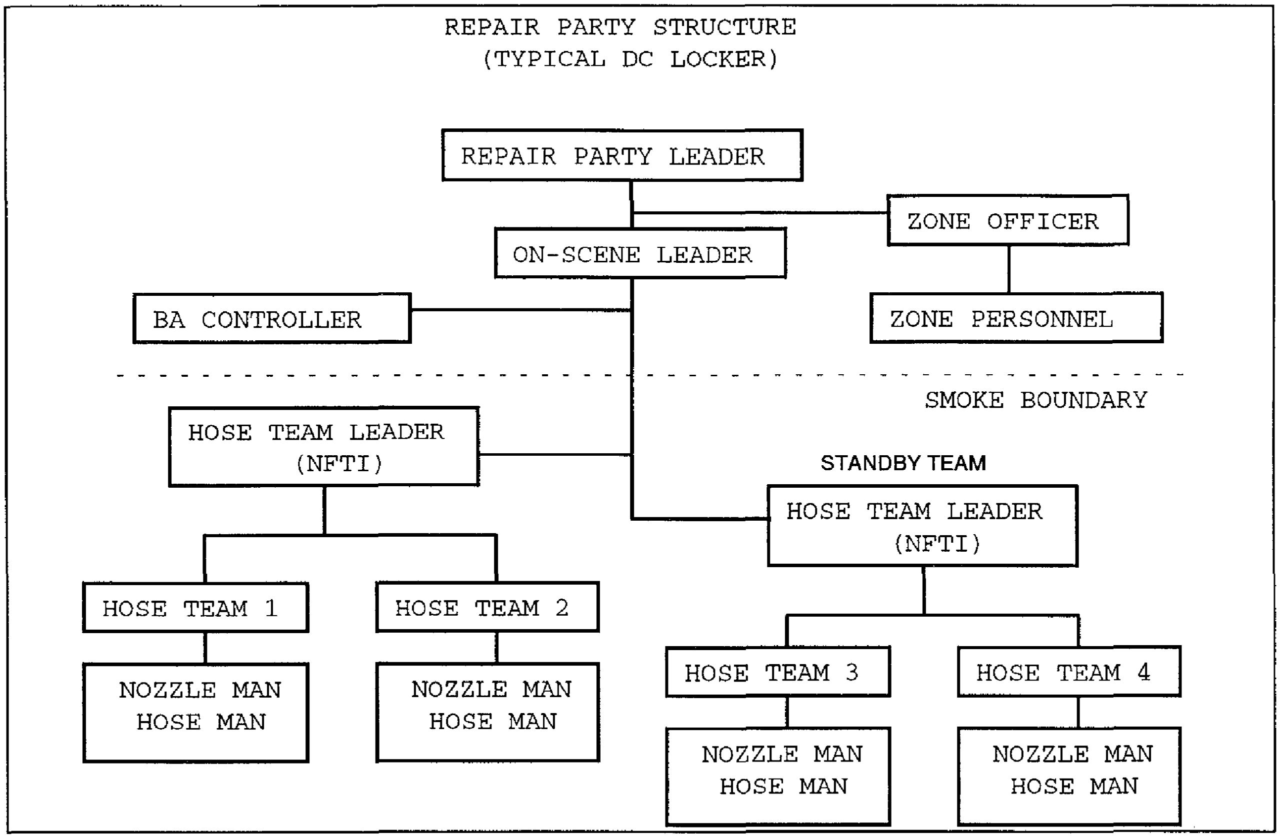


FIGURE 1-2-2

1-2-6 ACTION

a. COMSC. COMSC will establish the MSC DC organization and approve and promulgate all changes.

b. Administrative Commanders. Administrative Commanders shall periodically review ships' Station Bills and shipboard DC organizations to ensure compliance with the organization established by this instruction. As appropriate, Fleet and Area Commands recommend changes to the organization to suit improved techniques, new equipment or unusual circumstances. The Area Commanders shall ensure that ships' Station Bills address all aspects of the DC organization and that DC tasks are assigned to trained and capable personnel.

c. Ships. All shipboard Department Heads shall periodically review Station Bill assignments to ensure that the qualified personnel are utilized. Where personnel qualifications or fitness are deficient, Department Heads shall ensure that personnel receive required training or are reassigned.

PART 1

POLICIES AND PROCEDURES

CHAPTER 3

ENGINEEROOM MAIN SPACE FIRE DOCTRINE

1-3-1 PURPOSE

To establish policies for developing and posting ship or class specific main space (engineroom) fire doctrines for all MSC ships.

1-3-2 POLICY

Each ship shall have a ship specific Main Space Fire Doctrine (MSFD). A ship class MSFD is acceptable where the engineroom layout and firefighting systems are similar on all ships of that class.

1-3-3 BACKGROUND

Approximately 75% of all shipboard fires occur in the engineroom. The engineroom should be considered one of the highest fire risk areas aboard a ship and pre-planning a course of action to combat such a fire threat is the overall goal of the MSFD. Immediate and decisive action by the crew and engineering watch is imperative because rapidly increasing heat and smoke can quickly make the space untenable and firefighting impossible. The MSFD provides ship systems information and procedural guidance for fighting a Class B fire in the engineroom. The MSFD is not intended as a step-by-step procedure. It should, however, be used as a tool to help instruct and train the crew in the proper procedures needed to react and control such a fire. The Chief Engineer aboard ship may modify or add to each ship's MSFD and submit desired changes to the Administrative Commander for consideration.

1-3-4 DISCUSSION

a. The "strawman" MSFD in Appendix A provides a sample format that should be used to develop specific MSFDs for other ships or class of ships. Because engineroom configurations and equipment may vary within a given class, each MSFD may need to be customized for a specific ship.

b. Where applicable, a copy of the ship's MSFD is to be part of the ship's Engineering Casualty Control Manual (ECCM). The engineroom system drawings provided in the ship's ECCM, such as the Fuel and Lube Oil sketches, are available for use with the MSFD when training crewmembers to respond to an engineroom fire. Separately bound copies of the MSFD are to be provided to the watch engineer and Chief Engineer and one copy is to be located in the Engineering Operating Station (EOS).

c. The MSFD shall address who is responsible for providing the authority to release the fixed gas fire extinguishing system aboard ship. The Master is responsible for ensuring that crewmembers know who has been delegated this authority. A brief discussion of the release requirements for a ship having a "one shot or two shot" fixed gas fire extinguishing system is provided in Section 1-2-4a of Chapter 2.

d. Some MSFD items that will require modification to suit each ship include:

(1) Specifics to the ship's DC/firefighting organization.

(2) Description of installed/unique firefighting systems capabilities and limitations.

(3) Description of foam hose routing and lengths required to reach the furthest corner of lower level of the engineroom. Location of portable foam containers.

(4) Egress and re-entry through each main space access.

(5) Fuel Oil, Lube Oil and HVAC system operational considerations.

(6) Fixed gas fire extinguishing system release authority for the main space.

1-3-5 ACTION

a. COMSC. COMSC shall review MSCPAC and MSCLANT ship specific MSFDs and consider consolidating MSFDs on a class basis. COMSC shall maintain class MSFDs.

b. Administrative Commanders. Administrative Commanders shall ensure all MSC ships are provided with ship specific MSFDs and periodically review each MSFD to ensure that it is current and accurate. The Administrative Commanders shall review and incorporate Chief Engineer MSFD comments where warranted and shall maintain ship specific MSFDs.

c. Ships. Department Heads shall ensure that the ship's force is trained and competent in the duties and responsibilities detailed in the ship's MSFD and Firefighting Bills. The Chief Engineer and the ship's DCO shall provide recommended MSFD revisions through the Master to their cognizant Administrative Commanders.

PART 1

POLICIES AND PROCEDURES

CHAPTER 4

GENERAL DAMAGE CONTROL REQUIREMENTS FOR CONTRACT OPERATOR MANNED, CHARTERED AND READY RESERVE FORCE SHIPS

1-4-1 PURPOSE

a. To provide standard Damage Control (DC) and Chemical, Biological and Radiological Defense (CBR-D) wording for ship contracts and charter agreements. CBR-D requirements are ship or ship class specific and may not apply to certain ship contracts and charter agreements.

b. To establish and provide DC policies for contract operator manned ships, contract operated ships manned with civilian mariners under the provisions of the Office of Management and Budget (OMB) Circular A-76, chartered ships and MSC operated Ready Reserve Force (RRF) ships.

c. Each operator's contract identifies requirements for and maintenance and replacement of government property. Damage control equipment is government property which falls within the government's property control requirements.

1-4-2 POLICY

MSC contract operated ships and chartered ships shall comply with the DC provisions of the respective contract or charter and U.S. Coast Guard (USCG) regulations. The information contained herein must be provided to the contracting office by the requirement code for each applicable contract. It is important that this information be included in the solicitation package for contractors to be able to identify costs of compliance in their proposals. If compliance with this manual is not required by the contract or charter, the policies and procedures established by this instruction are provided as guidance to ship's personnel. If this guidance is at variance with the contract or charter, the contract or charter will govern.

1-4-3 BACKGROUND

The classification and certification practices and procedures of the American Bureau of Shipping (ABS), USCG and Convention for the Safety of Life at Sea (SOLAS) apply to MSC contract operated ships and chartered ships. In addition to this, MSC ship survivability features and policies for firefighting and DC will generally be sought on these vessels.

1-4-4 TYPICAL REQUIREMENTS FOR CONTRACT OPERATED SHIPS AND CHARTERED SHIPS

a. Government Furnished DC and CBR-D Property

(1) The Government will furnish loose equipment listed in the contract. Upon receipt, the Contractor shall be liable for the expense of repair or replacement of Government provided loose equipment. The Contractor shall return, at the end of the contract, loose equipment equivalent to that provided by the Government in accordance with the Government Property clause, FAR 52.245-2 (DEC 1989). The loose equipment returned shall be of like quality, kind and quantity as that provided by the Government at the beginning of the contract performance period. Loose DC equipment may include, but is not limited to, fire axes, fire hoses, OBA/SCBAs, proximity suits, battle lanterns, chemical agent detectors (if applicable), gas analyzers/indicators, shoring lumber, patches, braces, portable pumps, first aid kits, stretchers and submersible pumps.

(2) The Government will furnish DC items of controlled equipage listed in the contract. The Government will repair or replace, at its option, any items of controlled equipage worn out through fair wear and tear. Upon receipt, the Contractor shall be liable, in accordance with the Government Property clause, FAR 52.245-2 (DEC 1989), for the expense of repair or replacement of any item of controlled equipage lost or damaged by neglect of the Contractor, Contractor's employees or the Contractor's subcontractors. All items of controlled equipage worn beyond use or requiring repair will be returned to the Government for repair or replacement. DC and CBR-D (if applicable) Controlled Equipage may include, but is not limited to, Chemical Protective Overgarments (CPO), rubberized over garments, gas masks, personal decontamination kits and RADIACs.

(3) At the termination of the contract, a joint inventory of the Government furnished equipment will be conducted by the Contractor and Government representatives. The Contractor shall be liable for loss or damage to Government furnished equipment beyond fair wear and tear in accordance with FAR Clause 52.245-2 (DEC 1989). All property in need of repair or maintenance shall be repaired by the Contractor before the joint inventory is made. All repairs not made by the Contractor will be made at the Government's

option and at the Contractor's expense, except in cases where repair costs are reimbursable under the terms of the contract. If Government equipment is damaged, the amount of compensation due the Government by the Contractor will be the actual cost of repair, provided such amount does not exceed the replacement cost of the item. In the case of items lost or damaged beyond economical repair, the amount of the Contractor's liability will be the depreciated replacement value of the item to be determined by the Contracting Officer. The Government retains the right to verify equipment inventory on a quarterly basis.

b. Maintenance of DC and CBR-D Technical Documentation. The Contractor will be responsible for maintaining and updating shipboard DC and CBR-D (if applicable) technical documentation. The Contractor shall submit DC and CBR-D technical documentation for any configuration changes made during the course of the contract. This includes changes which cause or will cause a revision to the ship's plans and/or manufacturer's technical manuals or will require the development of additional plans or additional manufacturer's technical manuals. As official changes in DC and CBR-D technical documentation are promulgated, the Contractor shall be responsible for filing OPNAV Form 4790/CK.

c. DC and CBR-D (if applicable) Training Program Implementation. The Contractor shall implement the following training, drill and exercise programs.

(1) The Contractor will conduct all drills and exercises listed in Chapter 14. These drills and exercises will be conducted as required by 46 CFR Part 97.15, Part 1, and this manual. Upon completion of each drill, appropriate entries shall be made in the ship's Deck and/or Engineroom Log as appropriate.

(2) The Contractor will ensure that DC training is described provided to the shipboard personnel as specified herein. The Contractor will arrange for equipment training courses to be presented by either the equipment manufacturer or a skilled instructor certified as having completed the manufacturer's training course. Using instructors other than those provided by the manufacturer must be approved by COMSC.

(3) The Contractor shall develop training and indoctrination programs and courses described below. Documents and lesson plans supporting programs and courses developed by the Contractor under the contract shall become deliverable 60 days after contract award. The total training package including lesson plans shall be submitted to the Contracting Officer for approval. Replacement crews shall receive the required training prior to shipboard employment. Courses and programs which can only be conducted onboard ship must be completed by replacement crews within 30 days of reporting onboard. MSC retains the right to monitor any training sessions. The Contractor shall develop and present the following courses.

(a) Onboard Indoctrination. An onboard indoctrination in the operation and maintenance of all DC equipment and systems.

(b) Ship's CBR-D Officer Training. The Contractor shall ensure that a licensed officer (preferably Third Mate) is designated as the ship's CBR-D Officer and shall have attended MSC's CBR-D Officers Course prior to reporting aboard ship. Attendance at the course is to be arranged through COMSCLANT, Bayonne NJ or COMSCPAC, Oakland CA. This course is only required once in the life of a career of the mariner.

(c) General Shipboard CBR-D Training. The ship's CBR-D Officer shall be responsible for conducting, at a minimum, general shipboard CBR-D training, exercises and drills for decontamination (DECON) and survey teams.

1. General CBR-D Training. General CBR-D training for the crew shall include, but not be limited to the following topics, donning and doffing of the chemical protective overgarments (CPO) suits and rubberized over garments, the use of the gas mask and general personnel DECON procedures.

2. Specific CBR-D Training. Specific CBR-D training for the DECON and survey teams shall include, but not limited to, the use of Radiac equipment, chemical detection equipment, decontamination of personnel and equipment, how to rig and operate the ship's water washdown system, how to set up and use the DECON station and the donning and doffing of CPO.

3. Weekly Training. It is suggested that the contractor, on a weekly basis, conduct CBR-D training for the crew and/or the DECON and survey teams. This training should be comprised of lectures and/or exercises lasting about 1 hour in length. The lectures and/or exercises should be of such a nature that they naturally lead up to the CBR-D drill. The drill should be a test of the effectiveness of the training lessons and exercises. A syllabus of lesson topics and exercises will be made available to the Contractor upon request.

4. Required Quarterly Drill. On a quarterly basis, the Contractor shall conduct a CBR-D drill in the form of a scenario. This drill should involve the entire crew donning their masks and exercising the DECON team and the placement and activation of the Washdown Countermeasure (WDCM) System.

(4) The Contractor shall ensure that all crewmembers have received firefighting and DC training at a USCG approved firefighting course within 30 months preceding employment aboard the ship. The MSC DC/Firefighting school is available to provide this training to all mariners.

d. Damage Control Markings. The Contractor shall ensure that appropriate marking and instructions are displayed on all DC equipment, fittings, stations and throughout the ship.

e. Semi-annual Inspection of Equipment. The Contractor shall conduct a semi-annual inspection and inventory of all DC, firefighting and CBR-D equipment on station and in lockers. The inspection shall ensure that the equipment stored at each location is available and ready for emergency use. The Contractor shall take action to repair, re-certify, maintain or replace equipment found to be damaged, inoperable, missing or not currently certified. A hard bound record book maintained by the First Officer shall be used to record these inspections as set forth in the appropriate CDRL section, and the record shall be available for Government inspection. The person performing this equipment inspection shall enter that action in the Deck Log and initial and date the entry.

f. Ship and Crew Readiness. The Contractor shall maintain the readiness of the ship and crew to meet any emergency condition, including fire, collision and CBR attack.

g. Ship's Station Bills

(1) As required by USCG, the Station Bill shall be conspicuously posted in prominent places throughout the ship and available to all shipboard personnel. Chapter 1 of COMSCINST 5530.3B, 46 CFR Section 97.13 and USCG NVIC 7-82 provide addition background on this requirement.

(2) The various bills shall be used to direct crew actions in response to fire, collision, CBR attack, abandon ship order, man overboard alarm, emergency boat crewing, damage control, steering casualty and shipboard physical security. They shall be used to direct the operation of appropriate emergency systems and equipment and the manning of vital ship stations, list standard emergency signals and safety-at-sea instructions and shall include assignments for every person aboard the ship, regardless of appointment. The Bills shall be kept up-to-date, with necessary corrections or modifications being made by the Master. The Master shall ensure that mariners are trained in the duties assigned by the various bills. The Master shall coordinate all Sponsor assignments with the Sponsor's Department Representative. At the Master's discretion, personnel aboard actually standing a watch may be exempt from participation in drills.

h. Damage Control Book. The Contractor shall maintain the ship's Damage Control Book for use by shipboard personnel. The Damage Control Book shall be maintained with respect to the range of information contained and shall address the ship's DC organization, systems, machinery, controls and equipment as described in COMSCINST 3120.2D, page 1-11-8. The original will be held by the Master, with copies held by the Chief Engineer and the First Officer. Additional copies shall be kept on the Bridge and in each repair locker. A copy will be provided to the appropriate Area Commander.

i. Fire Control Plan. The Contractor shall maintain in a waterproof container located at the gangway, a copy of the ship's fire control plan as required by USCG regulations. The Contractor shall also maintain a copy of the ship's fire control plan at DC Central.

j. CBR-D Countermeasure Systems (if applicable). The Contractor shall maintain the ship's countermeasure washdown system and DECON stations(s) in operable condition.

k. HALON/CFC Survey Reports. The Contractor shall submit on an annual basis HALON/CFC Survey Reports to the cognizant Area Commander in accordance with COMSCINST 5090.3A, Shipboard Management of Ozone Depleting Substances (ODS).

1-4-5 ACTION

COMSC shall ensure the DC and CBR-D requirements of this instruction are cited in ship contracts and charter agreements.

PART 1

POLICIES AND PROCEDURES

CHAPTER 5

DAMAGE CONTROL REPAIR LOCKERS

1-5-1 PURPOSE

To provide guidance on the number and location of DC Repair Lockers on MSC ships.

1-5-2 BACKGROUND

DC repair lockers provide a central location for stowage of equipment and serve as a mustering and communications point for the Repair Party. Large equipment such as P-250 pumps, shoring material, breathing apparatus, submersible pumps and de-smoking fans may be stowed remote from the repair locker if locker space is limited or pre-staging is desired.

1-5-3 REQUIREMENTS

a. Location. Repair lockers shall be located on the Main Deck or 01 Level with interior access (exterior access shall be provided to each locker if practical). Where only one repair locker is available, it shall be located amidships in the vicinity of the machinery space accesses. If there is more than one repair locker, the second and or third repair lockers should be located at opposite ends of the ship (forward and aft). This configuration is designed to maximize the ability of the ship to deal with one or more emergencies simultaneously, and to minimize the risk of loss of capability in the event that one or more of these lockers is lost due to smoke, fire or damage.

b. Number Required. The number of DC lockers for each ship depends on the ships' length, hull configuration, mission, manning and operational requirements. Generally, on ships under 250 feet in length between perpendiculars, at least one repair locker shall be provided. On ships between 250 feet and 500 feet between perpendiculars, at least two repair lockers shall be provided. For ships whose length exceeds 500 feet between perpendiculars, at least three repair lockers shall be provided. One repair locker shall be provided for each hull.

c. Inventory. An inventory of DC items shall be posted on the inside of each locker door. Items stowed outside of the locker shall be identified and the location of that equipment noted on the inventory list.

d. Area. Each repair locker should have a minimum of 200 square feet of deck area to allow for orderly movement of tools, equipment and personnel in and out of the locker. Bulkhead space shall be made available in each locker to bulkhead mount at least six (6) breathing apparatuses (four on reduced storage ships) and to mount the DC Zone Chart. Access to the locker should be made available by means of double doors, if possible.

e. Outfitting. Repair lockers are to be outfitted with bookracks, tables and lights, as listed in Table 1-5-2, to suit locker configuration. Lockers shall be outfitted with all items specified by Chapter 6. The stowage arrangement shall be similar to that shown on NAVSEA drawing 804-5184259 augmented by NAVSEA S5090-B1-MMO-010, Stowage and Booklet for Damage Control Equipment. All items shall be stowed so that they are secured, but readily accessible.

1-5-4 ACTION

a. COMSC. COMSC shall ensure that newly constructed or newly acquired ships are provided DC repair lockers in accordance with the above criteria.

b. Administrative Commanders. Administrative Commanders shall ensure that ships maintain the quantity and condition of repair lockers as described above.

TABLE 1-5-1

DAMAGE CONTROL REPAIR LOCKERS

CLASS	**# OF DC LOCKERS (Notes A and C)**	**NOTES**
T-AE 26	3	
T-AFS 1	3	
T-AFS 8	3	
T-AG 194	1	
T-AG 195	1	B
T-AGM 20	1	
T-AGM 22	1	
T-AGM 23	3	
T-AGOS 1	1	B
T-AGOS 13	1	B
T-AGOS 19	1	B
T-AGOS 23	2	
T-AGS 26	1	
T-AGS 27	1	
T-AGS 33	1	
T-AGS 34	1	
T-AGS 29	1	
T-AGS 32	1	
T-AGS 39	2	
T-AGS 45	3	
T-AGS 51	1	B
T-AGS 60	2	
T-AH 19	3	
T-AKR 287	3	
T-AO 187	3	
T-ARC	2	
T-ATF 166	1	B
MPS SHIPS	1	
(JOHN BOBO)	2	

Notes: **(A) Does not include "Auxiliary DC Lockers" used to stow overflow DC equipment.**
(B) Reduced stowage ships.
(C) Input to alter DC Locker numbers must be submitted to COMSC for consideration.

TABLE 1-5-2

DAMAGE CONTROL REPAIR LOCKER

ITEM	REFERENCE/REQUIREMENT	QUANTITY (MINIMUM)
Damage control table and rack	NAVSEA dwg. 804-921930 with type D rack or equal	1
Hinged leaf unit For Type F Drawings	NAVSHIPS dwg. 804-921794,	1
Battle Lanterns, Relay	Illuminate access, DC table and rack, and stowage areas	2
Stool	Commercial (able to secure for ship motion)	1
Clock (24 hour)	Secondary clock from electric clock system master control (mechanical clock if electric system not installed)	1
Communications	Sound Powered Phones	4JV and 2JZ Circuits
Firemain gage	Pressure gage	1
Bookrack	Commercial	1

PART 1

POLICIES AND PROCEDURES

CHAPTER 6

PORTABLE DAMAGE CONTROL EQUIPMENT

1-6-1 PURPOSE

To establish standard DC equipment outfitting policy for MSC ships.

1-6-2 POLICY

MSC Ships shall be outfitted with portable DC equipment in accordance with the MSC Damage Control (DC) Equipment Allowance Equipage List (AEL) as provided in Appendix B. Small ships, as cited in Table 1-6-1, shall be outfitted with reduced quantities of DC equipment. The DC AELs account for reduced storage requirements. New construction ships or newly acquired ships shall be considered for inclusion in the listing of ships identified as reduced storage ships:

a. If crew size is 25 persons or fewer,

b. If the ship has one DC Locker, or

c. If the ship is under 250 feet in length.

1-6-3 BACKGROUND

a. MSC portable DC equipment requirements exceed USCG and ABS requirements for portable emergency equipment, but are less than that required by the U.S. Navy for USN ships. The goal of developing the standard DC equipment list is to ensure that each repair locker is outfitted the similar equipment throughout the fleet. The reduced DC equipment list was developed from the standard DC equipment list and applies to ships that have storage and space limitations and small crews. In general, the "Standard" DC equipment list is based on outfitting twelve firefighters per locker and the "Reduced" DC equipment list is based on outfitting eight firefighters for the ship's one repair locker.

b. The DC AEL is a dynamic document and must be reviewed and updated annually to ensure obsolete equipment is removed from service, to accommodate new and more technically advanced equipment and to support new DC procedures. Future procurement costs that may be necessary to comply with these DC equipment requirements should be programmed into the ship's subprogram budget authority. DC equipment stock numbers, required quantities and special notes are provided in Appendix B.

c. Certain items of DC equipment, selected because they are complex or are subject to specific MSC usage policies, are discussed below.

1-6-4 SPECIFIC DAMAGE CONTROL EQUIPMENT

a. Breathing Apparatus. Two types of breathing apparatus are supplied to MSC ships - the A-4 Oxygen Breathing Apparatus (OBA) and the NIOSH/MSHA approved, NFPA tested positive pressure demand type Self-Contained Breathing Apparatus (SCBA). NIOSH/MSHA stands for National Institute of Safety and Health (NIOSH) and Mine Safety and Health Appliances (MSHA). Although both breathing apparatus units are used for entry into and escape from oxygen deficient atmospheres, OBAs are not pressure demand type units and do not comply with USCG vessel requirements. Emergency Escape Breathing Devices (EEBDs) are to be used for escape purposes only.

(1) The USCG no longer approves SCBAs. Instead, the required apparatus must be NIOSH/MSHA certified. Although the equipment itself is no longer required to be CG approved, shipboard outfitting requirements for the SCBA continue to be.

(2) The following is a summary of the revised USCG acceptance requirements for SCBAs.

(a) NIOSH/MSHA certification

(b) Pressure-demand

(c) Open-circuit

(d) Minimum 30-minute air supply rating

(e) Full face piece

(f) Spare charge for each apparatus

(3) Although not a NIOSH/MSHA or USCG requirement, all SCBA models that are to be outfitted on MSC ships shall also have passed the 1992 National Fire Protection Association's (NFPA) tests for SCBAs, thereby requiring a third party NFPA test certificate issued for that model.

(4) Although OBAs have been the Navy's and MSC's primary breathing apparatus of firefighting, it is MSC policy to phase out the OBA and outfit all MSC with SCBAs. SCBA AEL outfitting requirements are provided in Appendix B. When SCBA outfitting has been completed on each MSC NFAF ship, two OBAs and 24 OBA canisters shall remain aboard those ships to be used for emergency assistance and transfer of the OBA units to USN ships.

(5) MSC SCBA outfitting allowance requirements exceed the allowances required by USCG regulations and ABS rules.

b. Vari-Nozzle. All 1-1/2 inch fire stations on MSC ships are to be outfitted with a 95 GPM 100 psi pistol grip vari-nozzle vice the all-purpose-nozzle (APN). The vari-nozzle is superior to the APN and has a wrist operated adjustable spray pattern which produces wide angle fog for thermal protection, narrow angle spray for the firefighters' attack pattern and a straight stream for long range attack and break-up. The vari-nozzle eliminates the need for strainers at each fire station.

(1) In compliance with USCG Regulations, it is MSC policy not to use the vari-nozzle for foam application, except at NAVAIR certified helicopter deck locations and in special circumstances where extra reach or wider spray pattern are needed. In accordance with NAVAIR requirements, hose reel systems that are located near the flight deck area are to outfitted with 125 GPM vari-nozzles.

(2) The 1-1/2 inch firefighting systems and equipment installed and outfitted on MSC ships have either commercial (9 TPI NH) threads or Navy (11-1/2 TPI NPSH) threads. USCG has accepted firefighting equipment having Navy standard threads on MSC ships. The Elkhart Brass model SFL-95 and the Akron Brass model 3019 vari-nozzles are the only acceptable vari-nozzles to be used on MSC ships having the Navy thread convention. Acquisition of these Navy threaded vari-nozzles through the Navy supply system may result in obtaining an un-approved vari-nozzle.

(3) MSC ships that have retained commercial firefighting equipment thread standards are only to be outfitted with the commercial threaded Elkhart model GCG-95 vari-nozzle or the commercial threaded Akron model 3019 vari-nozzle. Paragraph 1-11-4a lists those MSC ships that are required to have Navy standard or commercial threads on firefighting equipment.

c. Navy Firefighter's Thermal Imager (NFTI). The NFTI is a sensing device that allows the user to see heat sources through darkness, dense smoke and light steam by detecting differences ($\pm$ 4^{o}F) in thermal radiation. Thermal variations are displayed as a black and white video image on a screen at the rear of the NFTI. The NFTI is used to locate the seat of a fire, find and guide rescuers to injured personnel, set and maintain fire boundaries and locate ignition sources during fire overhaul. Each MSC ship is to be equipped with one NFTI. The NFTI uses a battery pack with 10 "AA" alkaline batteries. A fresh battery pack will last for 60 to 90 minutes. The NFTI should be stowed in its box in a cabinet or strapped to the deck to protect it from shock. During firefighting, it will usually be used by the Hose Team Leader to assist him in directing the application of firefighting agents.

d. Firefighter's Ensemble. To protect firefighters from heat, commercially available, National Fire Protection Association (NFPA) approved, two-piece turnout firemen outfits and the Navy Firefighters' Ensembles (NFFE), which are single piece outfits, are equally acceptable. These outfits provide a layer of fire resistant thermal insulation between the firefighter and the fire extending the time each firefighter can work close to the fire and protecting him from burns and scalding.

e. P-250 Mod 1 Gasoline Engine Driven Portable Pump. The P-250 is used to supply water for firefighting and for dewatering. It has a capacity of 250 gallons per minute at 100 PSI with a 16-foot suction lift. The pump can be used with an eductor to increase capacity when used for dewatering. Only Mod 1, gasoline powered, P-250 pumps are supplied to MSC ships. MSC is researching a commercially available diesel powered portable pump as a successor to the P-250 Mod 1. Mod 2 pumps, fueled by JP-5, are not to be outfitted on MSC ships.

f. Fire Hoses

(1) USCG has approved the replacement of the 2-1/2 inch fire hose outfitted at the exterior fire stations aboard MSC ships with two 1-1/2 inch fire hoses using a siamese connection. The difficulties of handling a 2-1/2 inch fire hose, the reduced manning required on 1-1/2 inch hoses and the ability to use the 1-1/2 inch vari-nozzle merits replacement of the 2-1/2 inch hose with 1-1/2 inch hoses in many applications. USCG letter G-MVI-3 16711/10 16714/162.027/GEN dated 07 December 1992 provides USCG approval for this change. A copy of this USCG letter may be required by the local USCG representative and can be obtained from the Administrative Commander. This change is to be accomplished on all USNS MSC ships, except those ships that are scheduled to taken out of service before December 1997.

(2) Each fire station must have one length of hose, a spanner wrench and hose rack or other hose storage. Each fire hose station shall be identified in red letter and figures at least 2 inches high - FIRE STATION NO. X-YY-Z, where "X" is the deck location, "YY" is the frame location and "Z" is the position to port or starboard.

(3) All fire hoses shall be hydrostatically tested annually to at least the maximum pressure to which they may be subjected in service. This is normally the shutoff head of the fire pump. The hose will be marked with the date and test pressure of each hydrostatic test. Threads on fire hoses shall match those on the fire hydrants as required in paragraph 1-11-4a.

g. Portable Foam. Portable foam concentrate is supplied aboard all MSC ships. The foam concentrate must be compatible with the foam type and concentration used in the ship's fixed foam system, if installed. Foam types must not be mixed. If a fixed foam system is not installed, portable foam containers of USCG approved 3/6% Universal Foam concentrate is recommended. If 3/6% foam is used, the portable foam generating equipment should be set for 6% foam concentration. With USCG approved 3/6% Universal Foam, both polar solvent and hydrocarbon fires can be successfully controlled. It is desirable for those fixed foam systems that have been installed in spaces to protect against hydrocarbon fires to be set for a 3% foam concentration. Existing systems that are set for 6% foam concentrations must not change the foam concentration setting of the fixed system setting to 3% until the new setting is approved by USCG. See Chapter 11 for more details regarding foam and foam systems.

h. Portable Fire Extinguishers. MSC policy requires the carriage of USCG approved or accepted fire extinguishers aboard all MSC ships. Military Specification NSN fire extinguishers are accepted by USCG for carriage on MSC ships provided the extinguishers meet, as a minimum, 46 CFR requirements for the space being protected. In accordance with COMSC Halon/CFC phase-out policy, portable Halon 1211 extinguishers shall be removed and replaced with acceptable CO_2 or dry chemical extinguishers.

1-6-5 ACTION

a. COMSC. COMSC will ensure that newly constructed or acquired ships are outfitted with DC equipment in accordance with Appendix B, as applicable. COMSC is responsible for updating Appendix B and promulgating same to the fleet. MSC's Configuration Data Manager (CDM), N4, will coordinate major equipage update requirements as provided by N7.

b. Administrative Commanders. Administrative Commanders shall ensure that all ships are outfitted in accordance with applicable DC equipment lists. As Appendix B is amended, Administrative Commanders shall ensure individual ship compliance. Administrative Commanders shall ensure the ships' budgets are programmed to purchase DC equipment changes as promulgated by COMSC.

c. Ships. The Master and Chief Mate shall ensure that the ship is fully outfitted with the required DC equipment, shall ensure that DC equipment is properly stored and maintained and ensure that the ship's COSAL is updated to reflect DC outfitting requirements.

PART 1

POLICIES AND PROCEDURES

CHAPTER 7

DAMAGE CONTROL DOCUMENTATION

1-7-1 PURPOSE

To establish policy on DC documentation required aboard each ship.

1-7-2 POLICY

MSC ships shall have onboard DC documentation as listed in Table 1-7-1. Each ship shall maintain a ship specific Damage Control Book, Fire Control Plan, Damage Control Drawings and other ship specific DC documentation.

Damage Control Documentation Requirements

Title	Requirement	Locations
DC Manual	MSC	DC Central
DC Book	MSC	DC Central Each Repair Locker
Fire Control Plan	USCG	Two rolled in watertight tubes and located on the weather-deck. Others located throughout ship.
DC Display Drawings (Zone and DC System Drawings)	MSC	DC Central Secondary DC Central
Engineering Casualty Control Manual	MSC	Chief Engineer EOS
Station Bills	USCG	Throughout the ship
Main Space Fire Doctrine	MSC	DC Central EOS Chief Engineer Appendix to ship's ECCM

Table 1-7-1

1-7-3 BACKGROUND

Each ship is provided a copy of all Chapters of the Naval Ships' Technical Manuals (NSTMs). NSTM chapters which apply to DC are listed in Table 1-7-2. COMSCINST 9000.2A, Engineering Drawings (Plans) and Charts to be Carried Aboard MSC Nucleus Fleet Ships, lists specific drawings that shall be mounted or filed aboard each ship. COMSCINST 4700.2F, Administrative Procedures for the Alteration, Maintenance and Repair of MSC Ships, provides direction for updating plans, technical manuals and other technical documentation when equipment, machinery and systems are added to a ship or undergo alterations. COMSCINST 9000.1C, Preparation of Selected Record Plans, provides procedures for developing DC Drawings and Firefighting Plans. Other DC documents are discussed below.

1-7-4 DISCUSSION

a. MSC Damage Control Manual (COMSCINST 3541.5D). This manual establishes DC policy and provides information, training requirements and ship Station Bills for ashore and afloat personnel.

b. Damage Control Book

(1) MSC Drawing Standard 8302-5985826, Rev. A, Preparation of Damage Control Books for USNS Ships, provides guidance for preparing ship specific DC books. The DC Book provides ship's force with a source document for use as a ship emergency reference guide.

(2) The DC Book includes ship specific emergency data, a description and location of damage and casualty control equipment, a description of applicable ship systems and an outline of the shipboard DC organization.

(3) Damage Situation Handbook. A companion to the DC Book, this booklet provides the Master and Chief Mate with a quick reference, pictorial guide depicting the ship's reaction to given flooding damage scenarios. The Handbook is designed to complement and enhance the DC Book and the ship's Trim and Stability Booklet by not only depicting the effect of flooding damage on the ship, but recommending corrective action to decrease list and restore stability to the ship. Handbooks have been prepared for the T-AGOS 19 and T-AGS 45 Classes with the T-AFS 1 Class Handbook being prepared at this time. Handbooks are planned for all MSC ship classes.

c. Fire Control Plans. Fire Control Plans are required by the U.S. Coast Guard (USCG) in accordance with 46 CFR Subparts 35, 78 and 97. Fire Control Plans shall be prepared for each ship in accordance with COMSCINST 9000.1C. Fire Control Plans are used to assist the crew and shore response teams in managing casualty control situations while pier side. Fire Control Plans provide detailed information on the general arrangement of each deck, type and location of fire retardant bulkheads, location of DC and firefighting equipment, location of ventilation dampers and controls and the location of fire detecting, alarm and extinguishing systems. The Fire Control Plans are stored in watertight containers located port and starboard on the main deck or in other locations easily accessible to personnel on the weatherdeck.

d. Damage Control Display Drawings

(1) DC display drawings, commonly referred to as DC Plates, are to be prepared in accordance with COMSCINST 9000.1C and consist of a zone chart of the and vital DC system drawings. The DC display drawings are different than the Fire Control Plan, although both are provided to assist ships' personnel in casualty control operations. DC plates usually are laminated and mounted on bulkheads in DC Central and Secondary DC Central and, if space permits, in repair lockers. These drawings are developed as isometric plans.

(2) DC display plans permit the plotting of casualty control operations, provide a quick reference to the location of equipment and show the relationship of the casualty location to spaces and systems.

e. Engineering Casualty Control Manuals (ECCMs). ECCMs provide specific guidance on procedures for responding to casualties in the engineering spaces. There are two volumes that make up the ECCM package for a specific ship or ship class. Volume I is a trouble shooting guide citing various equipment symptoms, probable causes of the equipment casualties and corrective action to be taken. Volume II is the training section where engine casualty scenarios are in a format similar to lesson plans and both Volumes I and II are used as a guide for the Chief or First Assistant Engineer to prepare the ship's engineering crew to correctly respond to engine room casualties. Additional information on the ECCM program is discussed in Chapter 19.

f. Ship's Station Bill. The ship's Station Bill provides direction for crew actions in response to fire, collision, CBR-D, abandon ship, man overboard, emergency boat crewing, DC, steering casualty and shipboard physical security. The Bill directs the operation of emergency systems and equipment and manning of vital ship stations appropriate to the situation. This Bill shall include assignments for every person aboard the ship, regardless of his/her capacity. The Station Bill also lists standard emergency signals and safety-at-sea instructions. The Master is responsible for keeping the Station Bill updated.

g. Main Space Fire Doctrine (MSFD). The MSFD is ship or class specific and is to provide the ship's crew with guidance on firefighting procedures and ship specific equipment/systems information in order to assess, combat and controlling a Class "B" fire in the engine room. Additional information on the MSFD is provided in Part 1, Chapter 3.

h. Other DC Documents. DC Documents and related manuals required onboard are listed in Table 1-7-2. These manuals are not ship specific and do not have a specific required location onboard ship. They are used in training or as detailed references for specific operations.

1-7-5 ACTION

a. COMSC. COMSC shall ensure DC documentation policy and requirements are consistent with MSC's survivability and DC philosophy. COMSC shall ensure standardization of DC documentation and ensure command DC documentation is updated and consistent with other command documents. COMSC shall maintain DC documentation that is ship class specific.

b. Administrative Commanders. Administrative Commanders shall regularly verify that each ship's inventory of DC documentation is complete and provide required documentation to complete the inventory. Administrative Commanders shall ensure that DC technical documentation is updated as equipment, machinery and systems are altered or added to the ship. The Administrative Commanders shall maintain ship specific DC documentation.

c. Masters. The Master is responsible for ensuring that the inventory of required DC documentation is maintained onboard, and shall inform the Administrative Commander of any shortages. The Master shall ensure that DC documentation is current and kept in the required locations for ready reference by the crew. If changes or alterations in ship configuration or outfitting require revision of DC documentation, the Master shall inform the Administrative Commander.

TABLE 1-7-2

Other Damage Control Related Documentation

General Damage Control

NSTM 077, Personnel Protection Equipment
NSTM 079 Volume 1, Damage Control Stability and Buoyancy
NSTM 079 Volume 2, Practical Damage Control
NAVSEA SS600-AA-MMA-010/A-4, Technical Manual for Oxygen Breathing Apparatus, Type A-4
NWP 62-1D, Surface Ship Survivability
MSC DC Command Inspection form 5040/29

Firefighting

NSTM 555, Shipboard Firefighting

CBR-D (Ships requiring CBR-D capability only)

NSTM 070, Radiological Recovery of Ships after Nuclear Weapons Explosions
NSTM 470, Shipboard BW/CW Defense and Countermeasures
CBR-D Handbook for Training, S5080-AA-HBK-010
NWP 62-1D, Surface Ship Survivability

Helicopter Crash Rescue (Helicopter certified ships only)

NWP 42D, Shipboard Helicopter Operating Procedures
NAVAIR 00-80R-14, NATOPS, U.S. Navy Aircraft Firefighting and Rescue Manual
NAVAIR 00-80R-14-1, NATOPS, U.S. Navy Aircraft Emergency Rescue Information Manual

PART 1

POLICIES AND PROCEDURES

CHAPTER 8

DAMAGE CONTROL MARKINGS

1-8-1 POLICY

MSC ships shall be uniformly marked to enable personnel to find their way about the ship quickly and to readily locate DC fittings and equipment. Standardized markings enable crewmembers to rapidly locate compartments and equipment. Standardization of markings is of particular value to new crewmembers and personnel from other ships or commands who come aboard to assist in casualty control.

1-8-2 BACKGROUND

MSC has a uniform system of marking decks, compartments, equipment and fittings to facilitate quick location and identification. COMSCINST 9280.3D, Designation and Marking of Hull Structure on MSC Ships in Service, provides directions for marking a ship's hull, compartments, spaces, fittings and equipment. COMSCINST 4750.2C, Preservation Instructions for MSC Ships, provides instructions for marking DC lockers and decontamination stations.

1-8-3 DISCUSSION

A summary of DC marking requirements follows.

a. Compartment Labeling. To clearly identify each compartment relative to a deck, a frame and the centerline of the ship, and to identify its purpose/contents, label plates are installed at each access. These plates are permanent markings which do not require painting. Labels also are placed on heating and ventilation equipment, piping systems, firefighting systems, fire stations and similar items. Requirements for label plates, including abbreviations and placement, are found in COMSCINST 9280.3D. Additional marking requirements for fire main, countermeasures washdown, hazardous materials storage, DC lockers and decontamination stations are found in COMSCINST 4750.2C.

b. Instruction Plates. Various operating instructions, safety precautions and regulatory label plates are required to be posted throughout the ship. These include Station Bills, emergency signal procedures, equipment operating instructions, safety precautions and notices required for compliance with U.S. Coast Guard (USCG) regulations. Instruction plates are further described in COMSCINST 9280.3D.

c. Damage Control Repair Lockers. Repair Lockers and associated equipment are marked for easy identification and to avoid misplacement or misuse of equipment. The inner and outer sides of Repair Locker doors shall be painted international orange, MSC Code 55. The outer side of the locker doors shall have one, two or three black stripes 1" wide or numbers painted under the door label the same length as the label plate, indicating the locker number. The handles of tools or other suitable parts of equipment associated with a DC locker shall be painted international orange, MSC Code 55, and where practicable marked with one or more black stripes indicating the appropriate locker number. Ships having only one DC Repair Locker may omit the black stripes.

d. Countermeasures Washdown System. On ships utilizing the hose and clip system for countermeasure washdown, fog nozzle brackets shall be painted international orange, MSC Code 55.

e. Fire Stations and Hoses. Fire Stations shall be identified in red letters and figures at least 2 inches high "FIRE STATION NO. X-YY-Z", where "X" is the location deck, "YY" is the frame location and "Z" is the position to port or starboard.

f. Breathing Apparatus Locations. Lockers or spaces containing breathing apparatus shall be marked "SELF-CONTAINED BREATHING APPARATUS" or "OXYGEN BREATHING APPARATUS" as appropriate.

g. Shipboard Egress. Egress routes shall be marked as required by COMSCINST 5100.17B, Afloat Safety Manual, Chapter 23. Photoluminescent "EXIT" signs are required on doors and hatches which open directly to weather decks. Exit signs with arrows (EXIT-->) pointing to a door or hatch to weather shall be provided within 5 feet of that door or hatch, with subsequent signs a maximum of 15 feet apart (10 feet recommended) and at the foot of each ladder. All signs are to be no higher than 23 inches (30 inches if more than one sign required at one location) or lower than 6 inches above the deck. Exit signs and arrows are to be located on the same side of each compartment or passageway and will be located in areas that receive direct lighting. Double arrow EXIT signs (<--EXIT-->) are used in athwartship passageways that provide egress in either direction. "NO EXIT" signs are required in blind or dead end passageways.

1-8-4 ACTION

a. COMSC. COMSC will ensure that the DC markings on newly constructed or newly acquired ships comply with these instructions.

b. Administrative Commanders. Administrative Commanders shall ensure that shipboard DC markings comply with the above instructions.

c. Masters. The Master shall ensure all shipboard DC markings are maintain and properly installed as required.

PART 1

POLICIES AND PROCEDURES

CHAPTER 9

DAMAGE CONTROL COMMUNICATIONS

1-9-1 POLICY

MSC Ships are equipped with internal communications systems to report casualties and provide effective control and coordination of responding personnel. All ship's force personnel shall be trained and proficient in operation of all installed internal communications and alarm circuits.

1-9-2 BACKGROUND

Prompt response to casualties requires accurate and rapid communications. Regulatory requirements mandate a general alarm system and an engineering watch alarm system to notify crewmembers of emergencies.

1-9-3 DISCUSSION

a. Communications. During emergencies, communications between Damage Control Central (DCC), Secondary Damage Control Central (SDCC), Damage Control Repair Lockers (DCRLs) and On-Scene Leaders; communications between DCC and the Pilot House; and communications between the Pilot House and the ship must be reliable, accurate, rapid and flexible. Primary communications between the Pilot House and the ship is the General Announcing System Circuit "1MC" (Public Address System) and signals for "Collision Alarm," "General Alarm" and "Flight Deck Crash Alarm." Primary communications between DCC and DCRLs is by sound-powered phone circuit "2JZ." Hand-held radios (walkie-talkies) may be used as the primary means of communications between repair party investigators, on-scene leaders, DCRLs and DCC. Sound-powered phone circuit "4JV" is the Engineer's Circuit used for Fueling and Ballasting Stability Control. Sound-powered phone circuit "2JZ" and intercommunication announcing system "21MC" are used for communications between DCC and the Pilot House. Backup communications between DCRLs and the On-Scene Leader is by portable sound powered phones (Salt and Pepper Lines). Runners/messengers can be utilized as a backup if there is a question of system reliability. When installed, the ship service telephone system, Circuit "J" should not be relied on for communications during an emergency and should only be used as a backup. Table 1-9-1 provides a description of the most commonly used internal voice communication systems used for damage control. Part 3, Chapter 6, provides additional information on requirements for and use of DC communications systems.

Circuit	Stations on Circuit
4JV - Engineer's Circuit (Fuel and Stability)	Damage Control Central, Secondary Damage Control Central, Engineering Control Stations, Damage Control Stations, Fuel Control Stations
2JZ - Damage and Stability Control Circuit	Damage Control Central, Chart Room, Secondary Damage Control Central, Damage Control Stations, Emergency Fire Pump Control Station, Steering Gear Room, Engineering Control Station, Ship Service Switchboard, Forward of each Fire Zone Bulkhead, Weather Decks Fwd/Aft/Amid, Machinery Local Control Stations
1MC - General Announcing System (Public Address System)	Pilot House and other specified areas such as the Quarterdeck Station or OIC MILDET Office
21MC - Master's Command Announcing System	Pilot House, Main Propulsion Control, Damage Control Central, Master's Office, Chief Engineer's/Senior Mission Personnel Office, First Officer Stateroom, Officer and Scientist/Technician Messroom and other specified spaces (SSDR)

TABLE 1-9-1
DAMAGE CONTROL SOUND-POWERED PHONE CIRCUITS

b. Alarms. Alarm systems alert the crew to casualties. Alarms may be of a general nature (General Alarm), which ring throughout the ship or specific (system or actuation alarms) which usually ring in the pilot house or engineers operating station. Table 1-9-2 provides a description of typical DC related alarm systems. Part 3, Chapter 6, provides additional information on requirements for, and use of alarms.

Alarm	Location
AV - Hazardous Gas Monitoring and Alarm	Pilot House, QD Station
3AV - Hydrogen Sulfide Alarm	Pilot House, QD Station, Concerned Space
5AV - Halocarbon Alarm	Pilot House, QD Station
4EU - Firemain Low Pressure Alarm	Pilot House, QD Station
F - Fire and Smoke Alarm	Pilot House, QD Station
FD - Flooding Alarm	Pilot House, QD Station
FH - Sprinkling Alarm	Pilot House, QD Station
1FR - Carbon Dioxide Release Alarm	Pilot House, QD Station, Protected Space
2FR - Halon 1301 Release Alarm	Pilot House, QD Station, Protected Space
3FR - Aqueous Potassium Carbonate (APC) Release and Low Pressure Alarm	Pilot House, QD Station
G - General Alarm (Alarm Bells)	Located to warn all personnel in an emergency situation
G - General Alarm (Activation Contacts)	Pilot House, QD Station, DC Feeder Distribution Panel
LB - Steering Emergency Signal	Ship Control Console, Steering Station Aft (Steering Gear Room)

TABLE 1-9-2

DAMAGE CONTROL RELATED ALARM CIRCUITS

c. External Communications. External communications equipment will vary from ship to ship. Current Maritime Radio Services requirements for Global Maritime Distress and Safety System (GMDSS) including ship radio equipment requirements and the satellite Emergency Position Indicating Radio Beacon (EPIRB) are included in the Federal Register dated March 16, 1992, approved April 15, 1992.

d. Emergency Communication Links. MSC ships have various types of emergency communication links to other MSC ships, U.S. Navy ships, merchant ships and short stations.

(1) MSC Ship to Shore Links

(a) INMARSAT A. The primary means of emergency communication with the international rescue network is via the INMARSAT A terminal. This terminal is usually located in the Radio Room. The INMARSAT terminal can automatically send a digital formatted distress message, identifying the ship and the ship's location, to the INMARSAT network. This network is monitored 24 hours a day for distress messages. All distress messages received are passed to the nearest national rescue service such as a U.S. Coast Guard Rescue Coordination Center.

(b) High/Medium Frequency (HF/MF) Radios. The HF/MF radios located in the Radio Room require trained personnel to monitor a distress frequency. Thus unless the HF/MF radios are preset to the international distress frequency, any voice or teletype HF/MF transmissions will be transmitted on the frequency previously set.

(c) Cellular Phone. If the ship has a cellular phone on the Bridge and is within 30 miles of the U.S. or Canadian shore, the ship can use the cellular phone to establish a voice land line link to communicate with the nearest Coast Guard station.

(2) MSC Ship to MSC, USN or Merchant Ship

(a) Bridge to Bridge. The primary bridge-to-bridge voice communication to all other ships (MSC, USN, merchant) is VHF radiotelephone. The typical VHF radio range is 25 miles. All ships and the Coast Guard monitor and use VHF Channel 16 for marine operations. U.S. military and commercial aircraft also monitor VHF 121.5 MHz for emergency transmissions.

(b) MSC Ship to USN Ship. Radio voice communications with MSC or USN ships may be conducted on the UHF radios located in the Radio Room. The primary distress frequency is 243.0 KHz and normal fleet communications is on 277.8 KHz, Navy Common. This is also the primary ship to military aircraft method of voice communication.

(c) HF/MF Distress Frequency. All ships at sea monitor HF/MF 2182 MHz for distress signal beacons or voice. Transmissions may be made on the HF/MF radios located in the Radio Room.

(d) Secure Radiotelephone Network. Some communications from MSC ships to USN ships and shore stations are made over secure radio communication networks. The radios and the encryption devices are located in the Radio Room. Remote handsets are also located in the Pilot House. The frequencies are set by the NAVY Type Commander.

(3) Emergency Communication Devices. Located in an open area topside near the signal shelter is an orange buoy called an EPIRB. This device is designed to float free of the ship in the event of ship sinking and transmit a distress signal to a satellite network. This network notifies the proper authorities for rescue. The distress signal can also be manually activated by means of a switch on the unit.

1-9-4 ACTION

a. COMSC. COMSC will ensure that DC communications systems of newly constructed or newly acquired ships comply with regulatory requirements and meet the requirements of General Specifications for T-Ships of the U.S. Navy.

b. Administrative Commanders. Administrative Commanders shall ensure that each ship's force maintains DC communications systems as required and that crewmembers fully trained in the proper use of these systems.

c. Ships. Shipboard Department Heads shall ensure that members of the ship's force assigned to their department are trained and competent in the use of these systems.

PART 1

POLICIES AND PROCEDURES

CHAPTER 10

FLIGHT DECK DAMAGE CONTROL

1-10-1 PURPOSE

To establish policy on DC requirements for MSC ships with helicopter flight decks and hover facilities.

1-10-2 POLICY

MSC ships which embark and/or operate Navy aircraft shall be designated in accordance with COMSCINST 3120.15D, Policies and Procedures Concerning Helicopter Certification Requirements for MSC Cognizant Air Capable Ships. Other ships which require helicopter or hover facilities shall be built to U.S. Coast Guard (USCG) standards, as specified in Navigation and Vessel Inspection Circular (NVIC) No. 9-81, Coast Guard Guidance Regarding Shipboard Helicopter Facilities.

1-10-3 BACKGROUND

a. Navy Requirements. Ships required to operate with Navy aircraft, defined as "air capable" ships, (see Table 1-10-1) shall be certified in accordance with NAVAIRENGCEN Air Capable Ship Aviation Facilities Bulletin No. 1G which defines the requirements for helicopter flight decks and hover facilities for the level of support and type of aircraft on each ship. Each Navy certified helicopter installation will be outfitted in accordance with Allowance Equipage List (AEL) 2-830024025, Aeronautical Material, Mooring Aids and Equipment for Helicopter Operations. Navy certified installations must be re-certified every 3 years in accordance with NAVAIRINST 3120.1B, Lead Systems Command Procedures and Responsibilities for Certification of Aviation Facilities and Equipment in Naval Ships Operating Aircraft.

(1) MSC helicopter flight deck and hover facilities must comply with all requirements stated in the main body of Bulletin 1G. As changes are promulgated here, MSC will program individual ship types and classes for the upgrades.

(2) Following NAVSEA letter 9555 OPR 05G21 Ser 05G21/111 of 1 June 1993, TRANSALTs listed in Appendix B of Bulletin 1G for ship classes transferred and in the process of being transferred to MSC operational control are vacated upon ship transfer to MSC. Those TRANSALTs may be accomplished at the discretion of MSC. They are not required for helicopter flight deck and hover facility certification or re-certification.

b. USCG Requirements. Navigation and Vessel Inspection Circular (NVIC) No. 9-81, U.S. Coast Guard Guidance Regarding Shipboard Helicopter Facilities, provides guidance for the design and installation, of helicopter platforms and hover facilities built to USCG standards. This NVIC requires that the provisions of 46 CFR 108 be applied to helicopter facilities aboard USCG certificated ships. NVIC No. 9-81 and 46 CFR 108 regulations establish specific firefighting and safety requirements. Allowance Equipage Lists have been developed for ships equipped with USCG certified helicopter facilities.

1-10-4 DISCUSSION

a. Navy Certified Helicopter Facility Requirements Summary

(1) All points of the landing, VERTREP/external lift, HIFR and hangar/parking area must be reachable (nozzle touching the deck) by the nozzles of at least two foam outlets. Ships with landing facilities must be equipped with fixed foam systems. New ships require a minimum of 100-gallon capacity foam tank; existing ships with tanks less than 100-gallon capacity are certifiable, but retrofit of the 100-gallon capacity tank is recommended. Ships with hover only facilities may be equipped with portable foam systems (a minimum of 50 gallons of foam concentrate in containers shall be available). Foam stations are to be charged up to the nozzles before beginning helicopter operations.

(2) All landing and hover areas must have at least two 15 lb. CO_2 extinguishers and two 18 lb. or 27 lb. dry chemical extinguishers.

(3) Two crewmembers shall be assigned to dress out in proximity suits prior to the start of helicopter operations. These men shall have available a set of crash/rescue tools consisting of items as shown in Table 2-14-2 in Part 2, Chapter 14. Personnel manning the two foam hoses shall be dressed in flight deck jerseys, cranials and inflatable life vests.

b. USCG Certified Helicopter Facilities Requirements Summary

(1) Helicopter decks with fueling capability must have an approved firefighting foam system with enough foam agent to discharge 5 minutes at maximum. Two reel mounted hoses at different accesses must be able to reach any point on the helicopter deck.

(2) A 50 lb. dry chemical extinguisher must be at each fueling facility. Each access to the helicopter deck must have a 40 lb. foam, 200 lb. CO_2, or 100 lb. dry chemical semi-portable extinguishers.

(3) Each USCG certificated vessel is required to have two fireman's outfits consisting of self-contained breathing apparatus with lifeline attached, one flashlight, a rigid helmet, boots and gloves, protective clothing and one fire ax.

c. Helicopter Launch and Recovery Bill. Part 2, Chapter 14, provides a Helicopter Launching and Recovery Bill which outlines responsibilities and procedures for safe launching and landing of helicopters on MSC ships. On ships with helicopter hover facilities, these responsibilities shall be adapted to ensure safe helicopter operations.

1-10-5 ACTION

a. COMSC. COMSC will ensure that helicopter facilities aboard newly constructed or newly acquired ships comply with either COMNAVAIRSYSCOM or USCG certification requirements.

b. Administrative Commanders. Administrative Commanders/Area Commanders shall ensure that any deficiency in installation or outfitting which may compromise certification of a helicopter facility is promptly resolved.

c. Ships. Ensure flight deck firefighting systems and equipment is properly maintained/inventoried. Masters shall inform the Administrative Commander of any deficiency in installation and outfitting of a helicopter facility.

Ship Class
T-AE 26
T-AFS 1
T-AFS 8
T-AGOS 19 (hover)
T-AGS 29
T-AGS 39 (hover)
T-AGS 45 (hover)
T-AH 19
T-AK 3000 (MPS)
T-AO 187
T-ATF 166 (hover)
T-AVB 3

TABLE 1-10-1

SHIPS WITH NAVAIR CERTIFIED FLIGHT DECKS

PART 1

POLICY AND PROCEDURES

CHAPTER 11

FIXED FIREFIGHTING SYSTEMS

1-11-1 PURPOSE

To establish policy on requirements for firefighting systems aboard MSC ships.

1-11-2 POLICY

a. Systems. Firefighting Systems on new construction MSC ships shall meet the requirements of U.S. Coast Guard (USCG) regulations, American Bureau of Shipping (ABS), Rules for the Construction of Steel Ships and the General Specifications for T-Ships of the U.S. Navy (T-Ship GENSPECS). The criteria cited in T-Ship GENSPECS apply to new construction ships and is not to be used to inspect or evaluate existing ships. Ships transferred from the U.S. Navy shall retain existing firefighting systems. Alternate extinguishing systems or system enhancements in accordance with military specifications shall only be considered on a case-by-case basis.

b. Main Space Fixed Gas Systems Release Authority. Main space fixed gas system release authority shall be retained by the Master or delegated to a person designated in writing by the Master. In the absence of both of these, the senior licensed officer onboard will make this determination. The Main Space fixed gas release authorization shall be cited in the ship's Station Bill, noted in the ship's Main Space Fire Doctrine and shall be announced to the crew during fire drills. On ships outfitted with fixed gas smothering systems which have both a primary and secondary charges (two shots of equal capacity), the senior licensed officer on the scene is authorized to release the initial charge after concurrence for the bridge to secure main engines. The second charge will be handled like that of a single shot system. Refer to Chapter 2 for additional information on system release responsibilities.

c. Activation of Systems. The firemain shall be charged as soon as a fire or fuel spill is discovered. A total flooding fixed gas extinguishing system protecting a space will be activated (by designated person) only when the fire is determined to be out-of-control, when all personnel in that space have evacuated and have been accounted for, after required space closures have been accomplished and (in the case of the main space) after determining emergency maneuvering of the ship is not required. The determination that the fire is out of control is typically made by the senior licensed officer on the fire scene as supported by the Quick Response Team Leader, if present.

1-11-3 BACKGROUND

Because MSC ships are designed to commercial standards, upgrading firefighting systems to Navy standards is not required nor is it desired unless a specific need has been identified. Navy standards might be required in spaces with increased risk because of highly flammable cargo or identification of a space with an unusually high fire risk.

1-11-4 DISCUSSION

Firefighting system requirements for various spaces are summarized in Table 1-11-1. This guidance does not supersede regulatory body requirements. Because of the unique operating requirements of certain MSC ships and their construction dates, the firefighting systems, firefighting requirements and operation of the fixed systems may vary significantly from ship to ship. A brief description of fixed firefighting systems, with general requirements, follows:

a. Firemain. Seawater from the ship's firemain is the ship's first line of defense against fire.

(1) System Requirements. A firemain system is required on every ship regardless of other installed fire extinguishing systems. The firemain piping configuration is designed as either a single main or a horizontal loop (wet or dry). MSC ships designed to commercial standards usually have a dry type, single main system. Ships which have been transferred from the Navy to MSC will normally have a wet, horizontal loop system. Firemain piping must be large enough in diameter to distribute the maximum discharge from two fire pumps operating simultaneously. The system must be designed to provide at least 50 psi (75 psi on tank ships) at the two hydrants that have the greatest pressure drop. To provide maximum nozzle range yet limit handing difficulties, optimum pressure is between 75 to 100 psi. Each ship is required to have at least two independently powered fire pumps. One fire pump and its power source must be protected by a fixed gas flooding system. Each fire pump must be equipped with a relief valve set at 125 psi or 25 psi over the system pressure whichever is greater. If the ships firemain pump is used to provide water to the ship's fixed foam system, use of the foam system must not interfere with the simultaneous use of the firemain. To permit the use of firefighting water provided from shore, at least one shore connection to the firemain system is required on each side of the ship.

(2) Firemain Pipe and Coupling Threads. Commercial or Navy thread standards are used on 1-1/2 inch threaded couplings for firefighting systems and equipment. The following list indicates which MSC ships have Navy standard threads (NPSH 11-1/2 TPI) and which ships require commercial standard threads (NH 9 TPI). Threading on 2-1/2 inch firefighting equipment is 7-1/2 TPI for both commercial and Navy components.

Ships Requiring Navy Threads (11-1/2 TPI)		**Ships Requiring Commercial Threads (9 TPI)**
T-AH	T-AO 187 Class	FSS
T-AE	T-AK-FBM	T-AGOS 1 Class (Monohulls)
T-AGM	T-ARC	T-AGS 26 Class
T-AFS	T-AG 195	T-AGS 29 Class
T-ATF	T-AGS 39 Class	T-AGS 33 Class
T-AG 194	T-AGS 51 Class	
T-AGS 45	T-AGOS 19 Class	
T-AGS 60 Class	T-AGOS 23 Class	
All new construction ships		

b. Fixed Gas Fire Extinguishing Systems. Carbon dioxide (CO_2) and Halon 1301 fixed gas fire extinguishing systems are installed on MSC ships. No new Halon systems will be installed aboard MSC ships.

(1) Carbon Dioxide (CO_2). Carbon dioxide systems are especially suitable for shipboard use because they will not damage cargo or machinery. CO_2 leaves no residue and does not conduct electricity. Carbon dioxide can be used on fires in live electrical equipment. The disadvantages of CO_2 are that it displaces oxygen and hence is hazardous to life, has limited cooling effect on materials heated by fire and is ineffective against materials that create their own oxygen when they burn.

(a) Design Requirements. Requirements for installing and designing fixed or hose reel CO_2 fire extinguishing systems are cited in 46 CFR. The amount of CO_2 in pounds required to protect a space is determined by dividing the volume of the space by a flooding factor. The flooding factor for cargo areas 30, 25 for machinery spaces and 22 for spaces holding vehicles. Applicable sections of 46 CFR should be consulted when sizing or checking the capacity of a CO_2 system.

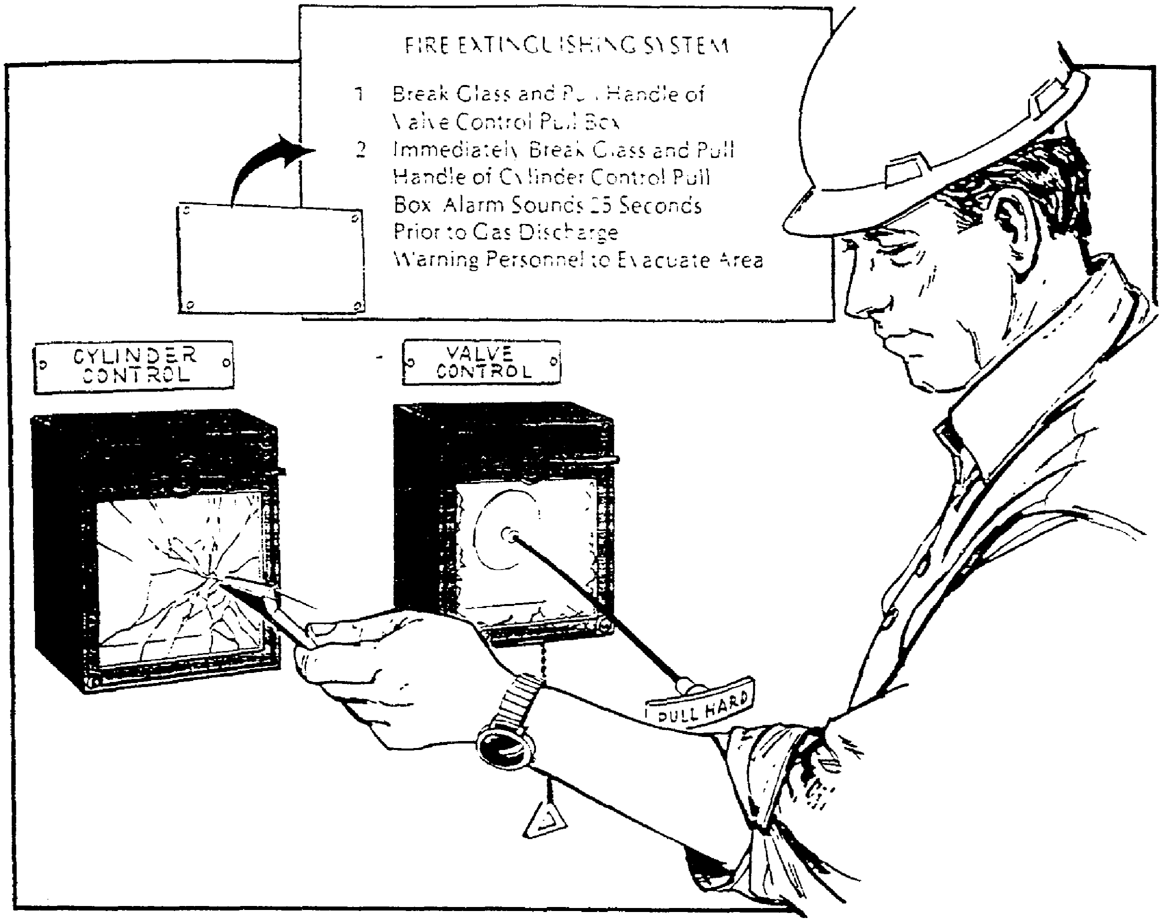
(b) System Characteristics. An approved audible alarm must be installed in every space protected by a CO_2 extinguishing systems (small stand-up lockers being an exception). CO_2 systems use the discharging gas to activate alarm devices and pressure switches that shut down ventilation systems. The alarm is a warning to people in the space that the CO_2 system has been activated. After the alarm sounds, there is a 20-second delay before the CO_2 is released. Release shall depend on no source of power other than the gas itself.

(c) Actuation. The total flooding system is actuated (after obtaining release authority and evacuation of all personnel) by breaking the glass in front of the pull boxes and manually pulling the appropriate cable handles. The cable handles MUST be pulled in the PROPER SEQUENCE. The VALVE CONTROL handle MUST be pulled FIRST, then the CYLINDER CONTROL handle. Total flooding systems and cargo systems are activated manually. Smaller fixed systems (those using less than 300 pounds of CO_2) for paint lockers and other small spaces may be automatically activated by heat sensitive devices or may be operated manually. (See Figure 1-11-1.)

(2) Halon 1301. Halon 1301, like CO_2, is an effective extinguishing agent involving flammable liquid and gas fires and fires in electrical equipment. Halon extinguishes fires by interrupting the chemical oxidation reaction which results in flame and heat. Halon is clean, colorless, odorless gas which does not conduct electrically or contaminate electrical equipment. Although non-toxic in its original form, when exposed to the heat of a fire, Halon will decompose into toxic by-products. Environmental studies of Halon and related chlorofluorocarbons have determined that these compounds are ozone depleting substances. For this reason, Halon is no longer the preferred extinguishing agent. Policy on Halon/CFC is established by COMSCINST 5090.3A.

(a) Design Requirements. Halon 1301 systems must meet all the design requirements for CO_2 total flooding systems as cited in 46 CFR, although Halon systems require only 80% of the quantity of CO_2 required for protecting an identical space. Like fixed CO_2 systems, HALON systems must not rely on any outside power source for activation of alarm devices and ventilation system shut down pressure switches. To meet this requirement, Halon systems utilize compressed CO_2. This actuation system, which activates the alarms and pressure switches and after a 60-second delay, will rupture the sealing discs on the Halon bottles, releasing the Halon into discharge piping. The CO_2 actuating system must be manually released. Enough Halon must be available to provide a minimum concentration of 6% (7% required for extinguishing fuel fires) of the gross volume of the protected space.

(b) Actuation. The total flooding system is actuated (after obtaining release authority and evacuation of all personnel) by breaking the glass in front of the pull boxes and manually pulling the appropriate cable handles. The cable handles MUST be pulled in the PROPER SEQUENCE. The VALVE CONTROL handle MUST be pulled FIRST, then the CYLINDER CONTROL handle. Total flooding systems and cargo systems are activated manually. Smaller fixed systems (those using less than 300 pounds of Halon) for paint lockers and other small spaces may be automatically activated by heat sensitive devices or may be operated manually.



The pull cables used to activate the total-flooding CO_2 system. The cables must be pulled in the proper order (valve control first) as noted in the posted instructions.

FIGURE 1-11-1

c. <u>Fixed Water Sprinkling Systems</u>. Fixed sprinkling systems are usually installed in munitions spaces and vehicle decks on roll-on/roll-off (RO/RO) ships. These systems are effective in protecting the ships structure, limiting the spread of fire and controlling the amount of heat produced by fires. Sprinkling systems also may be used to protect living quarters, adjacent passageways and public spaces. Sprinkling systems can be either automatically or manually actuated. When sprinkling systems are used, the water put on the fire must be removed from the ship by scuppers or internal drains. Bilge pumps must be capable of draining the space faster than water entering and must operate whenever the sprinkling system is actuated.

(1) Automatic Sprinkling Systems. Automatic sprinkling systems (wet systems) use sprinkler heads held closed by fusible links and installed in piping charged with water. The fusible links act as fire detectors actuating devices. An air pressurized tank partially filled with fresh water serves as the initial water source. The pressure tank must hold enough water to fill the piping system of the largest zone. The tank must hold sufficient pressure to force out 200 gallons of water at 15 psi at the zone having the least effective head at the pilot pressure valve. Fresh water is used in the system to avoid the breakdown of metal by electrolysis.

(2) Manual Sprinkling Systems. In manual sprinkling systems, sprinkler heads are normally open and their piping systems are not charged with water. Sea water is supplied to the manual system by the ship's fire pumps; no pressure tank is required. Manual sprinkling systems are installed in vehicular decks on RO/RO ships and in cargo spaces accessible to the crew when the ship is underway. Some manual systems provide total saturation of munitions spaces.

d. Firefighting Foams. Foam is the most effective means of fighting Class B pool fires, although it will not control or extinguish a three dimensional flowing fuel fire. Foam may also be effective at combating some Class A fires. Foam extinguishes by smothering and secondary cooling.

(1) System Placement. Foam systems are acceptable as fire protection for boiler rooms, machinery spaces and pump rooms on all ships. The USCG approves installation of foam systems in these spaces in lieu of other approved systems such as CO_2, but it is more typical to find a foam bilge flooding system installed to augment the fixed gas extinguishing system in high fire threat areas, such as the engineroom. Installed fixed foam systems are required on all tank ships and on ships with aircraft decks. Some older ships may have foam systems protecting flammable-liquid cargo holds. These systems are no longer installed. If the use of a foam protected space changes or if special or hazardous cargoes are carried, the foam manufacturer must be contacted immediately to determine acceptability of the foam to be used and the setting of foam system proportioning equipment. See 46 CFR for specific application design criteria, fire pump limitations and other requirements regarding foam systems.

(2) Types of Foams. There area a variety of air foams available: regular (protein), fluoroprotein, aqueous film-forming (AFFF), alcohol and high expansion. They all vary in effectiveness. Protein, fluoroprotein and AFFF (non-polar solvent foams) are effective on hydrocarbon (non-water mixing) fuels only. Alcohol (polar solvent) foams are generally used against fires involving polar (water-mixing) solvents chemicals, such as alcohols, ketones, water miscible esters and lacquer thinner. While polar solvent

foams are usually effective against hydrocarbon fires, non-polar solvent foams are generally not effective on polar solvent fires. Polar solvents have a high affinity for water and will thus drain the water from the non-polar solvent foam. In addition to USCG approving a specific foam for a specific foam system installed aboard ship, USCG must also approve its application. Most protein, fluoroprotein and AFFF foams are available in 3% and 6% concentrates. The 3% concentration is the most widely used and accepted commercial AFFF concentration for combating petroleum type hydrocarbon fires. For new construction ships, a CG approved AFFF system set for a 3% foam concentration vice 6% should be required when protection against hydrocarbon fires is desired. Since many of the existing MSC ships have AFFF systems installed and approved for a 6% concentration setting, CG approval would be required in order to alter the system concentration setting to 3%. Portable foam eductor equipment should continue to be set for 6% concentration.

(3) Foam Requirements. Foam quality is measured in terms of 25% drain time, expansion, burnback resistance and fire performance. Commercial AFFF must comply with UL 162 and Federal Specification OF-555-C requirements and be approved by USCG. NSN AFFF is available in 6% and 3% concentrations and must comply with Mil Spec 24385. NSN foam is currently only available for use on hydrocarbon fires.

(4) Maintenance Requirements. Annually, ships are required to take limited samples from the fixed and portable foam concentrate containers and submit those samples to the foam manufacturer for analysis. Like foam (same type, concentration and manufacturer) is to be used for all foam replacements or replenishments. Foam types are not to be mixed. If foam is mixed possible system failure may occur due to foam incompatibilities. NSN foam must not be used in commercial foam systems installed on USCG certificated MSC ships. Foam labels plates shall be mounted on all fixed foam storage tanks specifically citing the foam manufacturer and trade name and concentration of the foam in the tank. To avoid corrosion, the storage and piping lines in contact with the foam concentrate must be of a suitable material as recommended by the foam manufacturer. Firefighting personnel should look at the label on the foam concentrate container which specifically states the application of the foam. The acceptable storage temperature range for firefighting foams is $40^{O}F$ - $100^{O}F$. Special foam may be obtained for cold weather operations.

e. Aqueous Potassium Carbonate (APC) Systems. Aqueous potassium carbonate systems are used to protect shipboard galley deep fat fryers and other galley appliances and their exhaust systems. The system is designed to be activated automatically by the detector assemblies, or manually at the cylinder assembly pressure release control box or remote manual control box.

TABLE 1-11-1

FIREFIGHTING SYSTEMS ABOARD MSC SHIPS

SPACE	SHIP	DETECTING SYSTEM	FIXED EXTINGUISHING SYSTEM	REFERENCE
Accommodation	All MSC Ships	Smoke Detection	None, see note 1	46 CFR 34, 76, 95
Machinery Spaces	All MSC Ships	Smoke Detection	Fixed Gas System see note 2	46 CFR 34, 76, 95
Auxiliary Machinery Spaces, Pump Rooms, Enclosed Ventilation Systems	All MSC Ships	Heat Detection	Fixed Gas System	46 CFR 34, 76, 95
Cargo Tanks (tank tops)	Tankers	N/A	Fixed foam sprinkling system	46 CFR 34
Cargo Spaces (dry)	All MSC Ships	Smoke Detection	Fixed CO_2 System	46 CFR 34, 76, 95
Munitions Spaces	All MSC Ships	Smoke Detection	Fixed Sprinkling System	46 CFR 34, 76, 95
RO/RO Spaces	RO/RO Capable Ships	Smoke Detection	Fixed CO_2 System or Fixed Sprinkling System	46 CFR 76, 95
Paint Lockers and Battery Rooms	All MSC Ships	Smoke/ Heat Detection System	Fixed CO_2 System	46 CFR 76, 95, 111
Galleys	All MSC Ships	Smoke/ Heat Detection System	APC or Fixed CO_2 System	46 CFR 34, 76, 95

(continued on next page...)

TABLE 1-11-1 (cont'd)

FIREFIGHTING SYSTEMS ABOARD MSC SHIPS

SPACE	SHIP	DETECTING SYSTEM	FIXED EXTINGUISHING SYSTEM	REFERENCE
Helo Deck	Helo Capable Ships	N/A	AFFF Hose Reels (at least two) and In-deck AFFF Sprinkling System	NAVAIR Require-ment (unless otherwise stated)
Helo Hangar	Helo Capable Ships	N/A	AFFF Hose Reels (at least two) and In-deck AFFF Sprinkling System	NAVAIR Require-ment (unless otherwise stated)

NOTES:

1. Only passenger ships are required by the USCG to have a fixed sprinkling system installed in accommodation spaces. Such sprinkler application is not a requirement on the T-AH class ships.
2. Based on statistical data and as determined on a case-by-case basis a fixed foam bilge sprinkling system may be installed to augment existing fixed gas extinguishing system in high risk fuel spill/fire areas. COMSC approval is required to determine acceptable application of such systems on existing MSC ships.

PART 1

POLICIES AND PROCEDURES

CHAPTER 12

FLOODING CONTROL

1-12-1 POLICY

MSC ships shall meet compartmentation and watertight integrity requirements of USCG regulations and ABS rules. All hands shall be trained to maintain watertight integrity, prevent flooding and control flooding if it occurs.

1-12-2 BACKGROUND

A ship's ability to resist sinking after sustaining damage depends on compartmentation and maintaining watertight integrity.

1-12-3 DISCUSSION

Part 3, Chapter 1, describes compartmentation and watertight integrity standards. Part 3, Chapter 9, of this instruction provides procedures for conducting dewatering operations. COMSCINST 3540.6, Engineering Operations and Maintenance Manual (EOMM), includes general procedures for the prevention of shipboard flooding. These shipboard procedures emphasize the importance of maintaining shipboard watertight integrity. Specific instructions shall be developed for each ship addressing the proper line up and operation of eductors and liquid transfer valves, the importance of securing hatches, manholes, portholes, sideports and scuttles after use, the need to periodically operate watertight doors, the importance of packing wiring, vent and piping penetrations with watertight material and the need to permanently record the results of all USCG inspections of watertight doors and sea valves and ABS hull surveys.

1-12-4 ACTION

The Administrative Commander shall develop shipboard procedures to address shipboard watertight integrity. These directions shall be conspicuously posted near the equipment, machinery or systems to which they apply. Where it is not feasible to post instructions where they apply, the applicable instructions shall be posted in spaces where they can be easily viewed by the ship's force.

PART 1

POLICIES AND PROCEDURES

CHAPTER 13

HAZARDOUS ATMOSPHERE TESTING

1-13-1 PURPOSE

To emphasize the importance of testing the quality of air in confined or enclosed spaces which do or may contain flammable explosive atmospheres, toxic atmospheres or asphyxiating atmospheres or atmospheres that are oxygen deficient.

1-13-2 POLICY

No person shall be permitted to enter confined or enclosed spaces (such as voids, tanks and cofferdams) aboard ship unless the entry is required to maintain the operational readiness of the ship, and proper precautions have been taken to ensure that safe conditions exist within the space. Post fire procedures shall always include the testing of air quality in affected spaces. Prior to entry into a confined or enclosed space, the Chief Mate or Cargo Mate shall certify the space as "gas free." Gas Free Engineering policy is promulgated in COMSCINST 5100.17B, Afloat Safety and Occupational Health Manual, and proper gas free procedures are also delineated in COMSCINST 3540.6, Engineering Operations and Maintenance Manual and in NSTM 074, Gas Free Engineering. The individual conducting safety checks shall be a graduate of the U.S. Navy Gas Free Engineering School or an equivalent curriculum approved by MSC.

1-13-3 BACKGROUND

Improper entry into spaces containing flammable, explosive, toxic or asphyxiating atmospheres has caused death and disabling injury. Testing, ventilation, personnel protective equipment and other precautions are necessary to ensure personnel safety.

1-13-4 DISCUSSION

a. Hazardous Atmosphere Testing for Maintenance. COMSCINST 5100.17B promulgates gas free engineering requirements, testing requirements and responsibilities. COMSCINST 3540.6 provides supportive instructions for testing spaces containing or potentially containing a hazardous atmosphere prior to personnel entering the space or performing hot work in or near the space. These instructions are based upon the NSTM, Chapter 074, Volume 3. Part 3, Chapter 8 provides procedures for ventilating spaces which may contain toxic substances.

b. Post Fire Hazardous Atmosphere Testing. After a fire is out, a fire party member who is a graduate of the U.S. Navy Gas Free Engineering School or an equivalent curriculum approved by MSC shall test for a hazardous atmosphere. Personnel without breathing apparatus will not be permitted to enter the affected space(s) until these tests have been conducted and the space has been found to be free of toxic and or combustible gasses. All spaces must be desmoked before such testing because oxygen analyzers are not reliable in atmospheres with excessive moisture or airborne particulate and combustible gas analyzers are not reliable in oxygen deficient or high HALON content atmospheres. A series of tests in sequence for oxygen, combustible gases and toxic gases are required. If the result of any of the tests is unsatisfactory, the space must be ventilated and re-tested. After class A and C fires, toxic gases in spaces may include hydrogen chloride from polyvinyl chloride cable insulation. After class B flammable liquid fires, toxic hydrocarbon, carbon dioxide, carbon monoxide, hydrogen chloride and hydrogen cyanide gasses will be present. If Halon 1301 has been used to extinguish the fire, testing for hydrogen fluoride, a toxic by-product of HALON when decomposed due to high heat, may be necessary.

c. Gas Free Engineer Kit. A portable triple gas indicator and unit calibration kit is required to be part of the ship's DC equipment requirements, provided that such units are not in the ship's outfitting of standard equipment. The triple gas indicator should be able to test for oxygen and combustible gases, and it is recommended that the third gas testing capability be hydrogen sulfide, although this will be dependent on the specific needs of the ship. A four or five gas indicator is also acceptable. Equipment certification criteria is provided in NSTM 074.

1-13-5 ACTION

a. COMSC. COMSC shall develop and promulgate gas free and hazardous atmosphere testing policy.

b. Administrative Commanders. Administrative Commanders shall ensure proper implementation of the Hazardous Atmosphere Testing Program and ensure shipboard training programs emphasis to all mariners the safety hazards associated with not properly entering an uncertified confined space.

c. Masters. Ship's force shall comply at all times with the requirements for testing of confined and enclosed spaces provided in COMSCINST 5100.17B and COMSCINST 3540.6. The Master shall ensure that all gas free test equipment is in operating condition and shall ensure that firefighting drills include the requirement to use the gas testing equipment.

PART 1

POLICIES AND PROCEDURES

CHAPTER 14

DAMAGE CONTROL TRAINING AND DRILLS

1-14-1 POLICY

MSC ships shall conduct DC training and drills as listed in Table 1-14-1.

1-14-2 BACKGROUND

MSC training objectives include:

a. Efficient operation of ships.

b. Obtaining the highest possible degree of ship safety and operational readiness.

c. Prevention and control of casualties and damage repair.

d. Protection of personnel in emergencies.

1-14-3 DISCUSSION

Titles 33 CFR and 46 CFR provide USCG requirements for the conduct of routine shipboard drills. Routine shipboard engineering casualty exercises are required by COMSCINST 3541.6A, Engineering Casualty Exercises, and selected ship class specific Engineering Casualty Control Manuals (Part 1, Chapter 20). Civilian Marine Personnel Instruction (CMPI) 410 provides detailed information on training requirements for MSC shipboard personnel.

1-14-4 ACTION

a. COMSC. COMSC shall develop and promulgate shipboard and shoreside DC training policy requirements.

b. Administrative Commanders. Administrative Commanders shall track and schedule shoreside training of all shipboard personnel. Administrative Commanders shall ensure that training materials are provided to each ship.

c. Ships. The Master shall ensure that all shipboard training and drill requirements are performed and that their accomplishment is noted in the appropriate ship's log(s), and reported in Operational Summaries. Shipboard Department Heads shall ensure that personnel assigned to their department receive the required shipboard training.

TABLE 1-14-1

REQUIRED DAMAGE CONTROL AND RELATED DRILLS

Drill		Frequency	Reference
Fire		Weekly	1,2,4
Abandon Ship		Weekly	1,2,4
Engineerroom Casualty Drill Deck & Engine	12-4 4-8 8-12	Weekly	1,2
Damage Control		Bi-Weekly	1,2
Personnel Rescue		Monthly	1,2
Exposure Suit		Monthly	1,2,4
Oil Spill		Monthly	3,6
Steering	12-4 8-12	Monthly for each watch	1,2
Helo Crash and Rescue		Bi-monthly	1,2
Line Throwing Appliance		Quarterly	1,2,4
Man Overboard (Day)		Quarterly	1,2
CBR-D		Quarterly	1,2
Physical Security		Quarterly	1,2,5
Emergency Destruct		As required by sponsor	1,2
Man Overboard (Night)		Semi-annually	1,2
HAZMAT		Annually	3,7
Towing & Salvage		Annually	1,2

References:

1. COMSCINST 3120.2D
2. COMSCINST 3121.9
3. COMSCINST 5090.1
4. 46 CFR Subchapter I
5. COMSCINST 5530.3B
6. 33 CFR PART 155
7. 49 CFR PART 171-177

PART 1

POLICIES AND PROCEDURES

CHAPTER 15

CHEMICAL, BIOLOGICAL, RADIOLOGICAL DEFENSE

1-15-1 PURPOSE

To establish policy for chemical, biological and radiological defense (CBR-D) installations, outfitting, maintenance and training.

1-15-2 POLICY

MSC ships shall be provided with CBR-D protection in accordance with Top Level Requirements (TLR), Required Operational Capability (ROC) and or Projected Operating Environment (POE) developed for that ship or ship class. CBR-D on new ships coming on hire by contract or charter shall be delineated in those documents if the CBR-D requirement is deemed necessary. Ships shall maintain CBR-D systems and equipment and conduct CBR-D training and drills as required and listed in Appendix C. Not all MSC ships are required to have a CBR-D capability.

1-15-3 BACKGROUND

MSC ships that have a CBR-D capability have hose and clip water washdown systems, dedicated decontamination stations and a full allowance of personnel protection equipment. Although selective area collective protection systems (SACPS) and fixed chemical detection systems are available and have been installed to a limited degree on U.S. Navy ships, the expense of such systems are too high at this time to justify installation aboard MSC ships. Based on ship specific missions, enhanced CBR-D capabilities may be considered by the Chief of Naval Operations. As discussed in Appendix C, a strawman CBR-D allowance for personnel protection equipment has been developed to meet the need of outfitting those quick turn-around ships that will be operating in CBR-D areas, but are not normally outfitted with CBR-D equipment.

1-15-4 DISCUSSION

a. Appendix C, Chemical, Biological, Radiological Defense (CBR-D) Material Conditions of Readiness Policy, provides direction on training, outfitting and maintenance requirements for CBR-D installations. Table 1-15-1 lists those MSC ships required to have CBR-D. Part 2, Chapter 5, provides requirements for the CBR Defense Bill. Part 3, Chapters 4 and 5, describe the fundamentals of chemical and biological defense and radiological defense, respectively. COMSCINST 4750.2C, Preservation Instructions for MSC Ships, and COMSCINST 9280.3D, Designation and Marking of Hull Structure on MSC Ships in Service, as well as Part 1, Chapter 8, provide instructions for marking and painting decontamination stations and CMWD brackets.

Table 1-15-1
MSC Ship CBR-D Requirements*

Ships Requiring CBR-D	Ships Not Requiring CBR-D
T-AE T-AF T-AFS T-AO T-AH T-AGOS T-ATF FSS MPS T-AK/T-AKR (less RRF & designated short-term charter ships)	T-ARC T-AGOR T-AGS T-AG T-AGM T-AOT (Sealift Class)**

* COMSC letter of Promulgation: COMSC ltr 4700 Ser N7/C074 of 19 DEC 91, Subj: MSC CBR-D Policy. CBR-D data declassified via COMSC Ltr 4700 Ser N7/002117 of 9 Jul 92.

** CBR-D requirements for follow-on T-AOT to be determined and delineated IAW Ship Charter Agreement/applicable ROC and POE.
Note: Specific ships may require CBR-D equipment, application of such a requirement will be handle on a case-by-case basis for those ships having no CBR-D requirement.

b. When towing and salvage of a contaminated ship is required, procedures in COMSCINST 3121.9, Standard Operating Manual - Part 1, Chapter 16, Towing and Salvage; Part 2, Chapter 8, Towing Bill and COMSCINST 5420.2F, Salvage of MSC Ships, shall be followed.

c. Procedures for CBR agent containment and decontamination included in NSTM 070 for radiological contamination and NSTM 470 for chemical and biological contamination shall be implemented to suit MSC ship configurations and manning constraints, as required.

1-15-5 ACTION

a. COMSC. COMSC will ensure that newly constructed or newly acquired ships comply with these instructions. COMSC also will promulgate all changes to CBR-D policy.

b. Administrative Commanders. Administrative Commanders shall ensure shipboard compliance with the above referenced instructions.

c. Masters. Masters shall ensure CBR-D systems are maintained and operable. Onboard CBR-D equipment outfitting, RADIAC upkeep/inventory and shelf life items shall be managed by the ship's force. CBR-D crew training is the responsibility of the Master.

PART 1

POLICIES AND PROCEDURES

CHAPTER 16

TOWING AND SALVAGE

1-16-1 POLICY

All salvage activities for MSC ships, whether civil service manned or contract operated, shall be conducted by the Navy under the terms and conditions of OPNAVINST 4740.2E, Salvage and Recovery Program, and NAVSEAINST 4740.8, Salvage, Recovery and Open Sea Spill Response Programs. Salvage activities for vessels chartered to MSC (time, spot or voyage) shall be conducted under the terms of the charter contract. MSC ships being towed shall follow the procedures in Part 2, Chapter 8, Towing and Salvage Bill.

1-16-2 BACKGROUND

Safe towing operations require proper procedures and training. During annual Phase III training, towing and salvage gear is inspected for readiness. In addition, instruction is given and discussion conducted covering typical towing and salvage operations and problems. Salvage operations involve all services required to save a ship from loss at sea. Salvage may be required because of fire, flooding, grounding, collision or other accidents.

1-16-3 DISCUSSION

COMSCINST 3121.9, Standard Operating Manual, and COMSCINST 5420.2F, Salvage of MSC Ships, provide procedures for arranging for towing and salvage of MSC ships. Part 2, Chapter 8, provides guidance and assigns shipboard responsibilities for towing and salvage. Additional references on towing include:

MANUAL NAME		**PUB STOCK #**
Navy Towing Manual		0910-LP-309-8800
US Navy Salvage Manual,	Volume 1	0910-LP-107-7500
	Volume 2	0910-LP-252-2900
	Volume 3	0910-LP-252-3100
	Volume 4	0910-LP-252-3200
	Volume 5	0910-LP-252-9700
	Volume 6	0910-LP-256-9800

MANUAL NAME	PUB STOCK #
US Navy Salvage Manual	0910-LP-107-7600
US Navy Salvage Material Catalogue	0994-LP-017-7300
US Navy Salvor's Manual	0910-LP-107-7300

1-16-4 ACTION

a. COMSC. COMSC will act as the coordinator of all actions involved in the towing and salvage of ships to include ensuring that each class of ship has a proper towing diagram. COMSC will establish a Salvage Board to be convened when a salvage situation is imminent.

b. Administrative Commanders. Administrative Commanders shall ensure that each ship has properly sized towing equipment. Administrative and Area Commanders, when notified of a salvage situation by the Master of such a ship, an MSC ship shall notify the Surface Force Commander, offer any assistance to the ship, establish and maintain liaison with the salvaging activity and arrange for repair services.

c. Masters. Masters shall ensure that a Towing Diagram is maintained aboard ship. Masters shall ensure all towing equipment is maintained in good condition and is of proper size as called out in the ship's Towing Plan. Masters of MSC ships shall initiate requests for salvage assistance.

PART 1

POLICIES AND PROCEDURES

CHAPTER 17

HAZARDOUS MATERIAL SPILL RESPONSE

1-17-1 POLICY

Hazardous material shall be carried in not more than the minimum quantities needed to perform maintenance and operations. Material Safety Data Sheets (MSDS) are technical bulletins containing information about HM, including precautions for safe use and health and safety hazards. An MSDS is required aboard ship for each HM carried, either as a part of the Hazardous Materials Information System (HMIS) or as a hard copy and be readily available to personnel who actually use or handle the material. All personnel using HM must be trained on the hazards associated with the material, safe use, stowage, disposal and personal protective equipment requirements before they use the material. The Hazardous Material Control and Management (HMC&M) Compact Disc-Read Only Memory contains the Hazardous Material Information System (HMIS), Hazardous Material User's Guide (HMUG), Emergency Response Guides and the Afloat Safety Shopper's Guide (ASSG). The HMIS is maintained by the HM Coordinator. Ships are required to transfer used or excess HM to a Navy shore activity for determination of suitability for further use. Any spill of hazardous material or hazardous waste shall be cleaned up and placed in appropriate containers for disposal. Each ship shall assign a Hazardous Material/Hazardous Waste (HM/HW) Coordinator (usually the ship's Supply Officer) and shall be equipped with spill response kits to handle possible shipboard spills. The HM/HW Coordinator and two or three crewmembers who are not Department Heads or DC Repair Party Leaders shall be assigned to the spill response team. Crewmembers selected for the spill response team shall receive training annually on HM/HW emergency procedures. This training shall include at least one HM spill response drill.

1-17-2 BACKGROUND

a. Hazardous material (HM) is any material that because of its quantity, concentration or physical, chemical or infectious characteristics may pose a substantial hazard to human health or the environment when released or spilled. Hazardous waste (HW) is any discarded material (liquid, solid or gas) that meets the definition of an HM or is designated as HW by the Environmental Protection Agency (EPA) or state or local authority.

b. Navy policy is that ships do not generate hazardous waste. Ships are required to transfer used or excess HM to a Navy shore activity for determination of suitability for further use. Navy shore activities possess trained personnel who can determine whether Shipboard HM is usable, reusable or should be disposed of as HW. If the shore activity determines that the material has no further use, it will process the material as the HW generator as required by Federal and state laws and regulations.

c. Used or Excess Hazardous Material (Used/Excess HM) is HM for which there is no further, immediate use on board the ship processing the material. Such material may ultimately be used on another ship, within the shore establishment, for a different purpose other than initially manufactured or by commercial industry.

d. Hazardous Material User's Guide (HMUG) (OPNAV Pub P-45-110-9) is a publication which provides the fleet with easily understandable safety and health information to supplement the technical data found in MSDSs. The information in this guide is designed to assist HM users in protecting themselves and the environment. The contents of the guide include control measures, precautions, health hazards, spill control guidance and disposal guidelines for 20 hazardous material groups. It also provides a personal protective equipment shopping guide. It is intended that the guide be readily available and used in every work center. Applicable sections can be copied and posted in areas where specific HM groups are frequently handled or stored. The HMUG is available on the HMCM CD ROM.

1-17-3 DISCUSSION

COMSCINST 3540.6, Engineering Operations and Maintenance Manual, COMSCINST 5100.17B, Afloat Safety and Occupational Health Manual and COMSCINST 5090.1, Environmental Protection Program and Oil/Hazardous Substances (OHS) Spill Reporting Procedures, all provide procedures for ordering, handling, storage and disposal of HM/HW. These instructions also outline actions to respond to spills. Shipboard spill response kits are to be outfitted aboard ship in accordance with the Allowance Equipage List (AEL) with the addition of "HgX" mercury decontaminant powder (NSN 6850-01-230-8556) for mercury spills.

1-17-4 ACTION

a. COMSC. COMSC will develop and promulgate policy related to the response of HM/HW spills.

b. Administrative Commanders. Administrative Commanders and Area Commanders shall periodically review shipboard procedures for the procurement, storage, handling, use and disposal of HM/HW.

c. Ships. Shipboard Department Heads shall ensure that crewmembers assigned to their department are familiar with HM/HW and MSDS information on spills likely to occur in their area. The ship's HM/HW Coordinator shall coordinate training of the spill response team and maintain the shipboard HM/HW spill kit. All MSC ships require one HM/HW spill response kit onboard except the T-AO 187 class, T-AFS 1 class and T-AFS 8 class are required to have two kits aboard.

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS: KIT,RESPONSE,SPILL,HAZARDOUS MATERIAL/WASTE

TECHNICAL DOCUMENT NUMBER — MANUAL: — PLAN: —

IDENTIFICATION NO.: 2-550024007 | DATE: 11-25-91 | PAGE: 1

CHARACTERISTICS

THE FOLLOWING MATERIALS AND EQUIPMENTS ARE REQUIRED TO BE PLACED ABOARD SURFACE SHIPS TO PROVIDE FACILITIES TO HANDLE HAZARDOUS WASTE OR MATERIAL SPILLS.
THIS AEL IS DEVELOPED BY AUTHORIZATION OF NAVSEA 56YP AND OPNAV 5100 19B OF 04/11/89
SEE INDEX PART I FOR COLUMN WHICH APPLIES
COLUMN 1 FOR ALL SURFACE SHIPS EXCEPT MCM, MHC OR MSO HULLS
COLUMNS 2 THRU 8 BLANK
CAGE-03950
CCF DATE -08 91

REFERENCE NO./DESCRIPTIVE DATA	ITEM NAME	STOCK NO.	SEC SOURCE MAINT RECOV	NOTES	U/I	ON BOARD ALLOWANCE	COL. 1	COL. 2	COL. 3	COL. 4	COL. 5	COL. 6	COL. 7	COL. 8
769WS LARGE TYVEK/SARANEX	APRON,LARGE	1HM0099-LL-H30-5572	UPAOZZ		EEA	10								
PPPB26	BAG,PLASTIC	9Q 8105-01-183-9764	UPAOZZ		RBX	12								
HB1490	BRUSH-SCRUBBING LTGPC PL	9Q 7920-00-282-2470	UPAOZZ		EEA	1								
464046	CARTRIDGE,RESPIRATO	9G 4240-01-103-8475	U OZZ		BX	4								
7590 LARGE	COVERALLS,LARGE	1HM0099-LL-H30-5574	UPAOZZ		EPR	6								
7590 MEDIUM	COVERALLS,MEDIUM	1HM0099-LL-H30-5573	UPAOZZ		EPR	6								
MS27683-7	DRUM,SHIPPING AND S	9G 8110-00-866-1728	UPAOZZ		EA	1								
ZZD00800	DUSTPAN-RUB	9Q 7290-00-616-0109	UPAOZZ		EEA	1								
MILG12223 LRG	GLOVES-TOXILOGICAL,SZ L	9D 8415-00-753-6553	7PFOZZ		EPR	3								
MILG87066SZ10	GLOVES,RUBBER SZ 10	9D 8415-01-013-7382	UPAOZZ		EPR	3								
E-006	GLOVES,SURGEONS'	9L 6515-01-149-8841	UPAOZZ		EPG	12								
GGGG521TY2	GOGGLES, IND-CLR	9G 4240-00-190-6432	UPAOZZ		EPR	6								
DOT P5800 5	HANDBOOK	1HM0099-LL-H30-5575	UPAOZZ		EEA	1								
NNH104TY2SZ3	HANDLE-BRSH DK	9Q 7920-00-141-5452	UPAOZZ		EEA	1								
HAZ MATL/WASTE	KIT,SPILL RESPONSE	1HS0000-LL-CQA-3175	UXBOZZ	1	EKT		1							
5100/4	LABELS,HAZARDOUS WASTE	1HM0099-LL-H30-5576	UPAOZZ		EPG	50								
5090/3 REV 386	LABELS,PCB	1HM0099-LL-H30-5577	UPAOZZ		EPG	25								
MILF902	LOCKER,MEDICAL	9G 2090-00-368-4795	UPAOZZ		EEA	1								
8710-20	MASK,AIR FILTERING	9G 4240-01-246-0314	UPAOZZ		BX	12								
14-844	PAPER-LITMUS BLUE	9L 6640-00-290-0146	UPAOZZ		EHD	1								
WYK W0100	PILLOW,SORBENT	1HM0099-LL-H30-5578	UPAOZZ		EBX	20								
460968	RESPIRATOR,AIR FILT	9G 4240-01-022-8501	7PAOZZ		EEA	4								
5204	RESPIRATOR,AIR FILT	9G 4240-01-300-9411	UPAOZZ		EBX	4								
WYK W0050	SOCK,SORBENT	1HM0099-LL-H30-5579	UPAOZZ		EBX	6								
ZZS631	SQUEEGEE	9Q 7920-00-224-8339	UPAOZZ		EEA	1								
483 BLACK	TAPE,SEALING	1HM0099-LL-H30-5580	UPAOZZ		ERO	1								
MILT40097	TONGS	9Q 7330-00-616-0998	UPAOZZ		EEA	1								

SHIP TYPE & HULL NO. | PAGE

ALLOWANCE EQUIPAGE LIST (AEL)

IDENTIFICATION NO.: 2-550024007 | DATE: 11-25-91 | PAGE: 1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN	IDENTIFICATION NO.	DATE	PAGE
KIT,RESPONSE,SPILL,HAZARDOUS MATERIAL/WASTE			2-550024007	11-25-91	2

CHARACTERISTICS

ON BOARD ALLOWANCE TABLE

SEC CL	SOURCE	MAINT	RECY	NOTES	CUST	U/I	COL. 1	COL. 2	COL. 3	COL. 4	COL. 5	COL. 6	COL. 7	COL. 8

END

REFERENCE NO./DESCRIPTIVE DATA	ITEM NAME	STOCK NO.	SEC CL	SOURCE	MAINT	RECOVBLTY	NOTES	CUSTODY	U/I	1	2	3	4	5	6	7	8

SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
		ALLOWANCE EQUIPAGE LIST (AEL)	2-550024007	11-25-91	2

PART 1

POLICIES AND PROCEDURES

CHAPTER 18

MISHAP AND CASUALTY REPORTING

1-18-1 PURPOSE

To summarize procedures for submitting Mishap Reports and Casualty Reports (CASREPs).

1-18-2 POLICY

a. USNS civil service manned ships shall follow COMSCINST 5100.17B which implements OPNAVINST 5100.21B, Afloat Mishap Investigation and Reporting. Class A shipboard mishaps require convening a mishap investigation board, investigating the mishap and submitting a Mishap Investigation Report (MIR). A Class A mishap has reportable damage of $1,000,000 or more; or any injury or work-related illness resulting in death or permanent total disability. Other reportable shipboard mishaps (defined below) do not require a mishap board. However, they do require the submission of a Mishap Report (MR) in the format provided in OPNAVINST 5100.21B.

(1) Class B Mishap. The total cost of reportable property damage is $200,000 or more, but less than $1,000,000; an injury or work-related illness resulting in permanent partial disability or a mishap resulting in the hospitalization of five or more people.

(2) Class C Mishap. The total cost of reportable property damage is $10,000 or more, but less than $200,000; or an injury preventing an individual from performing regularly scheduled duty or work beyond the day or shift on which it occurred or a nonfatal illness or disability causing loss of time from work or disability at any time (lost time case).

(3) Special Case Mishaps. For data collection and analysis purposes, the following special case mishaps are reportable to the Naval Safety Center in an MR:

(a) All cases of electric shock (include the voltage in the report

(b) All cases of hazardous material, chemical or toxic exposure requiring medical attention

(c) All cases of back injury requiring medical attention

(d) All mishaps involving explosives, oxidizers, incendiaries, explosive systems or chemical warfare agents. They include the detonation, accidental launch, malfunction, dangerous defect, improper handling, damage to a launching device, weapon impact off-range or other unusual or unexpected weapons-related occurrence.

b. Ships shall submit CASREPs in accordance with NWP 10-1-10, Operational Reports, and COMSCINST 3121.9, Standard Operating Manual.

1-18-3 BACKGROUND

a. Each year MSC suffers the expense of millions of dollars caused by mishap damage, fatalities, injuries and occupational illnesses. These occurrences seriously degrade operational readiness of the Fleet and waste tax dollars. Hazard awareness and mishap prevention are dependent on mishap investigations and reports which disclose how and why each mishap occurred.

b. CASREPs are designed to support COMSC, CNO, FLTCINC and MSC Area and Subarea Commanders in the material management of assigned forces. Initial, update and correction reports provide the status of each outstanding casualty, allowing the chain of command to monitor progress and provide assistance.

1-18-4 DISCUSSION

The MR is a General Use Mishap Investigation Report and shall not include privileged information. The MR shall not state the source of any information. MRs are normally unclassified unless the Master cannot complete a meaningful, unclassified report. MRs are handled as General Use Mishap Reports and shall include the following statement in the heading of the MR: "FOR OFFICIAL USE ONLY. THIS IS A GENERAL USE SAFETY MISHAP REPORT TO BE USED ONLY FOR SAFETY PURPOSES AS DEFINED IN OPNAVINST 5100.21B." MRs contain personal information and other sensitive data protected by the Freedom of Information and Privacy Acts. Users shall protect MRs from unauthorized disclosure. MRs shall not contain privileged information. They shall not state the source of any information. To preclude association with disciplinary action, do not include any reference to legal or administrative action or other performance-related administrative action in an MR. If investigating personnel determine there is a need to obtain privileged information that may reveal valuable safety information, they shall advise the Master, who shall then ascertain the need for a mishap investigation board and inform COMSC and the Area Commander.

1-18-5 ACTION

a. Administrative Commanders. Administrative Commanders shall review submission of CASREPs, Mishap Reports and Voyage Repair Requests (VRR) to ensure compliance with instructions and publications.

b. Masters. Masters shall submit CASREPs as required. When submission of a Mishap Report is warranted as established in OPNAVINST 5102.1C, the Master shall submit a Mishap Report. When submission of a VRR is warranted as established by COMSCINST 3540.6, Engineering Operations and Maintenance Manual, the Master shall also submit a CASREP based upon input and technical information received from the Chief Engineer.

PART 1

POLICIES AND PROCEDURES

CHAPTER 19

ENGINEERING CASUALTY CONTROL

1-19-1 POLICY

a. Engineering Casualty Control Programs, utilizing ship specific or Class specific Engineering Casualty Control Manuals (ECCMs) and Engineering Casualty Control Training Exercise Manuals as guides, shall be implemented aboard all MSC ships.

b. Ship specific ECCMs and Engineering Casualty Control Training Exercise Manuals shall be developed for each unique Engine Room in a ship class.

1-19-2 BACKGROUND

a. Engineering casualty control seeks to prevent, minimize and correct operational failures in ship machinery, electrical and piping systems. It is essential to plan, prepare and train to react to casualties so that all hands know their engineering plant and how to handle specific operational failures.

b. The ECCM assists the ship's engineers in trouble shooting and controlling some of the more common engineering casualties.

c. The Engineering Casualty Control Training Exercise Manual includes exercises to be used by the Chief Engineer in conducting routine training and by observation and support teams for refresher training.

1-19-3 DISCUSSION

a. Engineering casualty control is the key to ensuring the safe operation of the engineering plant. Immediate casualty control action by well trained Engine Department personnel is essential to correct failures. Personnel training provides the foundation of an effective Engineering Casualty Control Program.

b. COMSCINST 3541.6A, Engineering Casualty Control Exercises, provides direction for conducting shipboard training and exercises in engineering casualty control for Engine Department personnel. Part 2, Chapter 6 of this instruction provides guidance for assigning responsibly for engineering casualty response to crewmembers. Ship specific ECCMs have been developed for the T-ATF 166, T-AE 26, T-AFS 1, T-AFS 8, T-AH 19 and T-AO 187 Class ships. These manuals provide specific guidance on procedures for responding to several types of casualties that may occur in the engineering spaces of those ships. ECCM drill frequency is discussed in Part 1, Chapter 14.

1-19-4 ACTION

a. COMSC. COMSC will develop the initial ship specific (class specific) ECCM packages. COMSC shall maintain ship class specific ECCMs.

b. Administrative Commanders. Administrative Commanders shall maintain ship specific ECCMs based on input from the ships.

c. Ships. The Chief Engineer shall implement an engineering casualty control training program using the ECCM for his/her ship.

PART 1

POLICIES AND PROCEDURES

CHAPTER 20

FIRE PREVENTION

1-20-1 POLICY

All crewmembers shall take action to reduce the risk of shipboard fires by:

a. Using non-combustible and fire retardant materials in construction and modification.

b. Proper control of maintenance (particularly hot work).

c. Accomplishing preventive maintenance of equipment.

d. Control of flammable and combustible materials.

e. Proper operation of equipment.

f. Regular and frequent inspections for fire hazards.

1-20-2 BACKGROUND

The most effective and safest way to fight a fire is to prevent it from starting.

1-20-3 DISCUSSION

a. Procedures. COMSCINST 3540.6, Engineering Operations and Maintenance Manual (EOMM), provides procedures for the prevention of shipboard fires. The EOMM provides instructions for conducting hot work, directs the disposal of flammable materials and includes guidelines for the installation of flange shields, as well as other fire prevention practices. The EOMM also addresses examination of personal electrical equipment by the shipboard Electrical Safety Officer. Though the EOMM is written from an engineering perspective, the fire prevention procedures provided therein apply to the entire ship's force. Part 1, Chapter 14, contains training requirements for personnel and Part 3, Chapter 3, includes further guidance on fire prevention.

b. Design and Construction. 46 CFR 92 requires the construction of cargo ships minimize fire hazards and specifically requires that the hull, superstructure, structural bulkheads, decks and deckhouses be constructed of steel. Fire resistance of certain bulkheads is also required. Ceilings, insulation, sheathing and furring are to be of incombustible materials. 46 CFR 164 establishes additional requirements for fire resistance of material used for deck coverings, bulkhead panels and other components. The T-Ships General Specifications, applicable to new ship designs, references military standards for fire retardant shipboard materials and furnishings. NSTM, Chapter 079, Volume II, also provides guidelines for outfitting ships with fire retardant materials.

c. Special Requirements for Roll On/Roll Off (RO/RO) Ships. Ships with spaces designed for the carriage of automobiles or other vehicles with batteries connected and fuel tanks containing gasoline are required to meet the requirements of 46 CFR 90.10-38. These requirements include ventilation and ventilation alarms, fire or smoke detecting systems, CO_2 fixed fire extinguishing systems or water sprinkler system, explosion proof lighting, designating and marking the spaces as "specially suitable for vehicles" on plans and diagrams and monitoring systems to warn of high carbon monoxide levels.

1-20-4 ACTION

a. COMSC. COMSC will ensure that fire retardant materials and furnishings are used in construction and outfitting of all new ships.

b. Administrative Commanders. Administrative Commanders shall periodically check each ship to ensure effective fire prevention measures and use of fire retardant materials.

c. Ships. The Master and Chief Engineer shall ensure that the ship's force conscientiously adheres to shipboard fire prevention measures and shall periodically check shipboard spaces to verify that fire retardant materials are being used and that flammable and combustible materials are removed from the ship. The Master and Chief Engineer shall ensure that regular shipboard training in fire prevention is conducted.

PART 1

POLICIES AND PROCEDURES

CHAPTER 21

PREVENTIVE MAINTENANCE OF DAMAGE CONTROL, FIREFIGHTING AND LIFE SAVING EQUIPMENT

1-21-1 POLICY

Ships shall perform preventive maintenance of damage control, firefighting and life saving equipment.

1-21-2 BACKGROUND

Proper performance of preventive maintenance improves reliability, reduces maintenance costs and ensures operational readiness. To ensure that this maintenance is performed, policies and procedures for preventive maintenance of damage control, firefighting and life saving equipment have been established and is cited in the Shipboard Automated Maintenance Management (SAMM) system.

1-21-3 DISCUSSION

The SAMM system provides a systematic means to identify, schedule and track preventive maintenance actions for shipboard equipment and machinery. The system contains extensive preventive maintenance actions for applicable damage control, firefighting and life saving equipment. Operation and maintenance of the SAMM system are outlined in COMSCINST 3540.6, Engineering Operations and Maintenance Manual (EOMM). Table 1-21-1 provides a brief summary of the major maintenance requirements for shipboard damage control and firefighting equipment and systems.

TABLE 1-21-1
DC/FF EQUIPMENT MAINTENANCE REQUIREMENTS

Equipment	Periodicity	Type of Maintenance
Portable Equipment		
SCBA	Annually	Flow test/Service (see vendor requirements).
	3 or 5 years	Hydrostatic test (see vendor data)
OBA	Quarterly	Inspect, test operate, clean and disinfect.
	Semi-Annually	Rotate canister stock.
P-250 Pump	Semi-Annually	Replace fuel & lube oil filters, air filter element, flame arrestor. Inspect and replace zinc anodes as required.
	Annually	Conduct vacuum, engine temperature tests. Replace fuel and lube oil strainer hoses. Clean autolube water passages and replace diaphragm.
Comb./Hazardous Gas Indicator	Weekly	Inspect and test operate.
	Before use	Calibrate using the manufacturer's factory-selected gas (such as methane) to obtain that instrument's reading.
Portable Fire Extinguishers	Annually	Weigh extinguisher.
RADIAC Equipment	Annually	Test battery and calibrate unit.
Chemical Agent Monitor	Semi-Annually	Inspect and test operate.
Submersible Pump	Annually	Service and test operate pump.

TABLE 1-21-1 (Cont'd)
DC/FF EQUIPMENT MAINTENANCE REQUIREMENTS

Equipment	Periodicity	Type of Maintenance
Portable Equipment (Cont'd)		
Portable Exothermic Cutting Unit	Monthly	Test and Charge Battery.
	Quarterly	Clean, inspect and test PECU.
Fire Hoses, Un-fixed	Annually	Inspect and hydrostatic test.
EEBDs	Semi-Annually or whenever tamper seal is missing or broken	Inspect.
Firefighter Thermal Imager	Monthly	Check batteries.
Fixed Equipment		
Halon 1301/CO_2 System	Quarterly	Inspect system and controls. Check bottle hydrostatic test dates.
	Annually	Perform weight test of bottles and test operate system actuation components.
Gaylord Hood/APC System	Quarterly	Check exhaust fan assembly and exhaust fan performance.
	Semi-Annually	Check fail safe thermostats and damper controls for proper operation.
	Annually	Inspect and clean hood as required (detergent system fittings; unit internals; grease gutter).
Fire Detection System	Monthly	Test and inspect Alarm Control Panel.
	Annually	Test manual pull stations and automatic detectors.
Foam Concentrate System	Annually	Take foam sample.

TABLE 1-21-1 (Cont'd)
DC/FF EQUIPMENT MAINTENANCE REQUIREMENTS

Equipment	Periodicity	Type of Maintenance
Fixed Equipment (Cont'd)		
Foam System Components	Semi-Annually	Clean and inspect pressure vacuum vent.
	Semi-Annually	Line up/test operate AFFF system/equipment.
	Annually	Renew foam proportioning pump reduction gear oil.
Foam Monitors	Quarterly	Inspect and lubricate.
Magazine Sprinkler Systems	Annually	Test Alarms. Check and lube reach rods.
Watertight Doors (motor operated, sliding)	Quarterly	Test motor insulation resistance.
	Semi-Annually	Inspect and test WT door.
	Annually	Clean and inspect motor controller. Annual service electric motors. Renew oil in expansion tank.
Ventilation Closures	Semi-Annually	Inspect, clean and test.
Emergency Diesel Generator Engine	Monthly	Inspect diesel engine drive belts, cooling water, lube oil and starting system.
	Annually	Renew oil. Service engine. Test Overspeed Trip. Inspect and adjust engine.
Fire Pumps	Quarterly	Service pump.
Fire Main System	Annually	Clean and inspect fire main valves and hydrostatically test system piping.
Fire Stations	Annually	Conduct maintenance on station components and evaluate performance of fire station. Conduct hydrostatic test of hose.

TABLE 1-21-1 (Cont'd)
DC/FF EQUIPMENT MAINTENANCE REQUIREMENTS

Equipment	Periodicity	Type of Maintenance
Fixed Equipment (Cont'd)		
SCBA Breathing Air Compressor	Quarterly	Air test to qualified lab for analysis.

1-21-4 ACTION

a. COMSC. COMSC will provide SAMM System updates to each ship and to the Administrative Commanders and Area Commanders.

b. Administrative Commanders. Administrative Commanders shall periodically verify shipboard compliance with requirements to perform and record scheduled preventive actions on all damage control, firefighting and life saving equipment and shall accomplish SAMM related duties as detailed in the EOMM.

c. Ships. The Master and Chief Engineer shall ensure that preventive maintenance of all damage control, firefighting and life saving equipment is accomplished and recorded as required by the EOMM. The Chief Engineer shall inform the Administrative Area Commander and COMSC of any damage control, firefighting or life saving equipment which is not covered by a preventive maintenance procedure in the SAMM System. In this case, the Chief Engineer shall follow maintenance instructions in the manufacturer's technical manual until suitable procedures are incorporated into the SAMM System.

PART 1

POLICIES AND PROCEDURES

CHAPTER 22

DAMAGE CONTROL INSPECTIONS

1-22-1 POLICY

MSC ships shall meet the DC, firefighting and lifesaving equipment inspection requirements of the American Bureau of Shipping (ABS), U.S. Coast Guard (USCG), Board of Inspection and Survey (INSURV) and MSC Command Inspection programs as applicable.

1-22-2 BACKGROUND

All MSC new construction ships are built to ABS classification and USCG certification requirements and subject to ABS and USCG inspection. INSURV conducts Acceptance Trials and Final Contract Trials of MSC ships during introduction into the Fleet, and surveys of MSC ships prior to deactivation. MSC ships transferred from the U.S. Navy are subject to triennial inspection by INSURV and may be subject to ABS and USCG inspections. Ships transferred from foreign navies are inspected by MSC. All MSC ships are inspected every 18 months as required by the MSC Command Inspection Program.

1-22-3 DISCUSSION

MSC ships classified by ABS require annual, intermediate and special ABS surveys. USCG certification requires inspection every 2 years along with a midterm inspection. INSURV inspection requirements are in INSURVINST 9080.2, Trials and Inspections of Surface Ships. MSC's Command Inspection program is described in COMSCINST 5040.2C, Command Inspection Program. A Damage Control and Firefighting inspection is conducted annually as part of each afloat Command Inspection. MSC 5040/29 provides a detailed checklist for evaluating the condition, inventory and operation of shipboard DC equipment and the effectiveness of shipboard administration of DC procedures and programs.

1-22-4 ACTION

Administrative Area Commanders shall conduct Damage Control and Firefighting inspections using MSC 5040/29 as part of each MSC Command Inspection. The results of each Damage Control and Firefighting inspection shall be submitted as part of the MSC Command Inspection report.

Technical Manual Identification Number for ECCM

APPENDIX ___
TO ECCM

MILITARY SEALIFT COMMAND

__________ CLASS
or
USNS __________

MAIN SPACE FIREFIGHTING DOCTRINE

Publication Date

_________ CLASS or USNS _________

MAIN SPACE FIREFIGHTING DOCTRINE

References:

(a) MSC Damage Control Manual, COMSCINST 3541.1D
(b) ____ Damage Control Book, TMINs #
(c) Damage Control Display Plan, COMSC DWG No.
(d) NSTM, Ch. 555, Shipboard Firefighting
(e) NSTM, Ch. 074, Gas Free Engineering

Enclosed Tables:

List of Diagrams and Illustrations:

List of Decision Flow Charts:

________ CLASS or USNS ________

MAIN SPACE FIREFIGHTING DOCTRINE (MSFD)

1. PURPOSE:

The purpose of this document is to provide the crew of the __________ with pertinent shipboard systems information and procedural guidance that will be useful to react to and or control a Class B fire in the main engineroom (main space). This doctrine is not intended to cover all eventualities or methods to combat a main space fire, it should however, be used as a tool to train the ships' crew in main space firefighting and as a reference during actual firefighting. Crew comments to improve the format or correct the contents of this doctrine are encouraged. All change recommendations should be submitted to the Administrative Command for consideration.

2. INTRODUCTION:

Approximately 75% of all shipboard fires occur in the engineroom. A significant number of these fires involve flammable liquids. Therefore a ship's crew must be familiar with firefighting procedures for that space. It is estimated that 90% of all fires can be controlled if proper extinguishment action is taken during the incipient stage of the fire. This document provides ship specific data, procedural information and general guidance for the crew to use to quickly and correctly react to a main space fuel spill or fire. For more information regarding general damage control and ship specific systems and capabilities, refer to references (a) through (e).

3. DISCUSSION:

A. The majority of main space Class B fires result from some type of hydrocarbon fuel (i.e. fuel oil or lube oil) leaking from a pressurized system, atomizing and impinging on a hot surface, and then igniting. The first line of defense in controlling the leak and or fire is to secure the source of fuel. The fire may quickly become out-of-control and require the evacuation of the space if immediate and decisive action is not taken. Each fire scenario will require different responses from the watchstanders, quick response team and fire fighters. To provide some guidance in this area, specific actions for various main space fire scenarios have been provided in bullet form in Table 1 for those personnel expected to be involved in such a casualty.

B. Figure 1 is provided to show in a simplified form, a typical decision making process if a fuel leak results in controlled or out-of-control main space fire scenario.

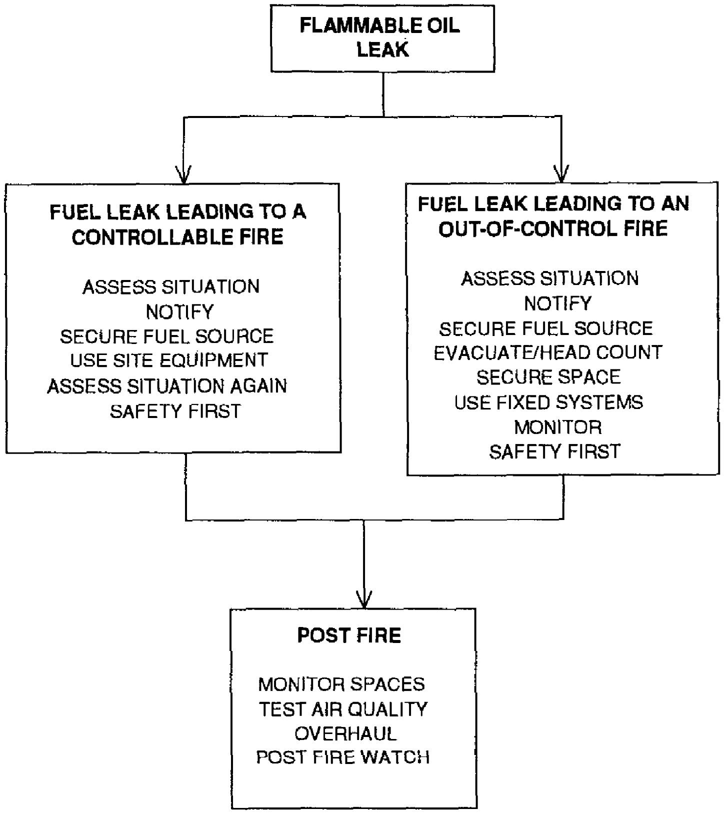


FIGURE 1:
Class Bravo Main Space Fire Considerations

C. WHEN IS A MAIN SPACE FIRE CONSIDERED OUT-OF-CONTROL?

1. The ability to control a main space fire with on-site portable firefighting equipment must be determined on a case-by-case basis by the person(s) assessing the situation. However, a fire should be considered OUT-OF-CONTROL when firefighting action is not containing or extinguishing the fire.

2. Factors to consider when deciding if the fire is OUT-OF-CONTROL include:

- Fire covers a large area and is expanding,
- Fuel source cannot be secured,
- Fire threatens firefighting or escape,
- Firefighting capability degraded (i.e., firemain pressure low, extinguishers emptied, or semi-portable systems exhausted).

4. FIREFIGHTING SYSTEMS AND CAPABILITIES

A. General: It is important that all crew members understand the methods of fighting specific types of fires, where firefighting equipment and EEBDs are located, emergency escape (egress) routes, and that initial responsibility upon discovery of a fire is to assess the situation and report the facts of the fire to the engineering control station or the bridge.

B. Firefighting Systems: The capabilities of the ships' firefighting systems are detailed below:

(1) Water (Fire Main System). The primary function of the fire main system is to supply sea water to the shipboard fire stations in sufficient quantity and pressure to allow for firefighting. Remote starting and stopping controls, located in Engine Room Control (ERC) and the bridge, are provided for the ship's ______ fire pumps and associated sea suction valves. The emergency fire pump, located __________, also has remote starting and stopping controls located at the Fire Control Panel (FCP) in ship passage ______.

PROVIDE DETAILS ON THE CAPABILITIES AND OPERATION OF THE FIRE MAIN SYSTEM. INCLUDE THE LOCATION OF ALL FIRE PUMPS, VALVES (INCLUDING ANY CROSS-OVER VALVES), FOAM CONNECTIONS, AND NORMAL OPERATION PROCEDURES.

A general schematic of the fire main is provided as Figure 2.

(2) Installed Foam Systems. This ship is provided with ___ installed foam systems. The ______ station, which has a tank capacity of _____ gallons of foam concentrate, provides foam to the _________.

PROVIDE DETAILS ON THE CAPABILITIES AND OPERATION OF THE FOAM SYSTEM, IF INSTALLED. INCLUDE THE LOCATION OF ALL FOAM PUMPS, VALVES (INCLUDING FOAM CONCENTRATE CROSS-OVER VALVES, IF ANY), HOSE REELS (WITH THE SIZE AND LENGTH OF HOSE), AND NORMAL OPERATION PROCEDURES FOR GETTING FOAM IN THE ENGINE ROOM.

Figure 3 shows the recommended foam/fire hose layout and locations to access the engine room. In addition to the fixed AFFF systems, each ship is outfitted with 95 gpm 1.5 inch portable in-line foam eductors and portable 5 gallon AFFF containers. This equipment may be used to provide foam from any fire station on the ship. The portable foam 1.5" in-line eductors are stowed in the repair lockers and the portable foam containers are located throughout the ship. The maximum length of hose to be used between the in-line eductor discharge and the nozzle inlet is 150 feet. For proper operation of the inline foam eductor, the back pressure that results due to flow resistance in the equipment downstream of the eductor must not exceed 60% of that pressure realized at the inlet of the eductor. To improve the quality of the foam an air aspirated nozzle such as the Chubb JS-10B nozzle should be used. Vari-nozzles do not air aspirate the foam and should not be used for engineroom foam application. Foam will not extinguish a 3D fuel fire. Use your foam supply sparingly and apply to the lowest point where the fuel will accumulate.

(3) Dry Chemical. Dry chemical fire extinguishing agents are highly effective in combating small (10' diameter or less) Class B fires. There are two types of dry agent extinguishers in the engine room; the semi-portable and the multi purpose portable extinguisher.

PROVIDE THE BRAND, WEIGHT AND TYPE OF DRY CHEMICAL FIRE EXTINGUISHER LOCATED IN/NEAR THE ENGINE ROOM.

Caution should be exercised when using dry chemicals to avoid breathing difficulties, reduced visibility and discharging into electrical equipment.

(4) Carbon Dioxide (CO2). Carbon dioxide portable extinguishers are located throughout the ship and engine room and are used primarily for small electrical fires and small (5' diameter or less) Class B fires. When possible, portable extinguishers along with an EEBD or SCBA should be brought to the scene of the fire.

(5) **CO2 or HALON 1301.** The ship's installed ________ system is the primary fixed firefighting agent for extinguishing out-of-control Class B fires in the engine room.

PROVIDE DETAILS EXPLAINING THE CAPABILITIES OF THE FIXED GAS EXTINGUISHING SYSTEM. INCLUDE IF THE SYSTEM IS A ONE SHOT OR TWO SHOT SYSTEM AND IF THE SHOTS ARE EQUALLY SIZED.

As shown in Figure 4, the engine room fixed ______ systems can be activated from one of ______ locations:

- ERC _______ bulkhead
- Fire Control Panel in Passage
- _______ Cylinder Room located at
- ETC....

THE FOLLOWING WORDING ON FIXED GAS RELEASE AUTHORITY IS PROVIDED FOR ONE SHOT AND TWO SHOT SYSTEMS. USE THE APPROPRIATE WORDING WHICH CORRESPONDS WITH THE SHIPS SYSTEM.

ONE SHOT SYSTEM

The Master, or person designated by the Master, must give permission to activate the ships _____ system. Ensure the ER is properly secured (ventilation, machinery, and personnel) prior to release of _________. There is a ______ second time delay before _____ gas is released into the space.

TWO SHOT SYSTEM (IF APPLICABLE) -- MUST BE TWO 100% SHOT SYSTEM (I.E. EQUAL SIZE)

After the Bridge concurs with securing the Engine Room, the senior engineer in ERC is authorized to activate the initial _______ charge; the master, or person designated by the Master, must give permission to activate the second _______ charge. Ensure the ER is properly secured (ventilation, machinery, and personnel) prior to release of _________. There is a ______ second time delay before _____ gas is released into the space.

B. FIRE AND SMOKE BOUNDARIES.

(1) **Fire Boundaries.** Primary and secondary fire boundaries should be established around the space(s) involved in the fire. Primary fire boundaries (Class A type) are generally the watertight bulkheads and decks that form the limits of the space, however, fume tight (Navy designation) and Class "B" (commercial designation) bulkheads and decks may be used. Secondary fire boundaries provide a second line of defense should the fire expand through the primary boundaries. To assist repair personnel in setting smoke and fire boundaries, Table 2 lists primary and secondary fire boundaries for the Engine Room. Lessons learned from recent fires have shown that ships are extremely vulnerable to vertical spread of fire, by means of heat conduction through the overhead to the deck above. For this reason the setting of topside fire boundaries should be emphasized. Fire boundary personnel must relocate combustibles from the bulkheads of adjacent spaces and monitor those spaces for high heat areas and provide cooling if necessary. All adjacent spaces should be observed for hot bulkheads and decks. Figures 5 and 6 are provided to illustrate those areas in the engineroom susceptible to vertical spread and show other potential engineroom boundary areas.

(2) **Smoke Boundaries.** The use of smoke boundaries around a space involved in a fire can effectively limit the spread of smoke and provide control areas for staging

firefighting personnel. Smoke blankets can be used to aid in setting such smoke boundaries. The Breathing Air (BA) Controller and On Scene Leader (OSL) are to establish a position just on the clear side of the smoke boundary. Primary and secondary smoke boundaries for the main space fire, like fire boundaries, should be set at pre-planned locations by the zone teams as determined by the OSL. The objective of the primary smoke boundaries is to establish an inner limit or buffer zone of "dead-air" around the affected space. This will involve closing the doors and hatches that provide access to the spaces involved. The secondary smoke boundary will form the outer limit of the buffer zone and should be used to check the spread of smoke to other spaces.

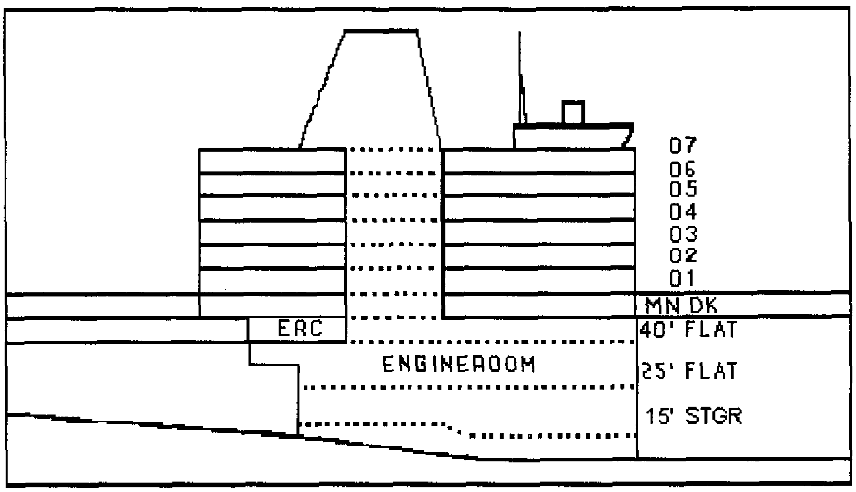


FIGURE: 6
Engine Room Compartment Layout - Profile

EXAMPLE DRAWING, PROVIDE SIMILAR DRAWING FOR THE SPECIFIC SHIP CLASS.

C. ISOLATING THE ENGINE ROOM.

To prevent a fire from intensifying due to the addition of fuel and air, and to reduce the electrical hazards the space must be mechanically and electrically isolated. (**Note:** The bridge must always be notified of the need to secure Main Propulsion Systems while underway. The requirement to maneuver the ship in an emergency may significantly out weigh the damage resulting from delayed shut down.)

(1) Mechanical Isolation. Every effort should be made to secure and isolate those systems, machinery, and tanks that may have the potential to feed or contribute to the intensity of a fire. These include, in order of priority, the following:

- Ventilation (See C.2)
- Fuel transfer, service and stripping pumps, purifiers.
- Fuel systems, storage and service tanks.
- Cargo oil transfer systems.
- Lube oil pumps and purifiers.

- Hydraulic systems.
- Lube oil tanks.
- Air systems.
- Steam Systems.

To assist watchstanders and repair personnel in mechanically isolating the Engine Room, Table 4 provides a list of mechanical items that may need to be isolated. It should be noted that if lubricating systems are prematurely secured to operating equipment, severe damage may occur to that equipment.

(2) Electrical Isolation. All electrical power and electrical and electronic equipment in the space involved in a fire should be secured. This isolation should be accomplished by the watch engineer in ERC. Table 5 is a listing of electrical equipment that, when isolated, will isolate the engineroom.

(3) Ventilation Isolation. While a fire is under control and being fought by firefighters, ventilation to the space should be set, if possible, to remove smoke from the space (negative ventilation). It should be noted, however, that this ventilation provides oxygen that will feed and intensify the fire. Table 6 provides a list of ventilation controllers, areas serviced, and location of intake or exhaust ducts. When a fire is determined to be out of control and or prior to *INSERT* SHIP'S FIXED GAS SYSTEM actuation, all ventilation to the space **must** be secured (fans off and vent dampers closed). Table 6 may be used as a quick reference to check ventilation controllers and equipment servicing spaces in and around the engineroom.

(4) Re-entry. Re-entry into the engineroom will be required to ensure extinguishment of the fire, to conduct post fire overhaul/repair and or to resume ship operations. The officer-in-charge shall make the determination as to when re-entry into the space shall be accomplished. Adjacent space bulkhead temperatures will provide a good indication if the space has cooled sufficiently to enter. A 15 minute secure period is commonly cited as the minimum time required before space reentry should be considered. The space may, however, may need to remain secured for several more minutes or even hours to have sufficiently cooled to prevent the fire from re-flashing when re-entry is attempted. The time before re-entry will also depend on many variables including the need to operate the plant and the severity and intensity of the fire and availability of usable firefighting equipment and personnel. Do not rely on existing firefighting equipment in that space when re-entry is being considered. It is highly likely that this equipment will not be in a usable state. If time is not critical, the space should remain secured until the bulkheads and overhead have sufficiently cooled. Re-entry trade-offs will need to be assessed by the persons in charge and will always vary for a given fire.

D. POST FIRE VENTILATION/DESMOKING.

After extinguishing a fire, the key to quickly re-manning the space and initiating repairs is thorough and effective desmoking. Due to the toxic and combustible gases that will be present in the space, personnel must use breathing apparatuses, and activation of power circuits should be limited as much as possible until these gases have been removed and the space has been certified as gas-free/safe for personnel. Because gas-freeing equipment will not operate properly if the sensors are exposed to excessive moisture or airborne particulate found in a post-fire atmosphere, desmoking must precede air sampling actions. The most effective methods of desmoking the engine room will be to operate the installed ventilation system, naturally ventilate and or use portable fans. Because of the possibility of igniting combustible gases, the following steps must precede desmoking:

- fire must be overhauled,
- space must be allowed to cool,
- examine the electrical distribution system, fans, and controllers for damage,
- examine the ventilation system for damage.

If the ventilation system is fully operational, run main space exhaust (on high) and supply (on low) fans for several minutes to remove smoke and toxic gasses. If there is any question as to the safety of the system use an alternative means of desmoking.

Applying positive pressure to adjacent spaces is also an effective method of desmoking. In order to use this method, the automatic vent dampers, which were closed upon actuation of *INSERT* SHIP'S FIXED GAS SYSTEM (see Table 6), must be reopened. Another method of desmoking is through the use of portable blowers exhausting to atmosphere. If the installed system is partially inoperative or if an alternative means is used, desmoking will take longer. Ensure that personnel practice the various ventilation procedures during training. Once desmoking has been completed a qualified person should conduct the required atmospheric testing. Refer to reference (e) for space gas free procedures.

E. FIRE CONTROL PANEL _____.

The Fire Control Panel, located in athwart ship passage ______, provides central remote operation of various systems to shut down machinery and activate firefighting systems. Figure 7 shows a simplified layout of this Fire Control Panel.

The Fire Control Panel will control the following operations:

THE FOLLOWING LISTING IS PROVIDED AS AN EXAMPLE. FIRE CONTROL PANELS BETWEEN SHIP CLASSES MAY DIFFER SLIGHTLY.

(1) Start up

- Emergency Fire Pump and Valves
- No. 1 ER Bilge Pump and Valves
- Emergency Diesel Generator
- Remote Activation of Engine Room HALON System

(2) Shut down

- Fuel Oil System and Valves
- Engine Room Supply and Exhaust Ventilation
- Main Engines
- Ship Service Diesel Generators
- Auxiliary Boiler Force Draft Fans
- Sea Valves Motor Operator Push Buttons

F. MAIN SPACE FIRE DRILLS.

In order to ensure the safety of the ship and its crew, mariners must be properly trained in the tactics and strategies required for fighting a main space fire. This can be accomplished by instituting an ongoing shipboard training program that builds upon the experience and pre-assignment training of the mariner. The training program's goal should be to have the assigned personnel trained to a degree that will enable them to effectively perform in an actual emergency.

(1) **Training.** The training program should break down the damage control organization into functional units (i.e. watchstanders, fire team, DC Central, zone teams, etc.) and concentrate on each unit's specific duties and responsibilities. The unit should then conduct a walk through drill to ensure that each individual knows the duties of their position. After the units are trained, a real time exercise should be conducted. This exercise should be repeated as often as necessary to ensure the maintenance of an effective organization.

(2) **Drills.** Drills are a training tool used to evaluate the effectiveness the shipboard training, tactics, and strategy. Main Space Fire Drills should be conducted as if an actual emergency exists and should be done only after the training has taken place. All drills are to be followed up with critiques at the supervisory and repair party level. The critique must stress specific areas for individual improvement.

(3) **Training and Drill Safety.** Those personnel who are evaluating the training and/or drill should also act as primary safety observers. If at any time, an unsafe condition arises during training or in a drill scenario, the training or drill should immediately be stopped and the unsafe condition corrected prior to continuing. Trainers must ensure that personnel are informed of heat stress symptoms and the proper action to take if any of the symptoms start to appear. The trainees are responsible for advising the trainers of any physical or physiological conditions that they may have which would prevent them from conducting such training.

G. IN-PORT PROCEDURES.

If a main space fire occurs while the ship is in-port refer to the ship's In-Port Emergency Bill. Because of the number of personnel required to combat a main space fire the procedures listed in the In-port Emergency Bill should be supplemented with the following procedures:

- Quarterdeck: Upon notification of a fire, sound General Alarm, call shore firefighting facility for assistance and activate the firemain system.
- All onboard personnel muster at DC stations. If after working hours, muster as directed by the Senior Onboard Officer (normally at the quarterdeck).
- Senior Onboard Officer takes control of situation. If the fire is out-of-control, order space evacuated, secure the Engine Room, and actuate the *INSERT* SHIP'S FIXED GAS SYSTEM. Responsibility of activating the *INSERT* SHIP'S FIXED GAS SYSTEM'S SECOND SHOT (IF APPLICABLE) remains with the senior officer on board ship if the Master is not present.
- Call Master if not on board. Repair lockers dress out and standby. Zone personnel ensure closures are secured and boundaries readied/cooled.

THE FOLLOWING TABLES ARE PROVIDE AS A GENERAL GUIDE. TABLES 1 TO 6 WILL REQUIRE REVISING BASED ON THE SPECIFIC SHIP CLASS. TABLES 7 AND 8 AND THE MAIN SPACE FIRE DECISION TREE AND CHECK SHEET MAY REQUIRE SOME REVISING BASED ON THE CLASS OF SHIP. PLEASE ENSURE THAT THE MAIN SPACE FIRE DECISION TREE AND CHECK SHEET ARE THE LAST TWO PAGES OF THE MSFD SO THEY ARE EASILY ASSESSED FOR REFERENCING.

TABLE 1 A

MAIN SPACE CLASS BRAVO FIRE MATRIX

FLAMMABLE LIQUID LEAK

STATION	ACTION TO BE TAKEN
PERSON DISCOVERING LEAK	• REPORT LEAK TO ERC OR BRIDGE. • SECURE THE SOURCE/DEFLECT LEAK AWAY FROM IGNITION/HEAT SOURCES. • ISOLATE THE AFFECTED SYSTEM. • OBTAIN AND SHOULDER AN EMERGENCY ESCAPE BREATHING DEVICE (EEBD). • SET UP FIRE FIGHTING EQUIPMENT.
WATCH ENGINEER, (ERC)	• SOUND THE GENERAL ALARM. • REPORT LEAK TO BRIDGE/CHIEF ENGINEER. • SECURE OPERATING MACHINERY AFFECTED BY LEAK. • ACTIVATE EMERGENCY FIRE PUMP AND ENERGIZE FIRE MAIN. • DIRECT THE QRT TO RIG HOSES W/ AFFF INLINE EDUCTOR (SEE FIGURE 2), AND FLUSH FUEL/OIL TO BILGE.
BRIDGE PERSONNEL	• IMMEDIATELY ASSESS NEED FOR SHIP MANEUVERABILITY AND SHIPS POWER • ANNOUNCE OVER GENERAL ANNOUNCING SYSTEM: - "LOCATION AND NATURE OF CASUALTY", - "SECURE ALL FO/LO PUMPING OPERATIONS". • NOTIFY THE MASTER AND CHIEF MATE.
MASTER	• AUTHORIZE DISPOSAL OF FLAMMABLE LIQUID AS APPROPRIATE FOR CIRCUMSTANCE.
CHIEF ENGINEER	• REPORT TO ERC AND TAKE CHARGE OF SITUATION.
QUICK RESPONSE TEAM (QRT)	• REPORT TO THE WATCH ENGINEER IN ERC FOR INSTRUCTIONS. • OBTAIN AND SHOULDER AN EEBD. • ASSIST THE WATCHSTANDERS AS ORDERED.
REPAIR PARTIES	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMS WITH DC CENTRAL. • DRESS OUT HOSE TEAMS. • STANDBY FOR FURTHER ORDERS.
DC CENTRAL	• ESTABLISH COMMUNICATION WITH ALL STATIONS. • ASSIST ENGINE ROOM AS NECESSARY.

TABLE 1 B

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE *NOT* OUT OF CONTROL

STATION	ACTION TO BE TAKEN
PERSON DISCOVERING FIRE	• REPORT FIRE TO ERC OR BRIDGE AND ASSESS FIRE LOCATION, TYPE AND SEVERITY. • SECURE THE SOURCE OF FUEL/OIL IF POSSIBLE. • OBTAIN AND SHOULDER AN EEBD. • IF POSSIBLE, CONTAIN FIRE WITH PORTABLE FIRE EXTINGUISHERS OR EXIT. • COMMUNICATE IF THE FIRE IS OUT OF CONTROL. • WHEN RELIEVED BY QRT/REPAIR PARTY, EXIT SPACE.
WATCH ENGINEER (ERC)	• SOUND GENERAL ALARM. • REPORT FIRE TO BRIDGE/DETERMINE NEED FOR SHIPS POWER. • SECURE MAIN ENGINES, IF CONDITIONS WARRANT. • SECURE OPERATING MACHINERY IN VICINITY OF FIRE. • ACTIVATE EMERGENCY FIRE PUMP AND ENERGIZE FIRE MAIN. • ACTIVATE EMERGENCY GENERATOR. • OBTAIN AND SHOULDER AN EEBD. • DIRECT THE QRT TO RIG HOSES W/ AFFF INLINE EDUCTOR, AND ATTACK FIRE AND FLUSH FUEL/OIL TO BILGE. • SET NEGATIVE VENTILATION IN ENGINE ROOM. SEE TABLE 6. • ESTABLISH COMMUNICATION WITH DC CENTRAL. • SET FIRE BOUNDARIES ON ENGINE ROOM BULKHEADS. SEE TABLE 2.
BRIDGE PERSONNEL	• ASSESS SHIPS MANEUVERABILITY/POWER REQUIREMENTS. • ANNOUNCE OVER GENERAL ANNOUNCING SYSTEM: - "LOCATION AND TYPE OF FIRE", - "SECURE ALL FO/LO PUMPING OPERATIONS". • CLOSE ALL SLIDING WATER TIGHT DOORS.
QUICK RESPONSE TEAM (QRT)	• ONE MEMBER REPORT TO WATCH ENGINEER AND OSL. • OBTAIN AND DON OBA/SCBA. • ASSIST THE WATCHSTANDERS AS ORDERED. • WHEN RELIEVED BY REPAIR PARTY, EXIT SPACE. • ONE MEMBER REPORT TO WATCH ENGINEER AND OSL.
MASTER	• REPORT TO BRIDGE. • NOTIFY. SUBMIT OPREP 3.

TABLE 1 B

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE *NOT* OUT OF CONTROL (continued)

STATION	ACTION TO BE TAKEN
CHIEF ENGINEER	• REPORT TO ERC AND TAKE CHARGE OF THE SITUATION.
DC CENTRAL	• ESTABLISH COMMUNICATION WITH ALL STATIONS. • DIRECT AND SUPERVISE OVERALL FIREFIGHTING ACTIONS. • RECOMMEND BRIDGE RESET SLIDING WATER TIGHT DOORS FOR LOCAL OPS, WHEN APPROPRIATE.
ZONE 1 PERSONNEL	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMUNICATION WITH REPAIR PARTY LEADER. • MAKE ZONE 1 CLOSURES. • SET AND MAINTAIN PRIMARY FIRE AND SMOKE BOUNDARIES FORWARD OF FRAME 60. SEE TABLES 2 & 3. • SET AND MAINTAIN SECONDARY FIRE BOUNDARIES. SEE TABLE 2. • ESTABLISH ROVING PATROLS TO CHECK BULKHEADS AND DECKS FOR HOT SPOTS.
ZONE 2 PERSONNEL	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMUNICATION WITH REPAIR PARTY LEADER. • MAKE ZONE 2 CLOSURES. • SET AND MAINTAIN PRIMARY FIRE AND SMOKE BOUNDARIES ABOVE THE MAIN DECK THROUGHOUT THE HOUSE. SEE TABLES 2 AND 3. • SET AND MAINTAIN SECONDARY FIRE BOUNDARIES. SEE TABLE 2. • WHEN DIRECTED BY REPAIR PARTY LEADER, RIG AFFF HOSES AS DIRECTED. SEE FIGURE 2. • ESTABLISH ROVING PATROLS TO CHECK BULKHEADS AND DECKS FOR HOT SPOTS.
ZONE 3 PERSONNEL	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMUNICATION WITH THE REPAIR PARTY LEADER. • MAKE ZONE 3 CLOSURES. • SET AND MAINTAIN PRIMARY FIRE AND SMOKE BOUNDARIES. SEE TABLES 2 & 3. • SET AND MAINTAIN SECONDARY FIRE BOUNDARIES. SEE TABLE 2.

TABLE 1 B

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE *NOT* OUT OF CONTROL (continued)

STATION	ACTION TO BE TAKEN
ZONE 3 PERSONNEL (continued)	• WHEN DIRECTED BY REPAIR PARTY LEADER, PICK UP AFFF HOSES FROM ZONE 2 PERSONNEL AND DISPATCH TO WTD THAT OPENS TO ERC. SEE FIGURE 2. • ESTABLISH ROVING PATROLS TO CHECK BULKHEADS AND DECKS FOR HOT SPOTS.
REPAIR PARTY 1	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMUNICATION WITH DC CENTRAL. • DRESS OUT HOSE TEAMS. • HOSE TEAMS STANDBY AND DISPATCH WHEN DIRECTED BY DC CENTRAL.
REPAIR PARTY 2	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMUNICATION WITH DC CENTRAL. • DRESS OUT HOSE TEAMS. • POSITION ELEVATOR AT MAIN DECK AND LOCK IT OUT OF SERVICE/SECURE ELEVATOR FAN. • STAGE PERSONNEL AND HOSE TEAMS IN THE ATHWART SHIPS PASSAGEWAY, AFT AND DISPATCH AT DC CENTRAL DIRECTION.
REPAIR PARTY 3 (PRIMARY FIRE PARTY)	• MUSTER AND TAKE ACCOUNTABILITY. • ESTABLISH COMMS WITH DC CENTRAL. • DRESS OUT HOSE TEAMS. • HOSE TEAM #1 RIGS SINGLE HOSE FROM ______ WITH AIR ASPIRATED NOZZLE AND FIRE STATION MOUNTED INLINE EDUCTOR. • HOSE TEAM #2 RIGS HOSE FROM ______ WITH VARI-NOZZLE AND FIRE STATION MOUNTED INLINE EDUCTOR. • STAGE FIRE TEAMS OUTSIDE SMOKE BOUNDARY AT WATERTIGHT DOOR ________. • UPON DIRECTION OF DC CENTRAL, ACTIVATE BREATHING APPARATUS AND ACCESS FIRE THROUGH WTD _______ TRANSITING ERC AND ENTER ENGINE ROOM. • BA CONTROLLER RECORDS TIME OF PERSONNEL IN AND OUT OF FIRE. **NOTE:** THE CONTROLLER SHALL NOTIFY THE REPAIR PARTY LEADER 5 MINUTES BEFORE EACH FIRE TEAM MEMBERS BREATHING APPARATUS IS DUE FOR RELIEF. THIS APPLIES TO ANY FIRE CONDITION. • CALL FOR FIREFIGHTER RELIEFS FROM DCC IF REQUIRED. • REPORT FIRE IS OUT.

TABLE 1 C

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE OUT OF CONTROL

STATION	ACTION TO BE TAKEN
PERSONNEL IN SPACE	• DON EEBD. • BACK-OUT OF SPACE AND NOTIFY WATCH ENGINEER OF FIRE STATUS, OPERATING EQUIPMENT AND OTHER PERSONNEL. • REPORT TO STATION BILL DUTY SITE.
WATCH ENGINEER	• ORDER SPACE EVACUATED/NOTIFY BRIDGE. • ACTIVATE FIREMAIN AND EMERGENCY GENERATOR. • ENSURE BRIDGE DOES NOT REQUIRE SHIP'S POWER FOR EMERGENCY MANEUVERS - PRIOR TO SECURING ER. • ENSURE ALL CLOSURES AND VENTILATION ARE SECURED. • ISOLATE ENGINE ROOM ELECTRICALLY & MECHANICALLY FROM ERC. SEE TABLES 4 & 5. • *INSERT* DETAILS ON THE ACTIVATION OF SHIPS FIXED GAS SYSTEM. • AFTER ALL PERSONNEL HAVE EVACUATED THE SPACE, ISOLATE FIREMAIN TO ENGINE ROOM. • IF REQUIRED TO EVACUATE ERC, DON EEBD AND EXIT SPACE. • REPORT TO REPAIR 3 OSL AND REPORT STATUS.
BRIDGE PERSONNEL	• ASSESS SHIPS MANEUVERABILITY/POWER REQUIREMENTS - NOTIFY ERC. • ANNOUNCE OVER GENERAL ANNOUNCING SYSTEM: - "LOCATION AND TYPE OF FIRE", - "SECURE ALL FO/LO PUMPING OPERATIONS". • CLOSE ALL SLIDING WATER TIGHT DOORS.
QUICK RESPONSE TEAM (QRT)	• ONE MEMBER REPORT TO WATCH ENGINEER AND OSL. • OBTAIN AND DON OBA/SCBA. • ASSIST THE WATCHSTANDERS AS ORDERED. • WHEN RELIEVED BY REPAIR PARTY, EXIT SPACE. • ONE MEMBER REPORT TO WATCH ENGINEER AND OSL.
MASTER	• REPORT TO BRIDGE. • NOTIFY. SUBMIT OPREP 3.
CHIEF ENGINEER	• REPORT TO ERC AND TAKE CHARGE OF THE SITUATION.

TABLE 1 C

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE OUT OF CONTROL (continued)

STATION	ACTION TO BE TAKEN
DC CENTRAL	• ENSURE SPACE IS ELECTRICALLY AND MECHANICALLY ISOLATED. SEE TABLES 4 & 5. • ORDER REPAIR 3 TO VERIFY FIXED GAS EFFECTIVENESS. • ENSURE POSITIVE VENTILATION IS SET IN UNAFFECTED SPACES. SEE TABLE 6. *DETAILED STEPS FOR TWO SHOT SYSTEM ONLY.* • IF INITIAL CHARGE OF FIXED GAS IS DETERMINED TO BE INEFFECTIVE, GET PERMISSION FROM MASTER OR INDIVIDUAL DESIGNATED BY THE MASTER TO ACTIVATE SECOND FIXED GAS CHARGE. **NOTE:** ALTHOUGH FIXED GAS SOAK TIME IS 15 MINUTES MINIMUM, IF THERE IS EVIDENCE THAT THE INITIAL CHARGE WAS INEFFECTIVE, ENSURE SPACE SECURED, ACTIVATE 2nd FIXED GAS CHARGE. • AFTER MONITORING BULKHEAD TEMPERATURES AND DETERMINING SPACE HAS SUFFICIENTLY COOLED, ORDER FULLY OUTFITTED FIRE PARTY TO ENTER THE SPACE. RE-ENTRY SHOULD BE ACCOMPLISHED AS IF THE FIRE IS STILL BURNING, INCORPORATING ALL SAFETY PRECAUTIONS AND PROCEDURES. **NOTE:** THE DECISION TO RE-ENTER THE ENGINE ROOM AFTER THE FIRE HAS BEEN EXTINGUISHED IS CRITICAL. ALTHOUGH THERE IS A MINIMUM SOAK TIME OF 15 MINUTES THERE IS NO MAXIMUM TIME. DEPENDING ON THE LENGTH AND SEVERITY OF THE FIRE IT IS ADVISABLE TO WAIT LONGER BEFORE ENTRY. • IF IT IS DETERMINED THAT THE SECOND CHARGE OF FIXED GAS IS INEFFECTIVE, MAKE DETERMINATION IF FIRE PARTY SHOULD ENTER SPACE AND COMBAT FIRE. • DIRECT AND SUPERVISE OVERALL FIREFIGHTING ACTIONS. • ENSURE PROPER DEWATERING ACTIONS, AS NECESSARY AFTER REENTRY.
MASTER (or individual granted release authority)	*DETAILED STEPS FOR TWO SHOT SYSTEM ONLY.* • IF INITIAL FIXED GAS CHARGE IS INEFFECTIVE, GIVE PERMISSION TO USE 2ND CHARGE OF FIXED GAS.
ZONE PERSONNEL (ZONES 1-3)	• SEE STEPS DETAILED IN TABLE 1B, FIRE *NOT* OUT OF CONTROL.
REPAIR PARTY PERSONNEL	• SEE STEPS DETAILED IN TABLE 1B, FIRE *NOT* OUT OF CONTROL.

TABLE 1 C

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

FIRE OUT OF CONTROL (continued)

STATION	ACTION TO BE TAKEN
REPAIR PARTY 3 (IN ADDITION TO THE STEPS IN TABLE 1 B)	• MONITOR SPACE, CHECK FOR FIXED GAS EFFECTIVENESS. • REPORT STATUS OF FIRE/FIXED GAS EFFECTIVENESS. • WHEN ORDERED, FIRE TEAMS ENTER SPACE VIA UNOBSTRUCTED ROUTE. DON AND ACTIVATE BREATHING APPARATUS. • BA CONTROLLER ASSUME MANAGEMENT OF ALL OBA/SCBAs IN FIRE AREA. • ENTER SPACE AND FIGHT FIRE. • CALL FOR FIREFIGHTER RELIEFS FROM DC CENTRAL IF REQUIRED. • REPORT FIRE IS OUT. • SET REFLASH WATCH. • NOTIFY DC CENTRAL REFLASH WATCH SET. • TURN OVER SPACE TO REPAIR 2 PERSONNEL TO OVERHAUL SPACE. • EXIT SPACE.

TABLE 1 D

MAIN SPACE CLASS BRAVO FIRE MATRIX (continued)

POST FIRE ACTIONS

STATION	ACTION TO BE TAKEN
DC CENTRAL	• ORDER REPAIR 2 TO CONDUCT OVERHAUL AND SALVAGE OF SPACE. • GIVE PERMISSION TO BEGIN EXHAUST VENTILATION OF SPACE, WHEN REQUESTED. • ORDER ATMOSPHERIC TESTING OF SPACE. • REQUEST PERMISSION FROM MASTER TO PUMP BILGES. • ORDER STAND DOWN WHEN OVERHAULING AND SALVAGE COMPLETED. • ORDER BRIDGE TO REOPEN WATER TIGHT DOORS AND STANDDOWN.
REPAIR PARTY 2	• FIRE TEAM ENTER SPACE. • RECEIVE TURNOVER FROM REPAIR 3 PERSONNEL. **NOTE:** MAKE ALL REPORTS TO REPAIR 3. • INVESTIGATE CONDITION OF VENT SYSTEMS. IF INTACT AND OPERABLE, REQUEST PERMISSION FROM DC CENTRAL TO DESMOKE USING INSTALLED VENTILATION. **NOTE:** IF INSTALLED VENTILATION IS DAMAGED OR IF THERE IS ANY QUESTION AS TO ITS SAFETY, DESMOKING SHOULD BE ACCOMPLISHED USING AN ALTERNATIVE METHOD. • REQUEST PERMISSION FROM DC CENTRAL TO BEGIN VENTILATION OF SPACE USING ALTERNATIVE METHOD. • REPORT RESULTS OF ATMOSPHERIC TESTING TO DC CENTRAL. • CONDUCT OVERHAUL AND SALVAGE AND REPORT RESULTS TO DC CENTRAL. **NOTE:** COOL ALL SURFACES WITH WATER. WASH ALL OIL TO BILGE USING AFFF. PUMP BILGES. • UPON ORDER FROM DC CENTRAL LEAVE A RE-FLASH WATCH AND STAND DOWN.

TABLE 2

FIRE BOUNDARIES

COMPARTMENT: ENGINE ROOM	
PERSONNEL	**BULKHEAD/DECK**
PRIMARY FIRE BOUNDARY: *INSERT FRAME NUMBERS*	
ZONE 2 PERSONNEL	
ZONE 3 PERSONNEL	
SECONDARY FIRE BOUNDARY: *INSERT FRAME NUMBERS*	
ZONE 1 PERSONNEL	
ZONE 2 PERSONNEL	

TABLE 3

SMOKE BOUNDARIES

COMPARTMENT: ENGINE ROOM	
AREA	**BOUNDARY**
PRIMARY SMOKE BOUNDARY: ZONE 3 PERSONNEL, *INSERT FRAME NUMBERS*	
STAIRWELLS LOCATED ON MAIN DECK:	
PORTSIDE - 1-89-2 GOING DOWN TO THE 2ND DECK AT 2-89-2.	SMOKE CURTAIN OR OTHER INSIDE DOOR.
SECONDARY SMOKE BOUNDARY: ZONE 3 PERSONNEL: *INSERT FRAME NUMBERS*	
WATERTIGHT DOORS (SLIDING).	SMOKE CURTAIN OR OTHER.

TABLE 4

MECHANICAL ISOLATION LIST

COMPARTMENT: ENGINE ROOM	
VALVE NUMBER	**LOCATION**
SYSTEM: FUEL OIL SERVICE SYSTEM	
FO-LV704	# 1 F/O SVC PUMP SUCTION
FO-LV707	# 1 F/O SVC PUMP DISCHARGE
SYSTEM: FUEL OIL TRANSFER SYSTEM	
FO-VL025	F/O TRANSFER PUMP DISCHARGE
FO-VL001	F/O TRANSFER PUMP SUCTION
SYSTEM: LUBE OIL SYSTEM	
LO-VL601	# 3 ROCKER ARM L/O PUMP SUCTION
LO-VL602	# 1 ROCKER ARM L/O PUMP SUCTION
SYSTEM: LUBE OIL PURIFICATION SYSTEM	
LO-VL467	L/O TRANSFER PUMP INLET
LO-VL468	L/O TRANSFER PUMP DISCHARGE

TABLE 5

ELECTRICAL ISOLATION LIST

COMPARTMENT: ENGINE ROOM	
EQUIPMENT	**LOCATION/REMOTE**
Diesel Generator	ISA Switchboard
Engine Room Pwr Pnl 2-100-2	ISA Switchboard
Aux Boiler #1	Grp Cntrl Ctr A Vital/ERC/& FCP
ME Lube Oil Svc Pump #2*	Grp Cntrl Ctr A Vital/ERC

* When possible, prior to securing power to the L/O pumps, ensure that machinery is secured and the shaft is stopped and locked.

TABLE 6

VENTILATION ISOLATION

COMPARTMENT: ENGINE ROOM			
Negative Ventilation Procedures: Set while fire is UNDER CONTROL. In Engine Room: Set EXHAUST FANS (E) on Fast and SUPPLY FANS (S) on Slow. All fans have FAST/SLOW (F-S) stop buttons in ERC, and Automatic Shutdown on *INSERT SHIPS FIXED GAS SYSTEM* Activation.			
Securing Ventilation Procedures: Set when fire is OUT OF CONTROL. In Engine Room: Actuation of *INSERT SHIPS FIXED GAS SYSTEM* will automatically secure all ventilation to the Engineroom. In surrounding areas ________:			
Ventilation Controls for Engine Room and surrounding areas: Engine Room Control, Fire Control Station Panel, Steering Gear Room, 06 Level Fan Room.			
FAN	**CONTROLLER/REMOTE**	**CLOSURE**	**DESIGNATION/ AREA SERVED**
E-07-92-1	Group Control Ctr "F" 06 Lvl, FR 76	07 Lvl stbd side	Engine Room

TABLE 6

VENTILATION ISOLATION (continued)

COMPARTMENT: ENGINE ROOM			
Positive Ventilation Procedures: Unaffected surrounding spaces: Set two speed supply fans on Fast and exhaust fans on Slow. For single speed fans set supply On and exhaust Off.			
FAN	**CONTROLLER/ REMOTE**	**DESIGNATION/AREA SERVED**	**W. D. INTAKE/ EXHAUST**
S-06-82-2	Fan Room 06-76-0	Wheel House/Chart Room	06 Lvl

TABLE 7

GENERAL MSF DUTIES AND RESPONSIBILITIES

SHIP POSITION	RESPONSIBILITY
MASTER	• OVERALL RESPONSIBLE FOR SAFETY. • ENSURE ALL HANDS FAMILIAR WITH MAIN SPACE FIRE PROCEDURES. • GIVE PERMISSION FOR FLAMMABLE LIQUID PUMPED OVER SIDE. • GIVE PERMISSION TO RELEASE SECOND CHARGE OF FIXED GAS IF REQUIRED.
FIRST OFFICER	• RESPONSIBLE TO CONDUCT DC TRAINING. • SHIPBOARD DAMAGE CONTROL OFFICER, SAFETY OFFICER, TRAINING OFFICER. • REPORTS TO DC CENTRAL DURING EMERGENCIES, IS IN CHARGE OF OVERALL FIREFIGHTING EFFORTS.
CHIEF ENGINEER	• RESPONSIBLE FOR ENGINE ROOM AND ALL SHIPS MACHINERY. • ADVISE MASTER AND DC CENTRAL DURING AN EMERGENCY.
SENIOR WATCH ENGINEER	• COORDINATE ISOLATION OF FLAMMABLE LEAK AND FIREFIGHTING EFFORTS UNTIL RELIEVED BY CHIEF ENGINEER. • ACTIVATE FIRE MAIN AND EMERGENCY GENERATOR. • ACTIVATE PRIMARY FIXED GAS FOR TWO SHOT SYSTEM ONLY IF REQUIRED, CONFIRM E/R IS SECURED FIRST.
QUICK RESPONSE TEAM	• REPORT DIRECTLY TO THE WATCH ENGINEER IN ENGINE ROOM CONTROL AND INITIATE DEFENSIVE ACTION. • INITIAL COMMS DIRECTED TO ERC, OSL THEREAFTER.
ZONE PERSONNEL	• MAKE REQUIRED CLOSURES AND ESTABLISH SMOKE AND FIRE BOUNDARIES. • ASSIST REPAIR PARTY AS ASSIGNED.
REPAIR PARTY 1	• DON APPROPRIATE PROTECTIVE CLOTHING, PROVIDE EQUIPMENT AS NEEDED TO SCENE AND FIGHT FIRES AND/OR CORRECT DAMAGE AS NECESSARY.
REPAIR PARTY 2	• DON APPROPRIATE PROTECTIVE CLOTHING, PROVIDE EQUIPMENT AS NEEDED TO SCENE AND FIGHT FIRES AND/OR CORRECT DAMAGE AS NECESSARY. • RESPONSIBLE FOR OVERHAUL OF E/R AFTER FIRE IS OUT. • RESPONSIBLE FOR ATMOSPHERIC TESTING IN E/R AFTER DESMOKING IS COMPLETED.
REPAIR PARTY 3	• PRIMARY E/R FIREFIGHTING ORGANIZATION. • DON APPROPRIATE PROTECTIVE CLOTHING, ACCESS ER AND FIGHT FIRE.
REPAIR PARTY LEADER (RPL)	• RESPONSIBLE FOR PERSONNEL ASSIGNED TO REPAIR LOCKER. • ESTABLISHES COMMUNICATION WITH DC CENTRAL, ON SCENE LEADER, AND THE ZONE COMMANDER. • DIRECTS BOTH ZONE AND REPAIR PARTY PERSONNEL IN THE ACTIONS OF EXTINGUISHING THE FIRE.

TABLE 7

GENERAL MSF DUTIES AND RESPONSIBILITIES (continued)

SHIP POSITION	RESPONSIBILITY
ON SCENE LEADER (OSL)	• CONTROLS REPAIR PARTY PERSONNEL AT CASUALTY SITE. • SETS CONTROL AREA, NOT NORMALLY DRESSED OUT. • MANAGES FIRE TEAMS ENTERING THE SPACE.
BREATHING APPARATUS (BA) CONTROLLER	• ENSURE PROPER OUTFITTING OF PERSONNEL BEFORE ENTRY TO A FIRE SPACE. • MANAGE BREATHING TIME OF PERSONNEL W/SCBA, OBA. • REMAINS OUTSIDE THE FIRE/SMOKE BOUNDARY. • COORDINATES RELIEF OF FIREFIGHTING TEAM.
NFTI/HOSE TEAM LEADER	• OPERATES NFTI. • DIRECTS HOSE TEAMS AT SCENE.
ZONE COMMANDER	• COORDINATES CLOSURES OF FITTINGS AND SETTING AND MAINTAINING OF SMOKE AND FIRE BOUNDARIES FOR REPAIR PARTY LEADER.
DC CENTRAL	• COORDINATION AND INFORMATION CENTER. • INFORMS MASTER OF PROGRESS. • IF 1ST CHARGE OF FIXED GAS TWO SHOT SYSTEM ONLY IS INEFFECTIVE, REQUEST PERMISSION FROM MASTER TO RELEASE 2ND CHARGE. • ADVISE/DIRECT REPAIR PARTIES.
SECONDARY DC CENTRAL	• LOCATED IN REPAIR LOCKER ___. • FIRST ASSISTANT ENGINEER IN CHARGE. • SHOULD DC CENTRAL BECOME COMPROMISED WILL ASSUME DC CENTRAL FUNCTIONS. • ESTABLISH COMMUNICATIONS WITH DC CENTRAL AND TRACK THE PROGRESS OF THE CASUALTY.
MEDICAL SERVICE OFFICER	• MAN SHIPS HOSPITAL. • STANDBY TO TREAT INJURED PERSONNEL (PREPARE FOR BURNS, SMOKE INHALATION, HEAT CASUALTIES). • ESTABLISHES COMMUNICATION WITH DC CENTRAL.
TRIAGE COORDINATOR	• REQUEST SAFE ROUTES FROM DC CENTRAL PRIOR TO DISPATCHING PERSONNEL ASSIGNED TO THE PCRT.
PERSONNEL CASUALTY RESPONSE TEAM (PCRT)	• MUSTER AT SHIPS HOSPITAL. • PROVIDE BASIC LIFE SUPPORT, CASUALTY EVACUATION AND TRIAGE TO INJURED PERSONNEL.
RATIONS TEAM	• AT DIRECTION OF DC CENTRAL TEAM PROVIDES FLUIDS AND RAPIDLY CONSUMABLE MEALS. • MADE UP OF PERSONNEL FROM THE FOOD SERVICE DIVISION. • CONTACT DC CENTRAL, DETERMINE SAFE ROUTE TO REPAIR STATIONS.

TABLE 8

FIRE PREVENTION MEASURES

The risk of fire in machinery spaces can be significantly reduced through a strong shipboard fire prevention program. The program shall consist of the following elements:

- The Chief Engineer is responsible for insuring that each engineering watch makes regular and frequent inspections of all machinery spaces. When conditions are found which will increase the risk of fire they shall be immediately corrected and the Chief Engineer and Master shall be notified.

- Smoking will be permitted only in designated spaces.

- All combustibles shall be properly stowed. Daily in-use flammables, combustibles, and aerosols shall be returned to the local flammable stowage cabinets at the end of each work shift.

- Hazardous materials shall be stored only in designated locations. Each watchstander shall insure that when hazardous material is returned to the correct stowage location after use.

- Explosion-proof fans or approved air-driven blowers will be used during the ventilation of fuel tanks or spaces.

- All portable electrical equipment used in or around tanks or vents will be explosion-proof and checked by the ship's electrician prior to use.

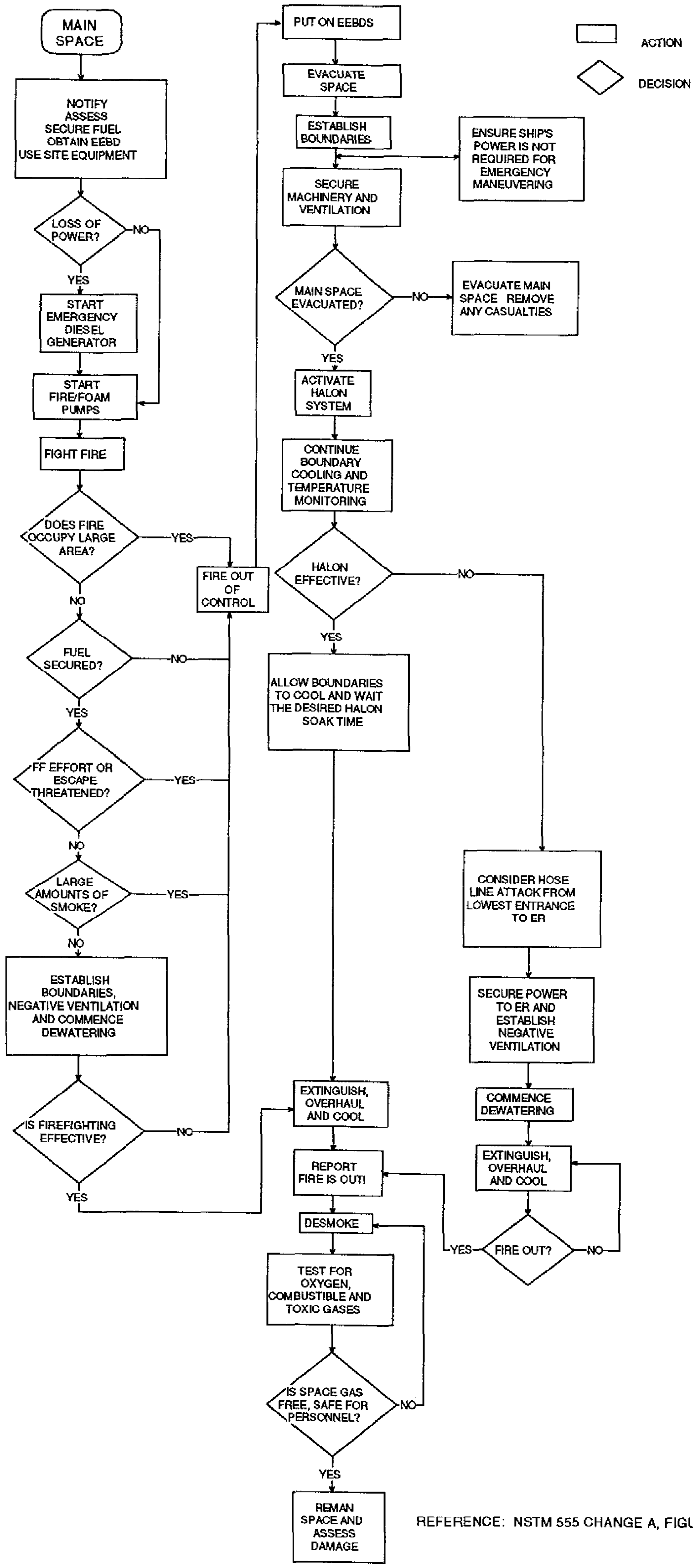
- All flammable systems shall be tested and inspected after repair.

- Enforce fire prevention policies and practices:

    1. Maintain flange shields on flammable liquid piping.
    2. Maintain proper covers on flammable liquid strainers and keep sounding tube caps in place.
    3. Immediately stop oil leaks and repair.
    4. Keep ventilation ducts free of oily residue.
    5. Keep bilges free of oil and trash.
    6. Prevent stockpiling of excess or unauthorized flammables.
    7. Operate and maintain systems and equipment in accordance with authorized plant procedures.
    8. Properly maintain all machinery space damage control equipment.
    9. Conduct frequent and meaningful training in escape and use of damage control equipment.

FOR ONE SHOT FIXED GAS EXTINGUISHING SYSTEM

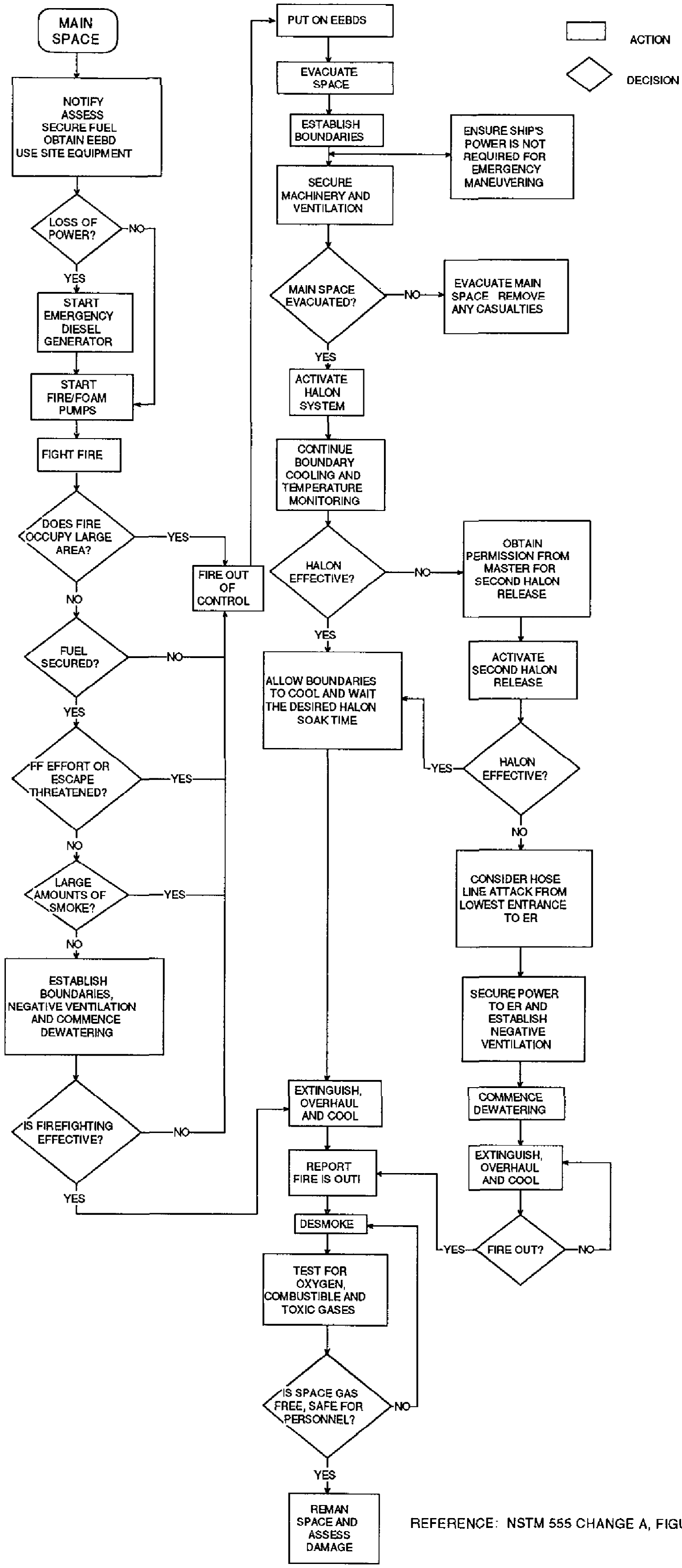
DECISION TREE FOR MAIN ENGINE ROOM FIRE



REFERENCE: NSTM 555 CHANGE A, FIGURE 555-79

FOR TWO SHOT FIXED GAS EXTINGUISHING SYSTEM

DECISION TREE FOR MAIN ENGINE ROOM FIRE



REFERENCE: NSTM 555 CHANGE A, FIGURE 555-79

MAIN SPACE FIRE INFORMATION AND CHECK SHEET

1. INDIVIDUAL DISCOVERING FIRE

______ REPORT FIRE TO ERC OR GANGWAY AND ASSESS FIRE LOCATION, TYPE AND SEVERITY.

______ SECURE THE SOURCE OF FUEL/OIL IF POSSIBLE. CARRY EEBD.

______ IF POSSIBLE, CONTAIN FIRE WITH PORTABLE FIRE EXTINGUISHERS.

______ COMMUNICATE IF THE FIRE IS OUT OF CONTROL.

2. WATCH ENGINEER

<u>FIRE UNDER CONTROL</u>

______ SOUND GENERAL ALARM.

______ REPORT FIRE TO BRIDGE.

______ START EMERGENCY FIRE PUMP AND EMERGENCY GENERATOR.

______ SET NEGATIVE VENTILATION IN THE ENGINE ROOM. COORDINATE W/ DCC.

______ SET FIRE BOUNDARIES IN ERC.

<u>FIRE OUT OF CONTROL</u>

______ ORDER EVACUATION OF THE ENGINE ROOM.

______ ENSURE SPACE IS MECHANICALLY AND ELECTRICALLY ISOLATED.

______ ACTUATE INITIAL <u>FIXED GAS</u> CHARGE.

3. DC CENTRAL

______ SECURE FIRE DAMPERS.

______ VERIFY MECHANICAL AND ELECTRICAL ISOLATION OF THE ENGINE ROOM.

______ IF INITIAL <u>FIXED GAS TWO SHOT SYSTEM ONLY</u> IS INEFFECTIVE REQUEST PERMISSION FROM MASTER OR RELEASE AUTHORITY TO ACTUATE THE SECOND CHARGE.

______ DETERMINE NECESSITY OF FIRE PARTY TO ENTER SPACE IF <u>FIXED GAS</u> CHARGE INEFFECTIVE.

ALLOWANCE EQUIPAGE . (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
AIR MOVER FAN			2-880048100	01/04/94	1

CHARACTERISTICS

COLUMN 1 FOR T-AG,T-AGM(EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS(EXCEPT 39,45,60),T-AK,MPS(EXCEPT
JOHN BOBO),T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS(39,45,60)
T-ARC,MPS(JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL	SOURC / MAINT / RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MILF18953MOD	81349	BOX FAN	1H 4140-01-272-6060		PAOZ2	1		EA	1	2	3					
WA5004	52081	RAM FAN,MODEL WF-20	0X 4140-01-333-2224		XBOGG	1		EA	1	2	3					
5959318PC1	53711	SMOKE CURT.,BLANKETS	9C 4210-01-306-7827		PAOZZ	1		EA	1	2	3					
5959318PC8	53711	SMOKE CURTAIN 2 PANE	9C 4210-01-306-7826		PAOZZ	1		EA	2	4	6					

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SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL) PART II SECTION C	2-880048100	01/04/94	1

ALLOWANCE EQUIPAGE LI... (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
SUBMERSIBLE ELEC PUMP ACCY			2-880048101	09/24/93	1

CHARACTERISTICS

NOTE-1-POWER CABLE ASSEMBLY EXTENSION CORD IS CONFIGURED FOR 440 VAC AND COMES COMPLETELY ASSEMBLED WITH CONNECTION BOX.
NOTE-2-OBTAIN THREE 50 FT LENGTHS OF NYLON LINE PER PUMP FROM SHIPS INVENTORY FOR SECURING TO PUMP FOR RAISING/ LOWERING. 2 IN CIRCUMFERENCE DOUBLE BRAIDED NYLON LINE. NSN INCLUDED FOR VERIFICATION PURPOSE ONLY (LINE ISSUED IN 600 FT REEL). CORD ON SUBMERSIBLE PUMP IS NOT TO BE USED FOR HANDLING UNIT.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS(EXCEPT 23), T-AGS(EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO), T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SEC/SOURC/MAINT/RECOV	NOTES	UI	CUST	ON BOARD ALLOWANCE TABLE COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-2-ABOVE	03950	CABLE ASSY-POWER ELE	9G 6150-00-087-0815	UPAOZZ	1	EA		2	4	6					
32070	08219	GASKET,HOSE 2 1/2 IN	9Q 5330-00-239-1877	UPAOZZ	1	EA		5	10	15					
ZZH561	81348	HOSE ASSY-HARD SUCTI	9C 4720-00-221-8763	UPCOZZ	1	EA		2	4	6					
SEE NOTE-3-ABOVE	03950	ROPE,FIBROUS	9Z 4020-00-106-9402	UPAOZZ		RL	FAB								
MILF19488	81349	STRAINER-SUCTION FRH	9C 4210-00-289-1539	UPAOZZ	1	EA		1	2	3					
AHS304	55719	WRENCH-SPNR	9Q 5120-00-277-9076	UPAOZZ	1	EA		1	2	3					

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SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL) PART II SECTION C	2-880048101	09/24/93	1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
SUBMERSIBLE ELEC PUMP			2-880048102	09/24/93	1

CHARACTERISTICS

NOTE-1-SUBMERSIBLE PUMP VOLTAGE TO MATCH SHIPS POWER SUPPLY. POWER CABLE ASSY NSN LISTED ON AEL 2-880048101 IS CONFIGURED FOR 440 VAC. ENSURE COMPATIBILITY OF PUMP HOOK-UP EXTENSION CORD AND SHIPS POWER OUTLETS. NEW CONSTRUCTION SHIPS TO BE OUT-FITTED WITH 440VAC SUBMERSIBLE PUMPS. ENSURE SHIP HAS POWER OUTLETS INSTALLED.
ACCESSORIES NOT FURNISHED WITH THE PUMP CAN BE FOUND ON AEL 2-880048101.
REPAIR PARTS FOR THE PUMP AND STARTER CAN BE FOUND ON THE APPROPRIATE APLS (M017710005 FOR THE 440 VAC PUMP M159990010 FOR THE 440 VAC STARTER).
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS(EXCEPT 23), T-AGS(EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO), T-AGOR,T-ATF
COLUMN 2 FOR T-AGOS 23,T-AGDS,T-AGS (39,45,60),T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SECCL/SOURC/MAINT/RECOV	NOTES	UI	CUST	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE-NOTE-1-ABOVE	03950	PUMP,ELEC SUBMER	OX 0000-LL-CLE-9541	UXBODD	1	EA	SEL	2	2	3					
576140	83590	PUMP-CTFGL 115VDC	7HH4320-00-368-3185	UPAODD		EA	SEL								
576907-220V	96046	PUMP-CTFGL 220VAC	7HH4320-00-752-9647	UPAODD		EA	SEL								
MILP17454	81349	PUMP-CTFGL 230VDC	7HH4320-00-554-9466	UPAODD		EA	SEL								
576139	83590	PUMP-CTFGL 440VAC	7HH4320-00-368-3186	UPAODD		EA	SEL								

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SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL) PART II SECTION C	2-880048102	09/24/93	1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
P-250 MOD I PUMP			2-880048103	09/24/93	1

CHARACTERISTICS

ALLOWANCES FOR P-250 MOD I DEWATERING PUMP PER SHIP CLASS IAW COMSC MSG 092007Z FEB 93.
JUSTIFICATION REQUIRED FOR DELETION/ADDITION OF P-250S FOR ALL SHIP CLASSES.
MOD II PUMPS ARE NOT TO BE SUBSTITUTED FOR MOD I PUMPS.
REPAIR PARTS FOR THE PUMP UNIT CAN BE FOUND ON APL 017600005; REPAIR PARTS FOR THE PUMP END CAN BE FOUND ON APL 017600006; REPAIR PARTS FOR THE ENGINE CAN BE FOUND ON 668260001.
ACCESSORIES NOT FURNISHED WITH THE PUMP CAN BE FOUND ON AEL 2-880048104.
COLUMN 1 FOR T-AK (FBM),T-AK,T-AKR,FSS,MPS,T-ARC,T-AVB
COLUMN 2 FOR T-AE,T-AFS,T-AH,T-AO
COLUMNS 3 THRU 8 BLANK
CAGE-03950
MSC-PECULIAR
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
P-250PMP-MOD-I	03950	PUMP-P250 MOD 1	3HD4320-01-186-3377	UPAOGG	1		EA	1	2	3						

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SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C	IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL)		2-880048103	09/24/93	1

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
PUMP P-250 MOD I PUMP ACCESSORY LIST		PLAN/APPLICABLE DRAWING	2-880048104	02/14/94	1

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ON BOARD ALLOWANCE TABLE

NOTE-1-FIVE GAL GAS CAN STORED IN JETTISON RACK INSTALLED ON WEATHER DECK. EXACT LOCATION SUBJECT TO APPROVAL BY AREA COMMANDER. RACK BASED ON GUIDANCE IN NAVSEA DWG. 810-4444641 (DRAWING FOR 50 GAL DRUMS AND INCLUDED FOR BASIC GUIDANCE ONLY. RACK WILL REQUIRE LOCAL DESIGN)
ENSURE ALL 1-1/2 IN FITTINGS MEET THREADING REQUIREMENTS OF THE SPECIFIC SHIP. (I.E. NAVY STANDARD 11.5 TPI (NPSH) OR USCG APPROVED 9 TPI (NH) COMMERCIAL EQUIP MENT. 2-1/2 IN FITTINGS ARE SAME THREAD SIZE FOR BOTH NPSH AND NH; 7.5 TPI). ON SHIPS WHOSE 1.5" FIRE STATIONS ARE OUTFITTED WITH 75' HOSES,THE SPARE HOSES IN DC LOCKERS MUST ALSO BE 75'. THESE HOSES MAY HAVE TO BE PROCURED LOCALLY.
TABLE BELOW FOR NAVY STANDARD 11.5 TPI EQUIPMENT FOR 1-1/2 IN FIRE STATIONS.

ITEM NSN
1. TRIGATE 2-1/2 F INLET TO 1-1/2 4210-00-255-0232 X 1-1/2 X 1-1/2 M OUTLET
2. HOSE ASSY 1-1/2 IN X 50 FT 4210-01-131-0249
3. HOSE ASSY, 1.5" X 75' COMMERCIAL
4. NOZZLE 1-1/2 IN APN 4210-00-392-2943
5. ADAPTER 1-1/2 IN M TO 2-1/2 IN M 4210-00-277-3378
6. COUPLING HOSE DBL F 1-1/2 4210-00-307-4699
7. REDUCER 2-1/2 IN F X 1-1/2 IN M 4210-00-202-7466
8. REDUCER 2-1/2 IN M X 1-1/2 IN F 4210-00-377-6521
9. SIAMESE WYE GATE 1-1/2 IN 4210-00-255-0234 (2-1/2IN X 1-1/2IN X 1-1/2IN)

COLUMN 1 FOR T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AO,T-AKR,T-AH
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ALLOWANCE EQUIPAGE LI... (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
PUMP P-250 MOD I PUMP ACCESSORY LIST		PLAN/APPLICABLE DRAWING	2-880048104	09/22/93	2

CHARACTERISTICS — ON BOARD ALLOWANCE TABLE

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-1-ABOVE	03950	CAN-GAS MILITARY 5 G	9G 7240-00-222-3088	UPAOZZ	1		EA	1	1	2	3					
BG-104N	20266	CONNECTION-TRI GATE	9C 4210-01-038-6001	UPAOZG	1		EA	1	1	2	3					
48S011	71905	EDUCTOR,PERI-JET	9C 4320-00-256-8206	UPAOZG	1		EA	1	2	4	6					
43068LLIBPC6	77842	GASKET,HOSE 1 1/2 IN	9Q 5330-00-239-1873	UPAOZZ	1		EA	1	1	2	3					
SSBN640-700-2118365	80064	GASKET,HOSE 1.562 IN	9Z 5310-00-728-7702	UPAOZZ	1		EA	1	1	2	3					
32070	08219	GASKET,HOSE 2 1/2 IN	9Q 5330-00-239-1877	UPAOZZ	1		EA	1	5	10	15					
T1-5501-1286281PC7	80064	GASKET,HOSE 2 1/2 IN	9Z 5330-00-246-2914	UPAOZZ	1		PG	1	1	2	3					
ZZH451	81348	HOSE ASSEMBLY 4 IN	9C 4210-01-220-6648	UPAOZO	1		EA	1	2	4	6					
592223	32195	HOSE ASSY-HARD RUBBE	9C 4210-00-725-9234	UPAOZZ	1		EA	1	3	6	9					
MILH24606	81349	HOSE ASSY-NMTLC	9C 4210-01-273-4727	UPAOZZ	1		AY	1	1	2	3					
ZZH561	81348	HOSE ASSY-RUB EXH. H	9C 4210-00-776-0657	UPAOZZ	1		AY	1	1	2	3					
810-1385871	03958	REDUCER-HOSE	9C 4210-00-618-8592	7PAOZZ	1		EA	1	1	2	3					
810-1385872REVA	80064	REDUCER-HOSE	9C 4730-00-618-8593	UPAOZZ	1		EA	1	1	2	3					
MILS1285	81349	SPOUT-CAN FLEX	9G 7240-00-177-6154	UPAOZZ	1		EA	1	1	2	3					
SEE NOTE ABOVE	03950	TRIGATE 2-1/2IN F TO	0X 0000-LL-CLE-9542	UXBOZZ	1		EA	1	1	2	3					
315F-N	20266	VALVE-FOOT	9C 4820-00-540-2381	UPAOZ2	1		AY	1	1	2	3					
AHS304	55719	WRENCH-SPNR	9Q 5120-00-277-9076	UPAOZZ	1		EA	1	2	4	6					

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CTA 101	H 6	ALLOWANCE EQUIPAGE LIST (AEL)	2-880048104	09/22/93	2
SHIP TYPE & HULL NO.	PAGE	PART II SECTION C	IDENTIFICATION NO.	DATE	PAGE

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
EMERGENCY COMMUNICATION EQUIPMENT KIT		PLAN/APPLICABLE DRAWING	2-880048106	01/04/94	1

CHARACTERISTICS

THIS AEL PROVIDES MATERIAL FOR ONE COMPLETE "SALT AND PEPPER" COMMUNICATION SET.
REPAIR PARTS FOR THE HEADSET CAN BE FOUND ON APL 270490075, FOR MSC M270490075.
STENCIL BAG-EMERGENCY COMMUNICATIONS KIT-IN TWO INCH LETTERS.
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60), T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23),T-AGS 51, T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SEC CL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
GGGB50	81348	BAG LINEMAN TOOL	9Q 5140-00-288-7763	UPAOZZ	1		EA	1	1	2	3	1				
MILC915/16	81349	CABLE-TEL TY MRI-D-1	9Z 6145-01-202-7764	UPAOZZ	1		FT	1	100	200	300	100				
A475	78957	HEADSET-CHEST SET E	9N 5965-00-900-6401	UPAOZZ	1		EA	1	2	4	6	2				
9000S6501H74210/G-15B	14100	JACK BOX-TY G15 B	9N 5935-00-552-6790	UPAOZZ	1		EA	1	4	8	12	4				
A2151404-1	28527	JACK-TELEPHONE	9N 5935-00-258-8947	UPAOZZ	1		EA	1	2	4	6	2				
H39A	81349	PLUG-TELEPHONE	9N 5935-00-254-9287	UPAOZZ	1		EA	1	2	4	6	2				
IC-TCR SYM2793	80064	REEL-CABLE	1HM8130-00-263-8644	7PAOZZ	1		EA	1	1	2	3	1				

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ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
PORTABLE EXOTHERMIC CUTTING UNIT (PECU)		PLAN/APPLICABLE DRAWING	2-880048109	09/23/93	1

CHARACTERISTICS

KIT NSN INCLUDES ALL ITEMS IN THAT KIT. NSNS LISTED FOR EACH INDIVIDUAL PIECE ARE PROVIDED FOR REORDERING PURPOSES.
OXYGEN BOTTLES IN PECU KIT ARE EMPTY AND MUST BE FILLED LOCALLY. FOR SHIPBOARD TRAINING PURPOSES THE LARGE MEDICAL TYPE OXYGEN BOTTLES MAY BE UTILIZED UPON CONCURRENCE OF COMMANDING OFFICER. O2 REFILL REQUIRED.
STENCIL CARRYING CASE-PECU-IN TWO INCH LETTERS.
REPAIR PARTS FOR PECU CAN BE FOUND ON APL 419990197.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23), T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO), T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23, T-AGS (39,45,60), T-AO, T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SEC CL / SOURC / MAINT / RECOV	NOTES	CUST	UI	QTY	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
AA1814	58536	GOGGLES-INDUSTRIAL	9Q 4240-00-203-3804	UPAOZZ			PR	1								
MILPXX298	81349	KIT-PORTABLE EXOTHER	1HM4240-01-272-3841	UPAOZZ	1		EA	1	1	2	3					
BB0925	81348	OXYGEN-TECH 38.4 CUF	9G 6830-01-333-3151	UPAOZZ	1		CY	1	3	6	9					
43-049-004	09687	RODS,CUTTING	9G 3449-01-325-7641	UPAOZZ			TF	25								
43-049-009	09687	RODS,CUTTING	9G 3449-01-325-7642	UPAOZZ			TF	25								

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REFERENCE DATA		ITEM NAME	STOCK NO.	SEC CL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL) PART II SECTION C	2-880048109	09/23/93	1

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
PIPE PATCHING KIT			2-880048110	09/22/93	1

CHARACTERISTICS

STENCIL BAG-PIPE PATCHING KIT-IN TWO INCH LETTERS.
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60),T-AK,MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60), T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SMR CODE	NOTES	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MILB829	81349	BAG,DUFFEL NO 7	9D 8465-01-117-8699	UPAOZZ	1	EA	1	1	2	3					
GGGB451	81348	BLADE-HND HAKSA 10 I	9Q 5110-00-277-4588	UPAOZZ	1	BD	1	1	2	3					
CCC419	81348	CANVAS-DUCKCLOTH	9D 8305-01-198-9806	UPAOZZ	1	YD	1	2	4	6					
GGGC311	81348	CHISEL-WOOD 1 INCH	9Q 5110-00-640-5419	UPAOZZ	1	EA	1	1	2	3					
GGGF00671TYA	81348	FRAME-HAND HACKSAW T	9Q 5110-00-289-9657	UPAOZZ	1	EA	1	1	2	3					
GGGH131	81348	HATCHET-HALF TYPE C	9Q 5110-00-228-3161	UPAOZZ	1	EA	1	1	2	3					
S2064	82041	KNIFE 3IN	9Q 5110-00-530-1757	UPAOZO	1	EA	1	1	2	3					
TR650	81348	MARLINE-TAR 2 PLY	9Z 4020-00-240-2185	UPAOZZ	1	CL	1	1	2	3					
803-461043 OTO1IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8953	UPAOZZ	1	EA	1	2	4	6					
803-461043 OTO2IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8958	UPAOZZ	1	EA	1	2	4	6					
803-461043 OTO3IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8962	UPAOZZ	1	EA	1	2	4	6					
AA2522	58536	RAGS-COTTON	9Q 7920-00-205-1711	UPAOZZ	1	BE	1	1	2	3					
HHP151 1/8THK	81348	RUBBER SHEET-SOLID	9Z 5330-00-179-0052	UPAOZZ	1	SY	1	3	6	9					
GGGS65	81348	SAW-HND XCUT 20 IN	9Q 5110-00-203-8310	UPAOZZ	1	EA	1	1	2	3					
GGGS00278	81348	SHEARS-TAILOR 12 IN	9Q 5110-00-223-6370	UPAOZZ	1	EA	1	1	2	3					
S8800-461043 2X2X8IN	80064	WEDGE,WOOD	9C 5510-00-268-3479	UPAOZZ	1	EA	1	2	4	6					
S8800-461043 3X3X12IN	80064	WEDGE,WOOD	9C 5510-00-268-3481	UPAOZZ	1	EA	1	2	4	6					

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SHIP TYPE & HULL NO.	PAGE		IDENTIFICATION NO.	DATE	PAGE
CTA 101	H 12	ALLOWANCE EQUIPAGE LIST (AEL) PART II SECTION C	2-880048110	09/22/93	1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
MEASURING BATTENS		PLAN/APPLICABLE DRAWING	2-880048111	09/22/93	1

CHARACTERISTICS

THESE ITEMS ARE TO BE FABRICATED LOCALLY OR BY SHIPS FORCE.
NAVSEA DWG NO. 8801-851644 REV.A.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO),
T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,61),T-ARC,
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
4.5 FT TO 7 FT.	03950	BATTEN-SHORING	1HA0000-LL-CJ6-7944	UXBOZZ	1		EA	FAB	1	2	3					
7FT TO 12FT	03950	BATTEN-SHORING	1HA0000-LL-CJ6-7945	UMOOZZ	1		EA	FAB	1	2	3					

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CTA 101	H 13	ALLOWANCE EQUIPAGE LIST (AEL)	2-880048111	09/22/93	1
SHIP TYPE & HULL NO.	PAGE	PART II SECTION C	IDENTIFICATION NO.	DATE	PAGE

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
WOOD DC SHORING			2-880048112	10/01/93	1

CHARACTERISTICS

TAPERED WOODEN PLUGS,(ALSO FOUND IN THE PLUGGING KIT AEL 2-880048114) HAVE BEEN REMOVED FROM THIS AEL TO MINIMIZE DUPLICITY.
SHORING NOT REQUIRED TO BE STORED IN DC LOCKER. SHORING TO BE LOCATED AS DIRECTED BY COMMANDING OFFICER WITH THE FOLLOWING CRITERIA APPLICABLE: ADJACENT TO THE DC LOCKER; WITHIN THE SKIN OF THE SHIP TO PROVIDE PROTECTION FROM THE ELEMENTS; ABOVE WATER LINE; WITHIN COLLISION BULKHEAD BOUNDARIES.
NOTE-1: FORMULA FOR DETERMINING BOARD FEET (BF) IS AS FOLLOWS: BF = THICKNESS IN INCHES X WIDTH IN FEET X LENGTH IN FEET (e.g. 2"T X 6"W X 10'L = 10BF) TO UTILIZE FORMULA, 6" MUST BE CONVERTED TO FEET (6" = 0.5').
DIMENSIONS PROVIDED WITH ITEMS ARE LISTED IN THE FOLLOWING ORDER: THICKNESS X WIDTH X LENGTH
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23, T-AGS (39,45,60), T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SMR	NOTES	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
A-A-1417, 1/2IN X 4FTX 8FT	58536	LUMBER, PLYWOOD	9C 5510-00-051-1195	UPAOZZ	1	EA	1	2	2	2					
SEE NOTE-1 MML751 2INX4INX12FT	81348	LUMBER-SFT WOOD	9C 5510-00-663-4687	UPAOZZ	1	BF	1	80	80	80					
SEE NOTE-1 MML751 4INX4INX8FT	81348	LUMBER-SFT WOOD	9C 5510-00-663-4691	UPAOZZ	1	BF	1	213	213	213					
SEE NOTE-1 MML751 4INX4INX12FT	81348	LUMBER-SFT WOOD	9C 5510-00-663-4693	UPAOZZ	1	BF	1	320	320	320					
S8800-461043 2-1/4X4X18IN	80064	SHORING 2-1/4X4X18IN	9C 5510-00-268-3478	UPAOZZ	1	EA	1	24	48	72					
S8800-461043 2X2X8IN	80064	WEDGE,WOOD	9C 5510-00-268-3479	UPAOZZ	1	EA	1	4	8	12					
S8800-461043 3X6X12IN	80064	WEDGE,WOOD	9C 5510-00-268-3482	UPAOZZ	1	EA	1	12	24	36					

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SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C	IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL)		2-880048112	10/01/93	1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
STEEL DC SHORING			2-880048113	09/22/93	1

CHARACTERISTICS

COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60),T-AK (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),T-ARC, MPS (EXCEPT JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23),T-AGS 51, T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MILS23965 MODEL 6-11	81349	SHORE STEEL DC	1HM2090-00-052-1581	UPAOZZ	1		EA	1	2	4	6	1				
MILS23965 MODEL 3-5	81349	SHORE STEEL DC	1HM2090-00-058-3737	UPAOZZ	1		EA	1	2	4	6	1				

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SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C	IDENTIFICATION NO.	DATE	PAGE
CTA 101	H 15	ALLOWANCE EQUIPAGE LIST (AEL)		2-880048113	09/22/93	1

ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
PLUGGING KIT			2-880048114	09/22/93	1

CHARACTERISTICS

STENCIL BAG-PLUGGING KIT-IN TWO INCH LETTERS
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS
(EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),T-ARC
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MILB829	81349	BAG,DUFFEL NO 7	9D 8465-01-117-8699	UPAOZZ	1		EA	1	1	2	3					
GGGC313	81348	CHISEL-COLD HAND	9Q 5110-00-221-8132	UPAOZZ	1		EA	1	1	2	3					
GGH131	81348	HATCHET-HALF TYPE C	9Q 5110-00-228-3161	UPAOZZ	1		EA	1	1	2	3					
803-461043 0TO1IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8953	UPAOZZ	1		EA	1	2	4	6					
S8800-461043 0TO2IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8958	UPAOZZ	1		EA	1	2	4	6					
803-461043 0TO3IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8962	UPAOZZ	1		EA	1	2	4	6					
S8800-461043 7TO10IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8949	UPAOZZ	1		EA	1	1	2	3					
803-461043 1TO5IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8966	UPAOZZ	1		EA	1	1	2	3					
803-461043 3TO7IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8969	UPAOZZ	1		EA	1	1	2	3					
S8800-461043 4TO8IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8973	UPAOZZ	1		EA	1	1	2	3					
S8800-461043 2X2X8IN	80064	WEDGE,WOOD	9C 5510-00-268-3479	UPAOZZ	1		EA	1	2	4	6					
S8800-461043 3X3X12IN	80064	WEDGE,WOOD	9C 5510-00-268-3481	UPAOZZ	1		EA	1	2	4	6					
S8800-461043 3X6X12IN	80064	WEDGE,WOOD	9C 5510-00-268-3482	UPAOZZ	1		EA	1	2	4	6					
S8800-461043 8IN	80064	WEDGES-WOOD 2 X 4 X	9C 5510-00-268-3480	UPAOZZ	1		EA	1	2	4	6					

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EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
SHORING X PLUGGING TOOL KIT			2-880048115	09/22/93	1

CHARACTERISTICS

COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60), T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60), T-ARC, MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23),T-AGS 51, T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MILB43663	81349	BAG TOOL SATCHEL	9Q 5140-00-293-2379	UPAOZZ	1		EA	1	1	2	3	1				
AA431 8IN	58536	CLAMP-C MED SER 2 1-	9Q 5120-00-840-3358	UPAOZZ	1		EA	1	2	4	6	4				
AA431 6IN	58536	CLAMP-C,6 IN	9Q 5120-00-203-6431	UPAOZZ	1		EA	1	2	4	6	4				
AA1306	58536	HAMMER-RIP CLAW-20 O	9Q 5120-00-892-5744	UPAOZZ	1		EA	1	1	2	3	1				
GGGH131	81348	HATCHET-LATHING	9Q 5110-00-223-5379	UPAOZZ	1		EA	1	1	2	3	1				
FFN105	81348	NAIL COM 16D	9Z 5315-00-164-5121	UPAOZZ	1		LB	1	3	6	9	1				
SSP166	81348	PENCIL-CARPENTERS	9Q 7510-00-275-7213	UPAOZZ	1		DZ	1	1	2	3	1				
AA2522	58536	RAGS-COTTON	9Q 7920-00-205-1711	UPAOZZ	1		BE	1	1	2	3	1				
GGGR791	81348	RULE-MULT FLDG 6FT	9Q 5210-00-293-3511	UPAOZZ	1		EA	1	1	2	3	1				
GGGS65 20IN	81348	SAW-HND XCUT 20 IN	9Q 5110-00-203-8310	UPAOZZ	1		EA	1	1	2	3	1				
GGS65 18IN	81348	SAW-METAL CUT HND 18	9Q 5110-00-221-0235	UPAOZZ	1		EA	1	1	2	3	1				
GGGS00278	81348	SHEARS-TAILOR 12 IN	9Q 5110-00-223-6370	UPAOZZ	1		EA	1	1	2	3	1				
GGGS656	81348	SQUARE-CARPENTER'S	9Q 5210-00-810-3490	UPAOZZ	1		EA	1	1	2	3	1				
GGGT106	81348	TAPE-MES STL 8FT	9Q 5210-00-293-3505	UPAOZZ	1		EA	1	1	2	3	1				

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ALLOWANCE EQUIPAGE LI.. (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
GAS FREE ENGINEER KIT		PLAN/APPLICABLE DRAWING	2-880048116	10/01/93	1

CHARACTERISTICS

DC LOCKER GAS FREE ENGINEER KITS MAY BE REMOVED FOR USE
BY GAS FREE ENGINEER DURING ROUTINE OPERATIONS BUT
MUST BE RETURNED UPON COMPLETION OF WORK.
NOTE-1-PORTABLE TRIPLE GAS INDICATOR AND CALIBRATION
CHECK KIT TO BE IN DC EQUIPMENT REQUIREMENTS ONLY
IF NOT INCLUDED IN SHIPS NORMAL EQUIPMENT
ALLOWANCE LIST.
SHIP TO PROCURE INDICATOR AND CHECK KIT
(1 EACH PER SHIP).
BOTH ARE MANUFACTURED BY NUMEROUS COMPANIES.
INDICATOR MUST BE APPROVED BY UNDERWRITERS LAB
AND USCG. CHECK KIT MUST BE COMPATIBLE WITH
INDICATOR (I.E.,SAME MANUFACTURER). ENSURE ALL
ANCILLARY EQUIPMENT IS PROCURED (I.E. CHARGER
SAMPLING LINE CALIBRATION CHECK GAS).RECOMMEND GAS DETECT-
ION CAPABILITIES FOR TRIPLE GAS INDICATOR ARE (IN ORDER OF
PRIORITY)-OXYGEN, COMBUSTIBLE, HYDROGEN SULFIDE, AND
CARBON MONOXIDE.
ADMINISTRATIVE COMMANDER TO BE FINAL DECISION
AUTHORITY IN PURCHASE OF EQUIPMENT.
STENCIL TOOL BOX-GAS FREE ENGINEER KIT-IN TWO INCH
LETTERS.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO),
T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60), T-ARC,
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-1 ABOVE	03950	CALIBRATION CHECK KI	0X 0000-LL-CLE-9544	UXBOZZ	1		KT	1	AR	AR	AR					
CH285	D1379	DETECTOR KIT-(DRAEGE	9G 6665-00-710-7815	7PAOZZ	1		KT	1	1	2	3					

CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL)	2-880048116	10/01/93	1
SHIP TYPE & HULL NO.	PAGE	PART II SECTION C	IDENTIFICATION NO.	DATE	PAGE

ALLOWANCE EQUIPAGE L... (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
GAS FREE ENGINEER KIT		PLAN/APPLICABLE DRAWING	2-880048116	10/01/93	2

CHARACTERISTICS

Reference Data		Item Name	Stock No.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
GGGT558/6	81348	TOOL BOX PORTABLE	9Q 5140-00-226-9018	UPAOZZ	1		EA	1	1	2	3					
SEE NOTE-1 ABOVE	03950	TRIPLE GAS INDICATOR	0X 0000-LL-CLE-9545	UXBOZZ	1		EA	1	AR	AR	AR					
CH235	53655	TUBE-CARBON DIOXIDE	9G 6665-00-769-0945	UPCOZZ	1		SE	1	1	2	3					
CH20601-2	D1379	TUBE-CARBON MONOXIDE	9G 6665-00-769-0949	UPCOZZ	1		BX	1	1	2	3					
CH26101-2	D1379	TUBE-HYDROCARBON	1HM6665-00-769-0954	7PAOZZ	1		SE	1	1	2	3					
CH30301-2	D1379	TUBE-HYDROGEN FLUORI	9G 6665-01-010-7960	UPAOZZ	1		SE	1	1	2	3					
CH19401-2	D1379	TUBE-PHOSGENE	9G 6665-01-010-7965	UPAOZZ	1		SE	1	1	2	3					

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B-16

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
INTERNATIONAL SHORE CONNECTION		PLAN/APPLICABLE DRAWING	2-880048117	09/22/93	1

CHARACTERISTICS

ENTIRE CONNECTION TO BE ASSEMBLED BY SHIPS FORCE UTILIZING ITEMS WHICH MAKE UP AEL. NAVSHIPS NOTE 9480 SERIAL 6648A3-831 OF 27 MAY 1966 AND SKETCH INCLUDED APPLY (46 CFR CHAPTER 1 SUBPART 162.034 ALSO APPLIES).
COLUMN 1 FOR ALL MSC SHIPS
COLUMNS 2 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE ABOVE	03950	ADAPTER-FEM	1HS0D0D-LL-CE6-8748	UXBOZO	1		EA	1	1							
A9324753	18131	CONNECTION	9C 4730-00-932-4753	UPAOZG	1		EA	1	1							
HHP151CL2-30R4	81348	GASKET	9Z 5330-00-179-0050	UPAOZZ	1		SY	1	AR							
A2303-12-51PC12	81996	LOCKWASHER SPRING	9Z 5310-00-820-6653	UPAOZZ	1		HD	1	1							
MS25690-1005	96906	NUT,HEXAGON	9Z 5310-00-763-8920	UPAOZZ	1		HD	1	1							
MS35311-166	96906	SCREW-CAP HEXH 5-8X2	9Z 5305-00-226-9207	UPAOZZ	1		EA	1	4							

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EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
BREATHING APPARATUS		PLAN/APPLICABLE DRAWING	2-880048119	01/04/94	1

CHARACTERISTICS

SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	ON BOARD ALLOWANCE TABLE COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

NOTE1-ADMINISTRATIVE COMMANDS ARE TO PRIORITIZE AND IMPLEMENT THE PHASE OUT OF THE OBA WITH THE POSITIVE PRESSURE SELF CONTAINED BREATHING APPARATUS (SCBA). ALL SCBA UNITS, SPARE CYLINDERS, AND SCBA SUPPORT EQUIPMENT ABOARD SHIP SHALL BE OF LIKE RATING, PRESSURE, MAKE AND MODEL. (COMSC APPROVAL IS REQUIRED TO VARY FROM THIS REQUIREMENT).

THE REQUIREMENTS FOR OUTFITTING SHIPS WITH LOW PRESSURE (LP-2216 PSI/30 MINUTE RATING) OR HIGH PRESSURE (HP-4500 PSI/60 MINUTE RATING) SCBA UNITS, SPARE CYLINDER, AND STOWAGE SHALL BE IAW THE TABLE BELOW. SHIPS THAT ARE OUTFITTED WITH HP SCBA UNITS ONLY SHALL HAVE A BREATHING AIR QUALITY (GRADE E OR BETTER) AIR COMPRESSOR AND SCBA REFILL SYSTEM INSTALLED SUCH AS THE 50K CUBIC FOOT, AIR PURIFYING, 12.9 SCFM, 5000 PSI MAKO COMPRESSOR AND REFILL STATION, MODEL NO. 9400E3MSC/M3100-3MSC OR EQUAL.

ALL SCBA UNITS ARE TO BE NIOSH APPROVED,POSITIVE PRESSURE, DEMAND TYPE FOR FIRE FIGHTING USE AND COMPLY WITH THE 1992 EDITION OF THE NFPA 1981 STANDARD OR LATER. ALL SCBA CYLINDERS SHALL BE OF THE LIGHT WEIGHT TYPE (KEVLAR WRAPPED) AS ACCEPTED BY THE DOT AND APPROVED BY NIOSH AND NFPA.

SCBA OUTFITTING REQUIREMENTS

#SHIP DC Lockers	SCBA Type	SHIP QTY of SCBA Units	SHIP QTY of spare Cylindrs	SCBAs per DC Locker	SCBAs Remotely Located
1 (Reduced Storage)	LP	8	12	6	2
1 (Standard Storage)	LP	14	24	12	2
2	LP	26	42	12	2
3	LP	38	42	12	2
3	HP	30	42	9	3

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
BREATHING APPARATUS		PLAN/APPLICABLE DRAWING	2-880048119	01/04/94	2

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ON BOARD ALLOWANCE TABLE

(T-AO)
3 HP 33 42 9 6
(T-AFS/AH/AE)
NOTE: Remote stowage location of SCBA units to be IAW CFR requirements (ER entrance, Bridge, Reefer Flat, etc.)

SAMPLE LIST OF VENDORS HAVING NIOSH/1992 NFPA SCBA UNITS W/COMPOSITE, LIGHT WEIGHT, KEVLAR WRAPPED CYLINDERS:

MANUFACTURERER	LOCATION (PHONE NUMBER)
INTERSPIRO	BRANFORD, CT (203-481-3899)
ISI	LAWRENCEVILLE, GA (404-962-2552)
MSA	PITTSBURGH, PA (412-967-3256)
NATIONAL DRAEGER	PITTSBURGH, PA (412-787-8383)
SCOTT AVIATION	LANCASTER, NY (716-686-1668)

AT LEAST (8) BULKHEAD MOUNTED WALK AWAY SCBA BRACKETS TO BE OUTFITTED IN/NEAR EACH DC LOCKER. SECURE BUT ACCESSIBLE STORAGE FOR REMAINING SPARE UNITS/SPARE CYLINDERS REQUIRED, TO SUIT SHIPS ARRANGEMENT. AT LEAST EIGHT (8) SCBA CARRYING CASES TO BE PROVIDED WITH EACH SHIP'S SCBA ALLOTMENT.
SAMPLE LIST OF SCBA WALK-AWAY BRACKET VENDORS:

MANUFACTURER LOCATION (PHONE NUMBER)
MODEL

W.S. DARLEY MELROSE,IL (1-800-323-0244)
MODEL M614, W/STRAP TO SUIT SCBA

ZICO YARDLEY, PA (215-493-3618)
MODEL UN-X-30-X-X, W/STRAP TO SUIT SCBA ("X"= TO BE DETERMINED BY INDIVIDUAL PURCHASER).
NOTE2-ONE SCBA SPARE PARTS ALLOTMENT REQUIRED/SHIP. ALLOT-MENT TO BE DETERMINED BY ADMIN COMMAND AND SCBA SUPPLY VENDOR TO SUPPORT MINOR SCBA REPAIR/REPLACEMENT BY NON-

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
CTA 101	2	ALLOWANCE EQUIPAGE LIST (AEL)									2-880048119			01/04/94			2	
SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C								IDENTIFICATION NO.			DATE			PAGE	

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
BREATHING APPARATUS			2-880048119	01/04/94	3

CHARACTERISTICS

CERTIFIED END USER.
NOTE3-SHIPS AWAITING CHANGEOUT TO SCBAs ARE REQUIRED TO HAVE AT LEAST 12 OBA UNITS/DC LOCKER (6 FOR SHIPS WITH REDUCED STORAGE) WITH 12 SPARE OBA CANISTERS PER OBA AND ONE CAP PER CANISTER. TO SUPPORT USN FLEET DURING A FIRE EMERGENCY, 50 OBA CANISTERS (NO OBAs) SHALL REMAIN ABOARD AFTER OBA PHASE OUT, PACKAGED FOR READY OFFLOADING.
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS (EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60) T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23),T-AGS 51, T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SMR	NOTES	UI	CUST	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
MANUAL	03950	MANUAL,OPERATORS	0X 0000-LL-CLE-9546	UXBOZZ	1	EA	1	2	4	6	2				
SEE NOTE-1 ABOVE	03950	PP-BREATH. APPARATUS	3HD4240-00-616-2857	UPAOZG	1	EA	1	AR	AR	AR	AR				
SEE NOTE-3 ABOVE	03950	PP-CANISTER OXYGEN	9G 4240-00-174-1365	UPAOZZ	1	EA	1	AR	AR	AR	AR				
SEE NOTE-3 ABOVE	03950	PP-CAP OBA CANISTER	9G 4240-00-089-7963	UPAOZZ	1	BX	1	AR	AR	AR	AR				
SEE NOTE-1 ABOVE	03950	SCBA SPARE CYLINDER	0X 0000-LL-CLE-9548	UXBOZZ	1	EA	1	AR	AR	AR	AR				
SEE NOTE-1 ABOVE	03950	SCBA UNIT	0X 0000-LL-CLE-9549	UXBOZZ	1	EA	1	AR	AR	AR	AR				
SEE NOTE-2 ABOVE	03950	SPARES	0X 0000-LL-CLE-9547	UXBOZZ	1	KT	1	AR	AR	AR	AR				

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ALLOWANCE EQUIPAGE LIST (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
FIRE FIGHTERS ENSEMBLE (FFE)		PLAN/APPLICABLE DRAWING	2-880048120	03/08/94	1

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
FIREFIGHTER 3000 SERIES CODE 30 NOMEX LINER GORTEX BARRIER NOMEX COVERING. MANUFACTURED BY BODY-GUARD DIVISION OF LION APPAREL CAGE OCEA6 3401 PARK CENTER DRIVE P.O.BOX 14576 DAYTON OH. 45413-0576. PHONE (800)421-2926. ADDITIONAL ORDERING INFORMATION: P-3000-30-00 SERIES P3000 BASIC FIREMANS TURNOUT 7.5 OZ NOMEX HIGH WAIST PANT YELLOW. COAT: 27IN LG REFLEXITE TRIM LIME (SPECIFY CHEST SIZE IN INCHES) PANT: PF057 19 X 4.5 INCH FLY FRONT W/NYLON VELCRO PL030300 CODE 30 LINER FOR P3000 TURNOUT PM001 BARTACK P 3000 PM199 NFPA LABEL SEWN TO FLY PP075 9X10X2IN SEMI-BLWS FOR P3000,VELCRO JUMBO POCKET ON PANT PS005 P3000 PANT SHELL W/SNAP IN LINER PT05112 2 INCH REFLEXITE TRIM AROUND PANT LEG LIME SUSPENDERS WIDE HEAVY DUTY SUSPENDERS REQD FOR EACH SUIT. THESE SHOULD BE LOCALLY PRO CURED. NORMAL PRICE $9.50 PER ARTICLE NOTE-1-SHIPS TO RETAIN ALL SERVICEABLE USN ENSEMBLES. COMMERCIALLY AVAILABLE NFPA (1971/1986 EDITION) APPROVED TWO PIECE TURNOUT FIREMEN OUTFITS AND GLOVES TO BE SUBSTITUTED FOR UNUSABLE NAVY ENSEMBLES. NEW CONSTRUCTION SHIPS TO BE OUTFITTED W/TWO PIECE TURNOUT FIREMAN OUTFITS AND GLOVES (I.E. COMMERCIALLY AVAIL VIA GSA CONTRACT GS-07F 1893A EXP APRIL 94). MSC STANDARD/REDUCED STORAGE RECOMMENDED PERCENT OF SIZES IN LEFTHAND COLUMN. NOTE-2-EQUIPMEMT BAGS; SAME MANUFACTURER AND ADDRESS AS ABOVE. NOTE-3-GLOVES; MODELS BG1002-1008 AS REQUIRED IN APPRO															

REFERENCE DATA	ITEM NAME	STOCK NO.	SECCL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
FIRE FIGHTERS ENSEMBLE (FFE)			2-880048120	10/01/93	2

CHARACTERISTICS

PRIATE SIZES. MODEL BG1008 RECOMMENDED. RECOMMEND
SIMILAR SIZE DISTRIBUTION AS TURNOUT GEAR.
NOTE-4-ANTIFLASH HOODS ARE IN ADDITION TO THE ONE ISSUED
TO EVERY CREW MEMBER.
NOTE-5-CAIRNS FIRE FIGHTERS HELMET OR EQUAL. APPROVED
CAIRNS MODEL IS THE "INTRUDER" 990N-2.
(ANY SUBSTITUTE HELMET MUST BE NFPA APPROVED WITH THE
SAME SALIENT CHARACTERISTICS AS THE "INTRUDER".)
MANUFACTURER: CAIRNS AND BROTHERS INC.
(CAGE 10256) 60 WEBRO ROAD P.O.BOX 4076 CLIFTON
NJ. 07012. PHONE (800)422-4767.
COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS
(EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),
T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23),T-AGS 51,
T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-2 ABOVE	03950	BAG	0X 0000-LL-CLE-9550	UXBOZZ				1		EA	1	13	26	39	9				
SEE NOTE-3 ABOVE	03950	GLOVES,BODYGUARD	0X 0000-LL-CLE-9551	UXBOZZ				1		PR	1	13	26	39	9				
SEE NOTE-4 ABOVE	03950	HOOD-ANTIFLASH	9D 8415-01-268-3473	UPAOZZ				1		EA	1	26	52	78	18				
AA50371SZ9	58536	PP-BOOTS-FIREMAN SIZ	9D 8430-00-753-5939	UPAOZZ				1		PR	1	3	6	9	2				
AA50371SZ10	58536	PP-BOOTS-FIREMAN SIZ	9D 8430-00-753-5940	UPAOZZ				1		PR	1	5	10	15	3				
AA50371SZ11	58536	PP-BOOTS-FIREMAN SIZ	9D 8430-00-753-5941	UPAOZZ				1		PR	1	3	6	9	3				
AA50371SZ12	58536	PP-BOOTS-FIREMAN SIZ	9D 8430-00-753-5942	UPAOZZ				1		PR	1	1	2	3	1				
AA50371SZ13	58536	PP-BOOTS-FIREMAN SIZ	9D 8430-00-753-5943	UPAOZZ				1		PR	1	1	2	3	0				
SEE NOTE-5 ABOVE	03950	PP-HELMET FIREMAN MK	9D 8415-01-271-8069	UPAOZZ				1		EA	1	13	26	39	9				
SEE NOTE-1 ABOVE	03950	TURNOUT GEAR,BDYGRD	0X 0000-LL-CLE-9555	UXBOZZ				1		EA	SEL	13	26	39	9				
40-PERCENT	03950	TURNOUT GEAR,LARGE	0X 0000-LL-CLE-9552	UXBOZZ						EA	SEL								
15-PERCENT	03950	TURNOUT GEAR,LARGE X	0X 0000-LL-CLE-9556	UXBOZZ						EA	SEL								
30-PERCENT	03950	TURNOUT GEAR,MEDIUM	0X 0000-LL-CLE-9553	UXBOZZ						EA	SEL								

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
FIRE FIGHTERS ENSEMBLE (FFE)			2-880048120	10/01/93	3

CHARACTERISTICS					SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
15-PERCENT	03950	TURNOUT GEAR,X-LARG	OX	0000-LL-CLE-9554	UXBOZZ						EA	SEL								

END

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
CTA 101	3	ALLOWANCE EQUIPAGE LIST (AEL)									2-880048120			10/01/93			3	
SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C								IDENTIFICATION NO.			DATE			PAGE	

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
EMERGENCY ESCAPE BREATHING DEVICE (EEBD)			2-880048121	10/01/93	1

CHARACTERISTICS

THE EEBD IS INTENDED ONLY FOR USE AS AN EMERGENCY DEVICE FOR ESCAPE THROUGH AN IRREPAIRABLE HOSTILE ATMOSPHERE. IT IS NOT INTENDED AND SHALL NOT BE USED FOR FIRE FIGHTING OR IN ANY MANNER OTHER THAN THAT FOR WHICH IT WAS DESIGNED.
NOTE 1: MAINTAIN A TOTAL OF FOUR (4) EEBD'S PER LOCKER.
COLUMN 1 FOR T-AG (194,195), T-AGM (EXCEPT 23), T-AGOR, T-AGOS (EXCEPT 23), T-AGS (EXCEPT 39,45,60), T-AK, T-ATF, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60), T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURCE / MAINT / RECOVR	NOTES	CUSTOD	UI		ON BOARD ALLOWANCE TABLE COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-1 ABOVE	03950	EMER ESC BAPRS	1HS4240-01-116-9888	UPAOZZ	1		EA	1	4	8	12					

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SHIP TYPE & HULL NO.	PAGE			IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL) PART II	SECTION C	2-880048121	10/01/93	1

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
NAVAL FIREFIGHTER THERMAL IMAGER (NFTI)			2-880048123	01/04/94	1

CHARACTERISTICS

COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO),
T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS(39,45,60),T-ARC,
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SECCL	SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
P4428B	6P860	BATTERY BOX	9G 6140-01-305-5890		UPAOZZ	1		EA	1	6	12	18					
AL9	09823	BATTERY-ALKA AA 1.5V	9G 6135-00-985-7845		UPAOZZ	1		PG	1	3	5	8					
NNS22D/18694	K8596	BULKHEAD THERMOMETER	6685-99-529-8503					EA		6	12	18					
955	65469	FIRE FINDER	4210-01-207-9687		UPAOGD	1		EA	1	1	1	1					
P4428USN	6P860	THERMAL IMAGER(NFTI)	7HH4210-01-213-7310		UPAOGD	1		KT	1	1	1	1					

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SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C	IDENTIFICATION NO.	DATE	PAGE
CTA 101	1	ALLOWANCE EQUIPAGE LIST (AEL)		2-880048123	01/04/94	1

ALLOWANCE EQUIPAGE L.. (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
HAND PORTABLE ELECTRIC LANTERN			2-880048124	09/22/93	1

CHARACTERISTICS

REPAIR PARTS FOR THE LANTERN CAN BE FOUND ON APL 249990137.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO),
T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),
T-ARC,MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL / SOURC / MAINT / RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
BA200	H1200	BATTERY DRY 6 VOLT	9Y 6135-00-050-3280	UPCOZZ	1		EA	1	16	32	48					
MILF16377-53-001	81349	BODY ASSEMBLY,LANT	9G 6230-00-783-6519	7PAOZZ	1		EA	1	4	8	12					
MILF16377-53-002	81349	HANDLE AND SWITCH	9G 6230-00-776-5920	UPAOZZ	1		EA	1	4	8	12					

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EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
DAMAGE CONTROL TOOL BOX			2-880048125	01/04/94	1

CHARACTERISTICS

NOTE-1-THIS ITEM IS TO BE FABRICATED LOCALLY OR BY
SHIPS FORCE.
COLUMN 1 FOR T-AG,T-AGM (EXCEPT 23),T-AGOS (EXCEPT 23),
T-AGS (EXCEPT 39,45,60),T-AK,MPS (EXCEPT JOHN BOBO),
T-AGOR,T-ATF
COLUMN 2 FOR T-AGDS,T-AGOS,T-AGS (39,45,60),T-ARC,
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMNS 4 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SEC CL / SOURC / MAINT / RECOV	NOTES	UI	CUST	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
GGGB451	81348	BLADE-HND HAKSA 10 I	9Q 5110-00-277-4588	UPAOZZ	1	BD	1	2	4	6					
CV20S9200-335182	80064	CHEST TOOL KIT	9Q 5140-00-369-4927	UPAOZZ	1	EA	1	1	2	3					
GGGC313	81348	CHISEL-COLD HND 1-2	9Q 5110-00-186-7107	UPAOZZ	1	EA	1	1	2	3					
GGGC749	81348	CUTTER CBL HND OPR	9Q 5110-00-595-8267	UPAOZZ	1	EA	1	1	2	3					
GGGC771	81348	CUTTER,PIPE 2 1/2 IN	9Q 5110-00-221-1049	UPAOZZ	1	EA	1	1	2	3					
250-795DIE1794B	80064	DRIFTPIN-SGL PNT 1-2	9Q 5120-00-242-8673	UPAOZZ	1	EA	1	1	2	3					
DB129	C7127	DRILL SET-TW 1-16T01	9Q 5133-00-293-0983	UPAOZZ	1	SE	1	1	2	3					
A-A-448	58536	DRILL,ELECTRIC,PORT	9Q 5130-00-017-6074	UPAOZZ	1	EA	1	1	2	3					
GGGF00671TYB	81348	FRAME-HAND HACKSAW T	9Q 5110-00-289-9657	UPAOZZ	1	EA	1	1	2	3					
AA1305	58536	HAMMER BALL PEEN 2 L	9Q 5120-00-061-8546	UPAOZZ	1	EA	1	1	2	3					
S2064	82041	KNIFE 3IN	9Q 5110-00-530-1757	UPAOZO	1	EA	1	1	2	3					
FAC01025	34871	PLIERS-SLIP JOINT 8	9Q 5120-00-223-7397	UPAOZZ	1	EA	1	1	2	3					
GGGT563TY7CL1	81348	PUNCH-BSMITHS 3-4 IN	9Q 5120-00-197-9477	UPAOZZ	1	EA	1	1	2	3					
345010	59433	SCREWDRIVER-CRS TIP	9Q 5120-00-542-3438	UPAOZZ	1	EA	1	1	2	3					
GGGS121TY1CL5STY1	81348	SCREWDRIVER-FLT TIP	9Q 5120-00-237-6985	UPAOZZ	1	EA	1	1	2	3					
GGGS620	81348	SPECTACLES-INDUSTRIA	9G 4240-00-516-4728	7PAOZZ	1	PR	1	1	2	3					
GGGT106	81348	TAPE-MES STL 8FT	9Q 5210-00-293-3505	UPAOZZ	1	EA	1	1	2	3					
GGGW651	81348	WRENCH PIPE ADJ 14 I	9Q 5120-00-277-1486	UPAOZZ	1	EA	1	2	4	6					
SEE-NOTE-1 ABOVE	03950	WRENCH,DOGGING,1IN	0X 0000-LL-CLE-9558	UXBOZZ	1	EA	FAB	1	2	3					
810-1385789PC13	80064	WRENCH-DK DR VL	9Q 5120-00-030-2738	UPAOZZ	1	EA	1	1	2	3					
AA2344	58536	WRENCH-OE ADJ 12 IN	9Q 5120-00-264-3796	UPAOZZ	1	EA	1	2	4	6					
GGGW00649	81348	WRENCH-PLR 8 1/2 IN	9Q 5120-00-277-4244	UPAOZZ	1	EA	1	1	2	3					

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EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
FIREFIGHTING/ACCESS EQUIPMENT LIST		PLAN/APPLICABLE DRAWING	2-880048126	01/04/94	1

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ON BOARD ALLOWANCE TABLE

PORTABLE REFRACTOMETER FOR TESTING FOAM(AEL 2-930034044) TO BE STORED OUTSIDE DC LOCKER. IT IS THE REFRACTOMETER FOR THE SHIP AND NOT PART OF THE DC LOCKER ALLOWANCE. EXACT LOCATION TO BE IDENTIFIED ON THE CONSOLIDATED DC LISTING. 1.5" FITTINGS IN REFRACTOMETER KIT ARE NPSH FITTINGS, 11.5 TPI

NOTE-1-PORTABLE FOAM MUST BE USCG APPROVED (UNIVERSAL FOAM 3/6 PERCENT OR EQUAL)OBTAINED IN 5 GAL CANS. COMPATIBILITY W/ONBOARD FOAM MUST BE CHECKED. FOAM GENERATING EQUIPMENT IS NORMALLY SET FOR 6 PERCENT FOAM CONCENTRATION. SOME EXISTING SHIPS HAVE 3 PERCENT SYSTEMS INSTALLED. FOAM IN-LINE EDUCTOR AND AIR ASP NOZZLE MUST ALL BE EITHER OF SAME MFR AND/OR COMPATIBLE WITH INSTALLED SYSTEM. MFRS: 3M FIRE PROTECTION SYSTEMS. 1137 RAINBOW DR. MARTINEZ, CA 94553; PHONE (510) 229-1284 CHUBB NATIONAL FOAM (CAGE: OLZRO) 150 GORDON DRIVE EXTON PA. 19341. PHONE (215) 363-1400.

NOTE-2-THE 1-1/2IN IN LINE FOAM EDUCTOR IS TO BE RATED FOR 100 PSI 95 GPM (I.E. CHUBB NATIONAL MODEL HLP-9 CATALOG PAGE 3-13).

NOTE-3-THE 1-1/2IN AIR ASPIRATED FOAM NOZZLE IS TO BE RATED FOR 100 PSI 95 GPM (I.E. CHUBB NATIONAL MODEL JS-10B CATALOG PAGE 4-9).

NOTE-4-1-1/2IN VARI NOZZLES IAW NSN 4210-00-465-1906 OR 4210-01-111-8531 ARE NOT USCG APPROVED. ORDER AKRON 3019 USCG APPROVED TYPE OR EQUAL). ENSURE VARI NOZZLES DIRECT FROM VENDER (I.E. 1-1/2IN THREAD COMPATIBILITY (NH OR NPSH). VARI NOZZLES APPROVED FOR REPLACEMENT OF USCG APN AND APPLICA TOR. MAINTAIN TWO 1-1/2IN APNS AND ONE 4 FT APPLICATOR IN DC LOCKER. AIR ASP NOZZLES ARE TO BE USED WITH PORTABLE FOAM SYSTEMS. VARI NOZZLES ARE NOT APPROVED FOR FOAM APPLICATION EXCEPT ON HELO DECK AREAS. MFR: AKRON BRASS CO. CAGE 00912

REFERENCE DATA	ITEM NAME	STOCK NO.	SECCL	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ALLOWANCE EQUIP/ ;T (AEL)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
FIREFIGHTING/ACCESS EQUIPMENT LIST		PLAN/APPLICABLE DRAWING	2-880048126	01/04/94	2

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

P.O.BOX 86 WOOSTER OH 44691. PHONE(216)264-5678
NOTE-5-FOUR FOOT APPLICATOR MUST HAVE THIS NON-CLOGGING
SPRINKLER TYPE TIP INSTALLED VICE THE PINEAPPLE
TIP SUPPLIED WITH THE APPLICATOR KIT. AKRON BRASS
MODEL NO. 1034 OR EQUAL.
ENSURE ALL 1-1/2IN FITTINGS MEET THREADING REQUIREMENTS
OF THE SPECIFIC SHIP. (I.E. NAVY STANDARD 11.5 TPI
(NPSH) OR USCG APPROVED 9 TPI(NH) COMMERCIAL EQUIPMENT
2-1/2IN FITTINGS ARE SAME THREAD SIZE FOR BOTH NPSH
AND NH; 7.5 TPI. ON SHIPS WHOSE 1.5" FIRE STATIONS ARE
OUTFITTED WITH 75' HOSES, THE SPARE HOSES IN THE DC LOCKER
MUST ALSO BE 75' HOSES. THESE HOSES MAY HAVE TO PROCURED
LOCALLLY.
TABLE BELOW FOR NAVY STANDARD THREADED EQUIPMENT FOR
1-1/2IN FIRE STATIONS.

ITEM	NSN
1. TRIGATE 2-1/2 F INLET TO 1-1/2 X 1-1/2 X 1-1/2 M OUTLET	4210-00-255-0232
2. HOSE ASSY 1-1/2IN X 50FT	4210-01-131-0249
3. HOSE ASSY 1.5" X 75'	COMMERCIAL
4. NOZZLE 1-1/2IN APN	4210-00-392-2943
5. ADAPTER 1-1/2IN M TO 2-1/2IN M	4210-00-277-3378
6. COUPLING,HOSE DBL F 1-1/2	4210-00-307-4699
7. REDUCER,2-1/2IN F X 1-1/2IN M	4210-00-202-7466
8. REDUCER,2-1/2IN F X 1-1/2IN F	4210-00-377-6521
9. SIAMESE,WYE GATE,1-1/2IN (2-1/2IN X 1-1/2IN X 1-1/2IN)	4210-00-255-0234

COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS
(EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGS (39,45,60), T-ARC,
MPS (JOHN BOBO)
COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR,T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23)
T-AGS 51,T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR

REFERENCE DATA		ITEM NAME	STOCK NO.	SEC CLE	SOURCE	MAINT	RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
FIREFIGHTING/ACCESS EQUIPMENT LIST		PLAN/APPLICABLE DRAWING	2-880048126	01/04/94	3

CHARACTERISTICS

CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SECCL/SOURC/MAINT/RECOV	NOTES	CUST/UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-1 ABOVE	03950	AFFF FOAM CNCNTRATE,	0X 0000-LL-CLE-9559	UXBOZZ	1	CN	1	8	16	24	8				
9000-S6202/73125PC3	80064	APPLICATOR NOZZLE 4	9C 4210-00-372-0864	UPAOZZ	1	EA	1	1	2	3	1				
GGGA926ATY2	81349	AX-PICK HEAD	9C 4210-00-142-4949	UPAOZZ	1	EA	1	1	2	3	1				
GGGB50	81348	BAG LINEMAN TOOL	9Q 5140-00-288-7763	UPAOZZ	1	EA	1	2	4	6					
250-795DIE1794B	80064	BAR CHSL PINCH 36 IN	9Q 5110-00-240-6031	UPAOZZ	1	EA	1	1	2	3					
GGGC740	81348	CUTTER BOLT 24 IN	9Q 5110-00-596-9156	UPAOZZ	1	EA	1	1	2	3	1				
SEE NOTE-2 ABOVE	03950	EDUCTOR,IN-LINE,FOAM	0X 0000-LL-CLE-9560	UXBOZZ	1	EA	1	2	4	6	1				
AA1292	58536	HAMMER SLEDGE 12 LB	9Q 5120-00-224-4130	UPAOZZ	1	EA	1	1	2	3					
SEE NOTE-5 ABOVE	03950	HEAD,SPRINKLER,FIRE	0CM4210-01-096-2870	UPAOZZ	1	EA	1	1	2	3	1				
GH-400-N2-1/2	73842	HOSE 2 1/2 IN X 50 F	9C 4210-01-131-0247	UPAOZZ	1	EA	1	4	8	12					
SEE NOTE-4 ABOVE	03950	HOSE ASSY, 1-1/2 IN	1HS0000-LL-CQA-3688	UBXOZZ	1	EA	SEL	2	4	6	2				
SEE NOTE-4 ABOVE	03950	HOSE ASSY,1-1/2X50FT	0X 0000-LL-CLE-9561	UXBOZZ	1	AY	SEL								
SEE NOTE-4 ABOVE	03950	HOSE ASSY,1-1/2X75FT	1HS0000-LL-CQA-3689	UXBOZZ		EA	SEL								
SEE NOTE-3 ABOVE	03950	NOZZLE,1-1/2IN AIR A	0X 0000-LL-CLE-9562	UXBOZZ	1	EA	1	2	4	6	2				
SEE NOTE-4 ABOVE	03950	NOZZLE,1-1/2IN APN	0X 0000-LL-CLE-9563	UXBOZZ	1	EA	1	2	3	6	2				
SEE NOTE-4 ABOVE	03950	NOZZLE,1-1/2IN VARIN	0X 0000-LL-CLE-9564	UXBOZZ	1	EA	1	2	4	6	2				
1385835PC1T024-30-32-33	80064	NOZZLE-FRHS WTR	9C 4210-00-392-2944	UPAOZO	1	EA	1	1	2	3					
GGGW201SZ4	81348	WEDGE JNT BRKG SIZE	9Q 5120-00-224-9486	UPAOZZ	1	EA	1	1	2	3	2				
GGGW201SZ5	81348	WEDGE JNT BRKG SIZE	9Q 5120-00-224-9487	UPAOZZ	1	EA	1	1	2	3	2				
GGGW665 2INCTOC	81348	WRENCH-SPANNER	9Q 5120-00-288-8746	UPAOZZ	1	EA	1	1	2	3	1				
AHS304	55719	WRENCH-SPNR	9Q 5120-00-277-9076	UPAOZZ	1	EA	1	1	2	3	1				

E N D

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
MISCELLANEOUS DAMAGE CONTROL EQUIPMENT		PLAN/APPLICABLE DRAWING	2-880048127	01/10/94	1

CHARACTERISTICS	SECCL	SOURC	MAINT	RECOV	NOTES	CUST	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8

ON BOARD ALLOWANCE TABLE

NOTE-1-BOX PATCHES NAVSEA STANDARD DWG. NO. 804-5959236
PLATE PATCHES NAVSEA STANDARD DWG. NO. 804
5959239. SELECT TYPE AND SIZE PATCHES FROM NAVSEA DWGs TO
OUTFIT SHIP WITH CORRECT QUANTITY AS GIVEN IN COLUMNS 1,
2, AND 3.
NOTE-2-ALL FIRE EXTINGUISHERS MUST BE MARINE TYPE
COAST GUARD APPROVED.
NOTE-3-FOR JUBILEE PATCHES, COMMERCIALLY PROCURE IN THE
FOLLOWING SIZES: 1-1/2IN 2IN 4IN 6IN AND 8IN.
ENSURE ALL 1-1/2IN FITTINGS MEET THREADING REQUIREMENTS
OF THE SPECIFIC SHIP. (I.E. NAVY STANDARD 11.5 TPI
(NPSH) OR USCG APPROVED 9 TPI (NH) COMMERCIAL EQUIP
MENT. 2-1/2IN FITTINGS ARE SAME THREAD SIZE FOR BOTH
NPSH AND NH; 7.5 TPI). ON SHIPS WHOSE FIRE STATIONS ARE
OUTFITTED WITH 75' HOSES, THE SPARE HOSES IN THE DC
LOCKERS MUST ALSO BE 75' HOSES. THESE HOSES MAY BE
PROCURED LOCALLY.
TABLE BELOW FOR NAVY STANDARD THREADED EQUIPMENT. FOR
1-1/2IN FIRE STATIONS.

ITEM	NSN
1. TRIGATE 2-1/2 F INLET TO 1-1/2 X 1-1/2 X 1-1/2 M OUTLET	4210-00-255-0232
2. HOSE ASSY,1-1/2IN X 50FT	4210-01-131-0249
3. HOSE ASSY 1.5" X 75'	COMMERCIAL
4. NOZZLE 1-1/2IN APN	4210-00-392-2943
5. ADAPTER 1-1/2IN M TO 2-1/2IN M	4210-00-277-3378
6. COUPLING,HOSE DBL F 1-1/2	4210-00-307-4699
7. REDUCER 2-1/2IN F X 1-1/2IN M	4210-00-202-7466
8. REDUCER 2-1/2IN F X 1-1/2IN F	4210-00-377-6521
9. SIAMESE,WYE GATE 1-1/2IN (2-1/2IN X 1-1/2IN X 1-1/2IN)	4210-00-255-0234

COLUMN 1 FOR T-AG 194,T-AGM (EXCEPT 23),T-AGS
(EXCEPT 39,45,51,60),T-AK, MPS (EXCEPT JOHN BOBO)
COLUMN 2 FOR T-AGDS,T-AGOS 23,T-AGS (39,45,60),T-ARC,
MPS (JOHN BOBO)

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL / PLAN/APPLICABLE DRAWING	IDENTIFICATION NO.	DATE	PAGE
MISCELLANEOUS DAMAGE CONTROL EQUIPMENT			2-880048127	01/10/94	2

CHARACTERISTICS

COLUMN 3 FOR T-AE,T-AFS,T-AGM 23,T-AH,T-AKR, T-AO
COLUMN 4 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23)
T-AGS 51,T-ATF
COLUMNS 5 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL/SOURC/MAINT/RECOV	NOTES	CUST/UI		ON BOARD ALLOWANCE TABLE COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-3 ABOVE	03950	ADAPTR,1-1/2 M X 2-1	0X 0000-LL-CLE-9565	UXBOZZ	1	EA	1	2	4	6					
FAC01011	34871	BAR-WRKG-30IN	9Q 5120-00-293-0665	UPAOZZ	1	EA	1	1	2	3	1				
BA030	H1200	BATTERY D CELL 1.5 V	9G 6135-00-835-7210	UPAOZZ	1	PG	1	1	2	3	1				
AA431 8IN	58536	CLAMP-C MED SER 2 1-	9Q 5120-00-840-3358	UPAOZZ	1	EA	1	6	12	18					
AA431 6IN	58536	CLAMP-C,6 IN	9Q 5120-00-203-6431	UPAOZZ	1	EA	1	6	12	18					
ASTM C387	81346	CONCRETE PRE-MIX	9Q 5610-00-985-1800	UPAOZZ	1	BG	1	1	2	3	1				
MILC52404	81349	COUPLING HOSE DBL FE	9C 4210-00-288-8816	UPAOZZ	1	EA	1	2	4	6	1				
SEE NOTE-3 ABOVE	03950	COUPLING,HSE DBL(F)1	0X 0000-LL-CLE-9566	UXBOZZ	1	EA	1	2	4	6	7				
FAC01015	34871	CROWBAR-TY 2 SZ 4	9Q 5120-00-224-1390	UPAOZZ	1	EA	1	1	2	3	1				
1544-2 1-2	81348	EDUCTOR 1 1/2 IN	9C 4320-00-217-0938	UPAOZZ	1	AY	1	1	2	3	1				
SEE NOTE-2 ABOVE	03950	EXTINGUISHER-FIRE CO	9C 4210-00-203-0217	UPAOZ2	1	EA	1	2	4	6					
SEE NOTE-2 ABOVE	03950	EXTINGUISHER-FIRE PK	3HD4210-00-989-4589	7PAOGG	1	EA	1	2	4	6					
MILF3747	81349	FLASHLIGHT WATERPROO	9Q 6230-00-270-5418	UPAOZZ	1	EA	1	13	26	39	9				
43068LLIBPC6	77842	GASKET,HOSE 1 1/2 IN	9Q 5330-00-239-1873	UPAOZZ	1	EA	1	12	24	36	12				
2118365PC21	80064	GASKET,HOSE 1.562 IN	9Z 5310-00-728-7702	UPAOZZ	1	EA	1	12	24	36					
32070	08219	GASKET,HOSE 2 1/2 IN	9Q 5330-00-239-1877	UPAOZZ	1	EA	1	12	24	36					
T1-5501-1286281PC7	80064	GASKET,HOSE 2 1/2 IN	9Z 5330-00-246-2914	UPAOZZ	1	PG	1	1	1	2	1				
MIL-R-2765	81349	GASKET,NMTLC HOSE 3I	9Z 5330-00-239-1879	UPAOZZ	1	EA	1	10	20	30					
MIL-R-2765	81349	GASKET,NMTLC HOSE 4I	9Z 5310-00-239-1882	UPAOZZ	1	EA	1	10	20	30					
1385835PC19	80064	GASKET/WASHER-U-SHAP	9Z 5310-00-372-0889	UPAOZZ	1	EA	1	4	8	12					
ASTMF696LRG	81346	GLOVES-LTHR LMN LRG	9D 8415-00-274-2433	UPAOZZ	1	PR	1	5	10	15	5				
ASTMF696MED	81346	GLOVES-LTHR MED	9D 8415-00-274-2432	UPAOZZ	1	PR	1	3	6	9	3				
AA1306	58536	HAMMER-RIP CLAW-20 O	9Q 5120-00-892-5744	UPAOZZ	1	EA	1	1	2	3					
SEE NOTE-3 ABOVE	03950	JUBILEE PIPE PATCH	0X 0000-LL-CLE-9568	UXBOZZ	1	EA	FAB	8	16	24					
C65451LVOL2	89875	KIT-FIRST AID	9L 6545-00-116-1410	UPAOZZ	1	EA	1	2	4	6	2				
GGGH86	81348	MAUL-5 LB 32 IN HNDL	9Q 5120-00-255-1476	UPAOZZ	1	EA	1	1	2	3	2				
SEE NOTE-1 ABOVE	03950	PATCH-BOX VARIOUS SI	1HS0000-LL-CJ7-5880	UXBOZZ	1	EA	FAB	1	2	3					
SEE NOTE-1 ABOVE	03950	PLATE PATCHES W-T-J-	1HS0000-LL-CJ7-5892	UXBOZZ	1	EA	FAB	4	8	12					

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
MISCELLANEOUS DAMAGE CONTROL EQUIPMENT		PLAN/APPLICABLE DRAWING	2-880048127	01/10/94	3

CHARACTERISTICS				SECCL SOURC MAINT RECOV	NOTES	CUST	UI		COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
SEE NOTE-3 ABOVE	03950	REDUCER,2-1/2F X 1-1	0X 0000-LL-CLE-9569	UXBOZZ	1		EA	1	2	4	6	2				
SAND	03950	SAND	1HA0000-LL-CJ6-8812	UPAOZZ	1		BG	1	1	2	3	1				
GGGS51	81348	SAW CIRCULAR ELECTRI	9Q 5130-00-889-8991	UPAOZG	1		EA	1	1	2	3					
D12S26	90226	SAW-HAND XCUT 26 IN	9Q 5110-00-596-0921	UPAOZZ	1		EA	1	1	2	3					
SEE NOTE-3 ABOVE	03950	SIAMESE WYE GATE	0X 0000-LL-CLE-9570	UXBOZZ	1		EA	1	2	4	6	2				
MILT16644	81349	TAPE, SOUNDING	9Q 5210-00-221-1887	UPAOZO	1		EA	1	1	2	3					
95270-52	83289	WAND-LGT CHMCL HAN Y	9G 6260-01-074-4230	UPAOZZ	1		BX	1	5	10	15	5				
GGGW651	81348	WRENCH-PIPE 36 IN	9Q 5120-00-270-4309	UPAOZZ	1		EA	1	1	2	3	1				

END

REFERENCE DATA		ITEM NAME	STOCK NO.	SECCL SOURCE MAINT RECOVR	NOTES	CUSTOD	UI	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
CTA 101	3	ALLOWANCE EQUIPAGE LIST (AEL)						2-880048127			01/10/94			3	
SHIP TYPE & HULL NO.	PAGE	PART II	SECTION C					IDENTIFICATION NO.			DATE			PAGE	

EQUIPAGE NOMENCLATURE/CHARACTERISTICS	TECHNICAL DOCUMENT NUMBER	MANUAL	IDENTIFICATION NO.	DATE	PAGE
DC MATERIALS LIST		PLAN/APPLICABLE DRAWING	2-880048128	10/01/93	1

CHARACTERISTICS

COLUMN 1 FOR T-AG 195,T-AGOR,T-AGOS (EXCEPT 23)
T-AGS 51,T-ATF
COLUMNS 2 THRU 8 BLANK
MSC-PECULIAR
CAGE-03950
CCF DATE -08 91

REFERENCE DATA	CAGE	ITEM NAME	STOCK NO.	SMR	NOTES	UI	CUST	COL 1	COL 2	COL 3	COL 4	COL 5	COL 6	COL 7	COL 8
CCCC419	81348	CANVAS-DUCKCLOTH	9D 8305-01-198-9806	UPAOZZ	1	YD	1	2							
MML751 2X4IN X 12FTLG	81348	LUMBER-SFT WOOD	9C 5510-00-663-4687	UPAOZZ	1	BF	1	48							
MML751 4X4IN X 8FTLG	81348	LUMBER-SFT WOOD	9C 5510-00-663-4691	UPAOZZ	1	BF	1	28							
FFN105	81348	NAIL COM 16D	9Z 5315-00-164-5121	UPAOZZ	1	LB	1	1							
461043 0TO1IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8953	UPAOZZ	1	EA	1	3							
461043 0TO2IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8958	UPAOZZ	1	EA	1	3							
461043 0TO3IN DIA	80064	PLUG,WOOD	9C 5510-00-260-8962	UPAOZZ	1	EA	1	3							
461043 7TO10IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8949	UPAOZZ	1	EA	1	1							
461043 1TO5IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8966	UPAOZZ	1	EA	1	1							
461043 3TO7IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8969	UPAOZZ	1	EA	1	1							
461043 4TO8IN DIA	80064	PLUG-WOOD TAPERED	9C 5510-00-260-8973	UPAOZZ	1	EA	1	1							
S8800-461043	80064	SHORING 2-1/4X4X18IN	9C 5510-00-268-3478	UPAOZZ	1	EA	1	12							

E N D

APPENDIX C

Subj: CHEMICAL, BIOLOGICAL, RADIOLOGICAL DEFENSE (CBR-D) MATERIAL CONDITIONS OF READINESS POLICY

Ref: (a) COMSCINST 3120.2D
(b) COMSCINST 3121.9
(c) COMSCINST 12410.25A
(d) CMPI 410
(e) COMSCINST 5040.2C

Encl: (1) CBR-D Installation and Equipment Standards

1. Purpose. To promulgate COMSC policy pertaining to CBR-D material readiness for ships under MSC control. CBR-D material condition encompasses decontamination (DECON) station installations, Countermeasure Washdown System (CMWD), Collective Protection Systems (CPS) and CBR-D personnel protective equipment and DECON supplies.

2. Background. The defensive and survivability capabilities of ships and personnel in a CBR contaminated environment continue to be matters of major concern. Improvements in material condition of readiness have been realized throughout the fleet; however, significant effort is necessary to maintain and upgrade shipboard CBR-D readiness. Ships which have the potential of operating in a CBR-D environment must be capable of carrying out their designated mission, or surviving a CBR attack and then reaching safe haven. While the threat of an attack with chemical agents is currently considered more likely than an attack with biological agents or nuclear weapons, all of these risks do exist and MSC ships and personnel must be prepared to operate successfully in a hostile CBR environment.

3. Policy

a. Design. The level of CBR-D features to be installed on MSC new construction ships is determined by the CNO during the requirement formulation process and promulgated in a Top Level Requirement (TLR) instruction. The level of CBR-D capability to be maintained on other MSC ships is promulgated by CNO in Projected Operating Environment/Required Operational Capabilities (POE/ROC) instructions. COMSC will maintain currency with the required capabilities and technical aspects of these documents revising guidance and directives as necessary. Any changes to the TLR or POE/ROC regarding shipboard CBR-D requirements as recommended by COMSC shall receive written concurrence from CNO and cognizant sponsors.

b. Ships

(1) Ship's characteristics shall comply with the latest COMSC authorized standards for the design, operation and maintenance of CBR-D systems (DECON stations, countermeasure washdown systems and collective protection systems, if installed) unless specifically excluded by this instruction or exempted by COMSC. Levels of material readiness are defined in enclosure (1). CBR-D equipment and supplies are to be maintained at prescribed operational levels as established in current allowance lists.

(2) Ships exempted from CBR-D requirements are required to ensure existing systems are operationally maintained or removed as directed by approved TRANSALT. Upgrades and modernization of ships requiring CBR-D capabilities will not be accomplished unless dictated by new developments and operational requirements. DECON station changes or additional heating, venting and air conditioning (HVAC) or structural modifications will be considered on a case-by-case basis.

(3) Short term chartered ships (1 year or less) may be exempted entirely depending on their mission and area of operation. For example, a ship chartered for transportation of bulk fuels would not be subjected to the standard criteria set forth herein whereas a chartered ship destined for service as a prepositioning ship would be required to comply. In general, ships in the point to point categories will not be equipped with CBR-D equipment and supplies. If the ship requires CBR-D, then the minimum level of readiness, as shown in enclosure (1), shall be required. Each charter/contract shall contain specific CBR-D requirements for the ship. In the event of a contingency involving the risk of a CBR attack, those ships which do not normally carry CBR-D equipment (RRF/charter) scheduled to enter the threat area, will be outfitted with CBR-D equipment and the ship's force trained in CBR-D in accordance with the procedures contained in enclosure (1).

c. Training and Drills. Training and drills shall be conducted on ships required to maintain a CBR-D capability as cited in references (a) through (c) and in charter/contract clauses. The CBR-D Officer (normally the Third Mate) shall be a graduate of the MSC CBR-D Course for the ship's CBR-D Officer in accordance with references (a) and (d), as applicable. This course must be successfully completed prior to assignment to a ship as the ship's CBR-D Officer. This course is required only once in an officer's career. If the CBR-D Officer has not served in this position for at least 3 years, he/she should then contact his/her Area Commander for a training assist to bring him/her current with any new matters and refresh past knowledge. Contract-operated and chartered ships required to have a CBR-D Officer may substitute another trained licensed officer as the CBR-D Officer in lieu of the Third Mate, if necessary. There is no acceptable substitute for the MSC CBR-D Course for the ship's CBR-D Officer.

4. Action

a. COMSC

(1) Engineering Director (N7)

(a) Act as the MSC point of contact on all matters concerning CBR-D policy.

(b) Advise COMSC on changes in technology and standards in CBR-D.

(c) Initiate revisions to the CBR-D Equipment and Supplies Allowances Lists as required and provide these revisions to COMSC (N4) for further documentation by Commanding Officer, Naval Sea Systems Command Engineering Logistics Support Activity, Mechanicsburg, PA.

(d) Coordinate with COMNAVSEASYSCOM in outfitting MSC ships with newly introduced CBR-D equipment as part of the overall Navy acquisition and distribution plan.

(e) Coordinate with COMSC (N10) to ensure appropriate CBR-D related clauses are in the contracts/charters of ships.

(f) Incorporate the latest CBR-D features on MSC's new construction ships to the level as defined by the documents described above and coordinate those requirements with the appropriate NAVSEA Program Manager. Optimum shipboard CBR-D features shall be used when considering CBR-D for new construction ships.

(g) Maintain currency in the technical aspects of these systems, disseminate appropriate guidance throughout MSC as it becomes available and recommend changes to the standards established herein.

(h) Budget for the required modifications and upgrades to MSC ships, and coordinate the accomplishment of planned work with the appropriate Administrative Commander.

(i) Ensure radiac allowances are established and that maintenance support is available.

(j) In coordination with COMSC (N3), recommend inclusion or exclusion of short term chartered ships in this CBR-D program to COMSC in sufficient time prior to the ship coming on hire to address contract modifications, accomplish required outfitting and any required ship alterations.

(k) In conjunction with COMSC (N3), determine which MSC or chartered ships will require a DECON station capability and coordinate the establishment of DECON station policy and procedures for these ships. Coordinate accomplishment of required installations and/or structural modifications.

(l) Coordinate the review of DECON stations, HVAC modifications and/or safe haven configurations for adequacy with Naval Surface Warfare Center (NSWC), Dahlgren, VA.

(m) In conjunction with COMSC (N3), coordinate CBR-D outfitting and training of RRF/charter ships with COMSC and COMSCLANT/COMSCPAC in the event of a contingency involving risk of CBR-D attack utilizing procedures delineated in enclosure (1).

(n) Review Ship Command Inspection reports to monitor CBR-D readiness and identify problems requiring COMSC assistance for resolution.

(o) Maintain advanced CBR-D related documentation and personnel protective system/equipment performance data.

(2) Operations Director (N3)

(a) In coordination with COMSC (N7), recommend inclusion or exclusion of short term chartered ships in this CBR-D program to COMSC in sufficient time prior to the ship coming on hire to address contract modifications, accomplish required outfitting and accomplish any required alterations.

(b) In conjunction with COMSC (N7), determine which MSC or chartered ships will require a DECON station capability and assist in the establishment of DECON station policy and procedures for these ships.

(c) Ensure that appropriate CBR-D related provisions are incorporated in the documentation and requirements of new construction, conversion and acquisition ships.

(d) In conjunction with COMSC (N7), coordinate CBR-D outfitting and training of RRF/charter ships with COMSC and COMSCLANT/COMSCPAC in the event of a contingency involving risk of CBR attack utilizing procedures delineated in enclosure (1).

(e) Coordinate revisions to TLR and POE/ROC instructions as necessary to include/exclude ship CBR-D requirements.

(f) Review Ship Command Inspection reports to monitor CBR-D readiness and identify problems requiring COMSC assistance for resolution.

(3) Transportation Director (N31)

(a) Act as initiating point to recommend inclusion or exclusion of short term chartered ships in this CBR-D program to COMSC prior to the ship coming on hire. Early identification is required to facilitate outfitting and the accomplishment of any required modifications to the ship and the contract. Recommendations are to be reviewed by COMSC (N7).

(4) Logistics Director (N4)

(a) Upon notification by COMSC (N7) of a revision to the CBR-D Equipment and Supplies Allowance List, ensure correctness of NSNs, and submit required documentation to Commanding Officer, Naval Sea Systems Command Engineering Logistics Support Activity, Mechanicsburg, Pennsylvania in order to change the ship's allowance lists.

(b) Administer the Government Furnished Equipment (GFE) CBR-D material aboard contract-operated and chartered ships. Ensure procedures are in place to remove material from applicable ships when contracts/charters expire.

(c) Assist as required in coordinating CBR-D outfitting of RRF/charter ships in the event of a contingency involving risk of CBR-D attack utilizing procedures delineated in enclosure (1).

(d) Establish and coordinate maintenance of the MSC CBR-D equipment War Reserve stockpile located at NSC NORFOLK.

(e) Provide direction to Area Commanders and Contract Operators in the ordering of initial and replacement CBR-D material in accordance with established allowances.

(f) As MSC's Configuration Data Manager (CDM), coordinate major equipage update requirements in response to tasking from N7.

(5) Contracts and Business Management Director (N10). Ensure appropriate CBR-D requirements are included in the contracts/charters of ships. When tasked by the Program Manager, include the appropriate CBR-D requirements in the Performance Work Statement of ships under contract or charter to MSC.

(6) Personnel, Manpower & Management Director (N1)

(a) Ensure required training curricula are in place and reflect the most recent CBR-D Doctrine changes. Ensure proper training instruction is provided at training facilities and shipboard training and drills are conducted.

(b) Review Ship Command Inspection reports to ensure proper CBR-D procedures and practices are in place.

(c) Assist as required in coordinating CBR-D training of RRF/charter ships in the event of a contingency involving risk of CBR attack.

b. Area Commanders/Administrative Commanders

(1) Recommend revisions to ship's required levels of compliance with this instruction when deemed appropriate. Recommend ships to receive CBR-D system upgrades to optimum capabilities along with rationale, current ship status and resources required.

(2) Provide input of recommended modifications to shipboard CBR-D allowances to facilitate budgeting of these modifications by COMSC. Budget for and provide funding to ships as required to ensure all equipment required in the established CBR-D allowance lists is aboard.

(3) Ensure proper maintenance support is provided for shipboard radiacs and all maintenance is accomplished.

(4) Ensure that trained and qualified CBR-D Officers are assigned to the ships where required. Maintain written verification record of ship's officers completing this training.

(5) Conduct and observe CBR-D training and drills during Phase III training and Phase III evaluation periods.

(6) Maintain ongoing CBR-D Readiness Status record for each ship required to maintain a CBR-D capability. Records should include: type of countermeasure washdown and DECON Station Systems installed, equipment outfitting status, training status, CBR-D system operational status, etc.

(7) As directed by COMSC, provide CBR-D outfitting and training, in accordance with the procedures delineated in enclosure (1), for RRF/charter ships brought on line/on hire to support contingency operations involving the risk of CBR attack.

(8) During Command Inspections conducted in accordance with reference (e), review the ship's CBR-D level of readiness as part of the ship's overall damage control evaluation. Optimum and minimum levels are detailed in enclosure (1). The following criteria shall be utilized in evaluating the ship's CBR-D level of readiness:

(a) SATISFACTORY

1. Ship has optimum or minimum level systems and all systems are operational.

_2_. Ship at either level with at least 75% of full allowance of required major equipment and supplies on board (i.e., clothing, masks, canisters, medical supplies, detectors, radiacs and DECON kits).

_3_. The Third Officer or an authorized substitute, has successfully completed the MSC CBR-D Course for the ship's CBR-D Officer.

(b) UNSATISFACTORY

_1_. Ship below minimum levels. No significant effort toward achieving minimum level can be verified through documentation.

_2_. Ship at either level, any system inoperative.

_3_. CBR-D equipment and supply quantities deficient in excess of 25% of full allowance levels in the major items (i.e., clothing, masks, canisters, medical supplies, detectors, radiacs and DECON kits).

_4_. No officer assigned who has successfully completed the MSC CBR-D Course for the ship's CBR-D Officer.

(9) Maintain advanced CBR-D related documentation and personnel protective system/equipment performance data.

(10) Conduct Quality Assurance (QA) inspections to ensure contract operator's compliance with the provisions of this directive in accordance with their individual contracts or modifications which incorporate these requirements.

c. Ships

(1) Ensure minimum CBR-D equipment and supply requirements are met.

(2) Maintain all installed CBR-D systems in fully operational status.

(3) Maintain items listed in established CBR-D allowance list and requisition replacement equipment as required for those items which have limited shelf lives.

(4) Ensure Phase II shipboard training and required drills and exercises are conducted, logged and reported as necessary.

(5) Maintain current versions of CBR-D reference documentation on board as listed in Appendix D of enclosure (1).

d. Requests for waivers or exemptions from the provisions established herein must be formally submitted in writing to COMSC (N7) via the Administrative Commander. Supporting documents and justification must accompany the request. Decisions for approval or disapproval will be made by COMSC following staff review and concurrence of CNO and/or sponsors, as appropriate.

e. MSC contract operators shall comply with and support the provisions of this directive in accordance with the terms of their individual contracts or modifications which incorporate these requirements.

APPENDIX C, ENCLOSURE (1)

CBR-D INSTALLATION AND EQUIPMENT STANDARDS

1. COUNTERMEASURE WASHDOWN SYSTEMS

A. OPTIMUM LEVEL: A fixed system of hard piping and nozzles capable of providing total ship coverage (with sufficient water pressure) and of being activated from the interior of the ship.

B. MINIMUM LEVEL: Hose and Clip System - Fog spray coverage of the hotel area and any other essential areas as determined aboard the particular vessel by the appropriate Engineering and Operations staff at COMSC/COMSCLANT/COMSCPAC. MA Plan S-95-5-1, Rev. A, provides the design guidance for these clips and brackets. A hose clip to accommodate the 1 1/2" Vari-Nozzle is under development.

2. DECON STATION (Non-Collective Protection System (CPS) Ships)

A. OPTIMUM LEVEL: The design of the recommended installation is contained in MSC Plan No. STD-802-4844759, Rev. A. This plan is to be used as guidance for all future installations and upgrades unless superseded by new technical developments and specifications from the Navy/Government experts and approved by COMSC.

B. MINIMUM LEVEL

(1) A DECON station, consisting of a Gross DECON Area, Contamination Control Area (CCA) (outer garment removal) and a DECON site (inner garment removal and showering), will be identified and established. In general, a ship's head with a separate entrance and exit, close to a weather entrance will be utilized. The DECON station must be capable of isolating the contamination with the entrance side considered "dirty" and the exit side considered "clean." The design must ensure that the flow of personnel through the station will preclude backtracking through possible contaminated areas.

(2) Section 470-4.5.1 of Naval Ships Technical Manual (NSTM) Chapter 470, "Shipboard BW/CW Defense and Countermeasures," provides general guidance on the arrangement of DECON stations and general procedures for decontamination.

3. DECON STATION - Collective Protection System (CPS) Ships

A. OPTIMUM LEVEL: On CPS ships, the DECON station shall be designed and installed in accordance with the latest directives published by NSWC, Dahlgren. Structural design and installation equipment performance criteria shall be strictly adhered to in order to ensure overall CPS system operability. NSWC shall be the final approval authority for all MSC CPS system installations.

B. MINIMUM LEVEL: There is no "minimum" criteria for a CPS DECON station.

4. COLLECTIVE PROTECTION SYSTEM (CPS) SHIPS

Based upon TLR, ROC/POE and mission requirements, MSC new construction ship classes shall be considered for CPS installation. COMSC (N7), in conjunction with COMSC (N3), shall make recommendations to COMSC. Existing ship classes shall be considered for CPS retrofit installations based upon the same requirement criteria used for the new construction ship classes.

5. EQUIPMENT:

A. ALLOWANCE LISTS

(1) The MSC CBR-D Protective Clothing and Equipment Allowance List was promulgated in March 1992 as Appendix C to enclosure (1) of COMSCINST 3400.2A and MSC unique CBR-D AELs have been developed from this list. MSC unique CBR-D AELs are 2-770008031 through 2-770008038. Recommended changes to this list should be submitted to COMSC (N7) via the chain of command. Revisions to this standard list and in the future the CBR-D AELs, will be generated by COMSC as necessary.

(2) Administrative Commanders will ensure that the required items on the MSC CBR-D Protective Clothing and Equipment Allowance List are provided in quantities sufficient for the crew, embarked staffs, MILDEPTs and sponsor personnel when the Memorandums of Agreement (MOA) so dictate. Additional personnel, i.e., surge crews or supercargoes, shall be responsible for procuring their own personal protective equipment.

B. RADIACS. COMSCINST 9670.1F, Allowance of Electronic Equipment for MSC Ships, provides allowances for MSC ships in service. All USNS and contract-operated ships furnished with radiacs will maintain radiacs in an operational status, particularly complying with calibration requirements. Calibration requirements are discussed in RADIAC Policies and Procedures Manual (SE700 AA MAN 210) Vol. 2, RADIAC Calibration Program. Control of all RADIAC equipment is required and must comply with the RADIAC recall and reporting procedures outlined in Volume 2, part one of that manual. COMSC (N73) will be the point of contact in resolving any questions concerning radiacs.

C. CONTINGENCY CBR-D PROTECTIVE CLOTHING/DECON EQUIPMENT

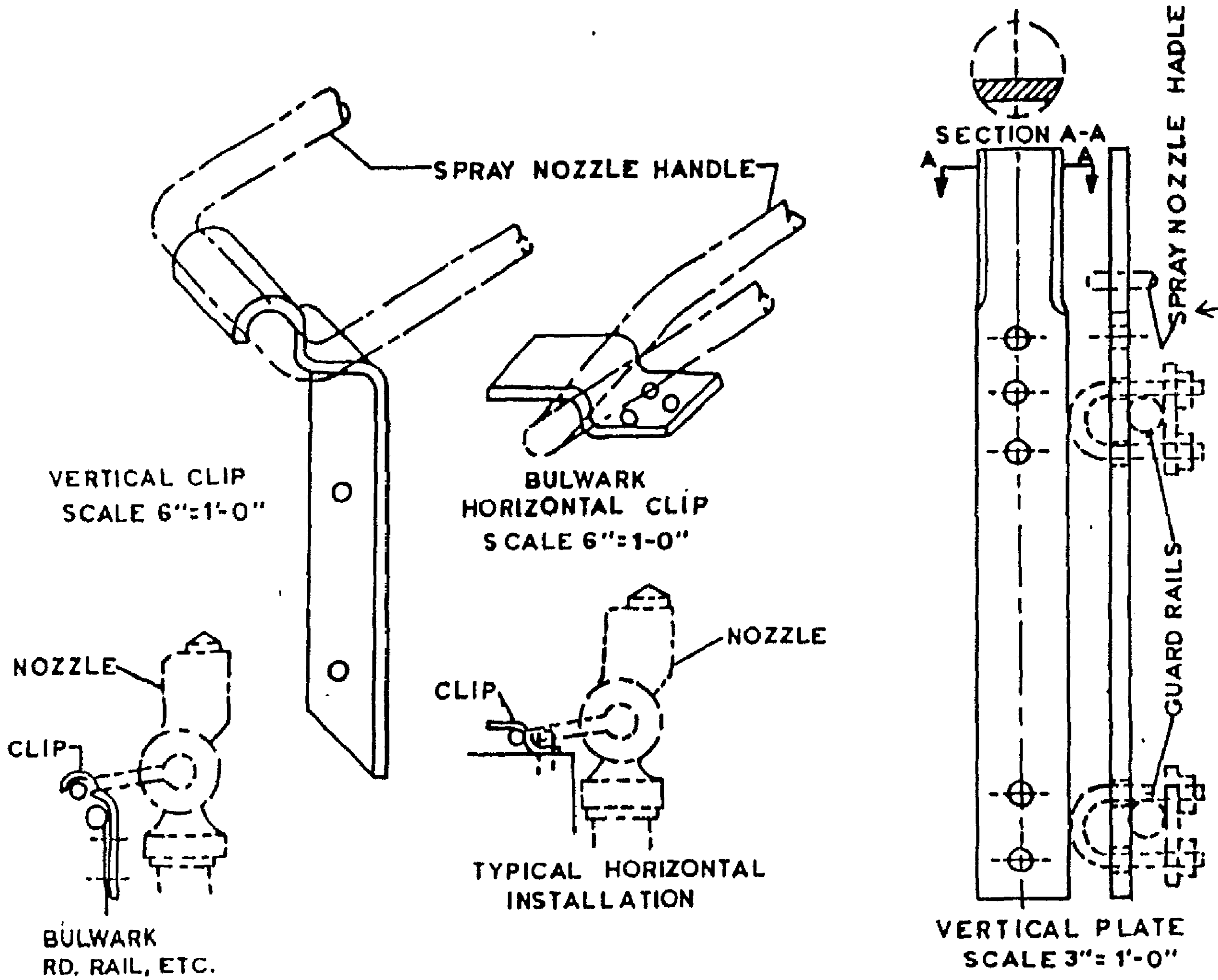
(1) The MSC Contingency CBR-D Protective Clothing/ DECON Equipment Allowance List was promulgated in March 1992 as Appendix D to enclosure (1) of COMSCINST 3400.2A. It provides the

minimum CBR-D equipment requirements for RRF/charter ships brought on line/on hire to support contingency operations involving the risk of CBR attack. This list is designed to assist in expediting the procurement of personnel protective gear and DECON equipment for these ships and delineates the CBR-D equipment required to provide basic CBR-D survivability capability for up to 40 personnel on each ship.

(2) War Reserves of CBR-D equipment have been established at NSC OAKLAND and NSC NORFOLK to provide sufficient CBR-D equipment to outfit up to 100 ships (35 in the MSCPAC AOR and 65 in the MSCLANT AOR), each with up to a 40-man crew.

(3) Upon commencement of a CBR threat scenario, COMSC will obtain CNO release of CBR-D equipment War Reserve. Upon release of the War Reserve by CNO, COMSC will direct Administrative/Area Commanders to immediately begin procuring and shipping the material listed on the contingency list to outfit each RRF/charter ship brought on line/on hire. Initial CBR-D equipment will be obtained by Administrative/Area Commanders from MSC CBR-D War Reserve stockpiles located at NSC OAKLAND and NSC NORFOLK. This will allow time for Administrative/Area Commanders to commence timely ordering and receipt of additional CBR-D equipment for follow-on shipping prior to depletion of the War Reserve stockpile. The ultimate goal is to ensure all MSC ships receive all required CBR-D equipment prior to departure for an area where the risk of CBR attack exists.

(4) In addition to providing CBR-D equipment to RRF/charter ships, COMSCLANT/COMSCPAC will ensure that, prior to their departure from on-load ports, the crews of each RRF/charter ship supporting the contingency receives training in basic CBR defense procedures and in use of all CBR-D equipment provided.



FOG SPRAY NOZZLE CLIPS AND BRACKET
FOR NUCLEAR, BIOLOGICAL & CHEMICAL
(N.B.C.) WASHDOWN SYSTEM

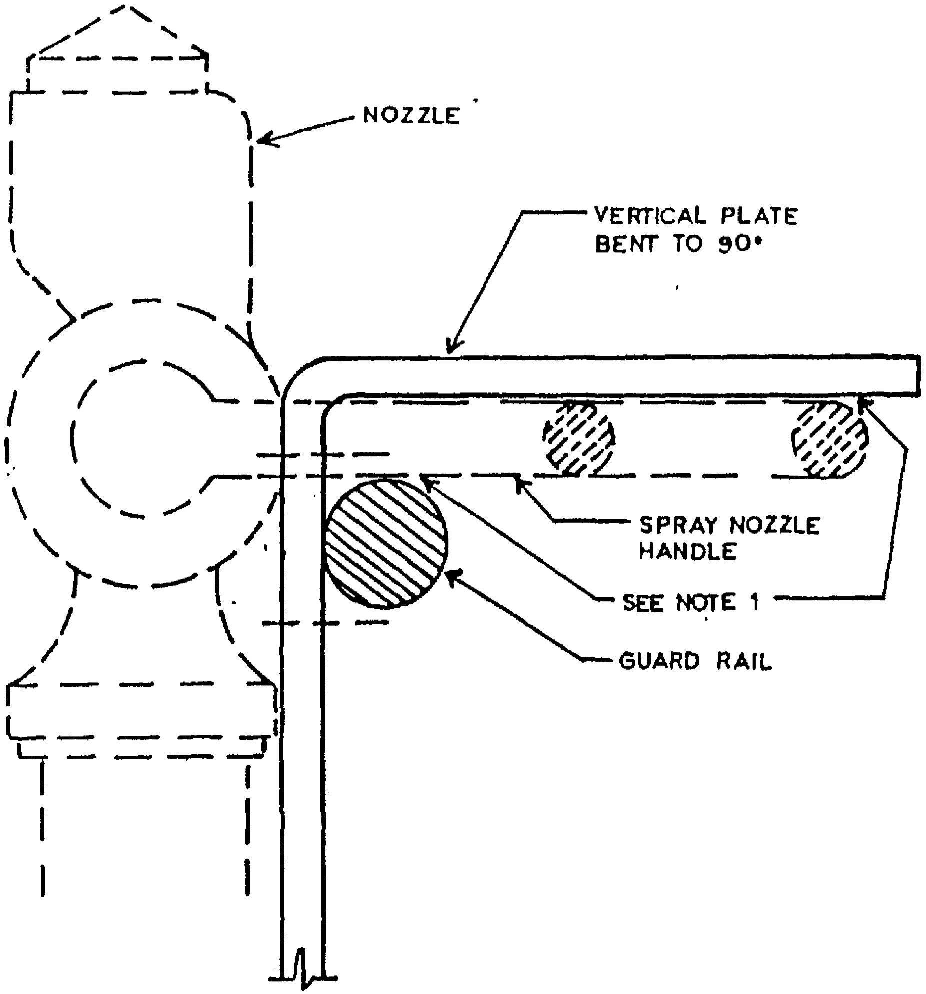
REV.	REMARKS
A	ADDED ADDITIONAL PAGE SHOWING NBC CLIP INSTALLATION DETAIL FOR GUARD RAILS.

U.S. DEPARTMENT OF TRANSPORTATION
MARITIME ADMINISTRATION WASH., D.C.

DESIGN & TITLE: PAGE 1 OF 2

MA PLAN No. S89-5-1, REV. A

DRAWN BY: Westy Williams DATE: 12-4-81
APPROVED BY: Ed Simmons SCALE ——



NOTE

1. THE VERTICAL PLATE CLIP SHALL BE OF SUFFICIENT LENGTH AND BENT 90° SUCH THAT THE FIRE HOSE NOZZLE HANDLE REMAINS IN THE "SPRAY" POSITION AND THE GUARD RAIL ACT AS A FULCRUM FOR THE HANDLE.

US Department of Transportation Maritime Administration Wash., D.C.	DESIGN/TITLE: MA PLAN No. S 89 - 5 - 1, REV. A PAGE 2 OF 2

DRAWN BY: SIMMONS/ WILLIAMS DATE: 5-1-84

CHECKED: Earl T. Simmons SCALE: NONE

APPROVED: Earl T. Simmons

REVISIONS

REV	ZONE	DESCRIPTION	DATE	APPVD
A	ALL	DRAWING REDONE TO INCORPORATE CHANGES REQUIRED PER NAVAL SURFACE WARFARE CENTER LTR 3400 H33-MAP OF 3 DEC 90 AND LTR 3400 H33-MAP OF 17 APR 91	5/10/91	

GENERAL NOTES

1. THIS DRAWING PROVIDES GUIDANCE FOR A STANDARD NON CPS, CHEMICAL, BIOLOGICAL, RADIOLOGICAL (CBR) CONTAMINATION CONTROL AREA / DECONTAMINATION STATION (CCA/DS). THE CONFIGURATION SHOWN IS SUFFICIENT TO SUPPORT A TWO-CUTTER OPERATED CCA. VARIATIONS IN IN COMPARTMENT LOCATION AND SIZE TO ACCOMODATE VARIOUS SHIP CONFIGURATIONS ARE PERMITTED. HOWEVER, FUNCTIONAL RELATIONSHIP AND SUITABLE ACCESS MUST NOT BE COMPROMISED.

2. SPACES WITH OTHER FUNCTIONS MAY BE CONFIGURED FOR USE AS A DECONTAMINATION STATION.

3. ALL INSTALLED ELECTRICAL/ELECTRONIC SYSTEMS SHALL BE OF WATERTHGHT CONSTRUCTION.

4. THE CCA SHALL HAVE ACCESS DIRECTLY FROM THE WEATHER DECK AND A SEPARATE EXIT INTO THE SHIP. IF SUITABLE INTERIOR SPACE IS UNAVAILABLE, A DECK AREA OUTSIDE THE SUPERSTRUCTURE WITH OVERHEAD COVER MAY BE ACCEPTABLE.

5. NO CCA/DS WEATHER ENTRANCE SHALL OPEN TO THE BOW.

6. TUBING FOR THE SHOWER SHALL BE CNA 90-10 IN ACCORDANCE WITH MIL-T-16400 OR EQUIVALENT. FITTINGS REQUIRED SHALL BE BRONZE.

7. ALL DRAINS FROM THE CCA/DS SHALL BE NEGATIVELY SLOPED AND SHALL DRAIN DIRECTLY OVERBOARD WITH USE OF A TRAP. WHERE THE SPACES UTILIZED HAVE EXISTING DRAINS NORMALLY SENT TO THE PLUMBING DRAIN SYSTEM, PIPING MODIFICATIONS SHALL BE MADE TO ALLOW THE SHIP TO DIVERT THE CCA/DS DRAINS OVERBOARD.

8. FRESH WATER SUPPLY TO SHOWERS AND FAUCET IS RECOMMENDED TO SIMPLIFY INSTALLATION. A SALT WATER SUPPLY SYSTEM IS ACCEPTABLE IF SUFFICIENT FRESH WATER PIPING TO SUPPORT DECON PROCEDURES IS NOT AVAILABLE. HOWEVER, FRESH WATER IS REQUIRED TO FLUSH SALT WATER INSTALLATIONS.

9. INTERCOM STATIONS AT OGRA, IGRA AND SHOWER SHALL BE "HANDS FREE" IN DESIGN AND OPERATION. INTERCOM STATION IN SHOWER TO BE MOUNTED IN OVERHEAD AND PROVIDED WITH SPLASH SHIELD. IN ADDITION TO THE INTERCOM SYSTEM, PROVISIONS FOR COMMUNICATION WITH DC CENTRAL AND THE BRIDGE WHILE PERSONNEL ARE IN GAS MASKS SHALL BE PROVIDED.

10. LIGHTING SYSTEM FOR ALL AREAS SHALL BE OF WATERTIGHT CONSTRUCTION, WITH RED LIGHT CAPABILITIES. IN ADDITION, BACK UP POWER/LIGHTING TO ALL AREAS SHALL BE SUPPLIED FROM EMERGENCY POWER SOURCES.

11. CCA/DS WEATHER DOORS SHALL BE EQUIPPED WITH LIMIT SWITCHES THAT SECURE LIGHTING WHEN REQUIRED TO MEET ANY DARKEN SHIP BILL REQUIREMENTS.

12. ALL CCA/DS AREAS SHALL BE PAINTED WITH CHEMICAL RESISTANT PAINT (NSN 8010-00-410-8461 OR 8010-00-421-2435 OR EQUIVALENT)

13. FLOORING THROUGHOUT DECON STATION SHALL BE "RAISED-DIAMOND" TYPE STAINLESS STEEL. BLOCKS 1, 2, 3, AND 4 SHALL BE PERMANENTLY MARKED ON THE DECK WITH TWO PART EPOXY BASE PAINT IN ACCORDANCE WITH MIL-D-23003. THE BLOCKS SHALL BE 10" BY 18". (SEE NSTM CHAPTER 470)

14. ALL FABRICATION, WELDING, AND INSPECTION SHALL BE IN ACCORDANCE WITH THE LATEST ABS AND USCG RULES AND REGULATIONS. ALL SEAMS SHALL BE COMPLETELY SEALED UTILIZING 100% FILLET WELDS.

15. TEMPLATE ALL WORK FROM SHIP AND EQUIPMENT.

16. ALL INTERNAL BULKHEADS AND OVERHEADS SHALL BE SMOOTH. ALL WORK SHALL BE FREE OF SHARP EDGES AND BURRS TO PREVENT PERSONNEL INJURY AND POTENTIAL POCKETING OF CONTAMINANTS. IF SHEATHING OR JOINER WORK IS INSTALLED IN THE SPACE, ANY SEAM NOT WELDED WITH 100% FILLET WELDS SHALL BE SEALED WITH SILICONE RTV.

17. A FIRE HOSE SHALL BE AVAILABLE UNDER THE CONTROL OF CCA/DS OPERATORS FOR CLEANING THE WAITING AREA ADJACENT TO THE CCA/DS PRIOR TO AND BETWEEN PROCESSING.

18. WHERE STIFFENERS ARE REQUIRED, THEY SHALL BE INSTALLED EXTERNAL TO THE CCA/DS, TO THE SHIP'S STRUCTURE, AND BE OF THE SAME MATERIAL AS THE SURROUNDING STRUCTURE. IF INTERNAL STIFFENERS ARE NECESSARY, SHEATHING SHALL BE EMPLOYED TO PROVIDE A SMOOTH, SEALED CCA/DS INTERIOR. WHERE SHEATHING IS EMPLOYED AND NOT WELDED WITH 100% FILLET WELDS , ALL SEAMS SHALL BE SEALED WITH SILICONE RTV.

19. PORTABLE STOOL SHALL BE BARE METAL IN CONSTRUCTION, PREFERRABLY STAINLESS STEEL. SEAT SHOULD BE APPROXIMATELY 12" IN DIAMETER OR 12"X12" AND OVERALL HEIGHT APPROXIMATELY 20".

20. SPRINKLER HEADS SHALL BE FULL JET, WIDE ANGLE, SQUARE SPRAY, EQUIVALENT TO SPRAYING SYSTEMS CO. NOZZLE NO. 1/4HH14WSQ BRASS. PRESSURE AT NOZZLE SOURCE TO BE 60 PSI PLUS OR MINUS 20 PSI.

21. BAR GRATING SHOULD BE 1" STAINLESS STEEL. IT IS INTENDED TO FACILITATE THE DECONTAMINATION PROCESS WHILE PREVENTING RE-CONTAMINATION OF THE PERSONNEL BY CONTAMINATED RUN-OFF.

22. IN ADDITION TO THE NORMAL SPACE DESIGNATION LABELS, LABELS SHALL BE INSTALLED IN THE FOLLOWING LOCATIONS WITH THE FOLLOWING INSCRIPTIONS, WHITE LETTERS 3/4" HIGH ON A RED BACKGROUND.

   A. AT THE EXTERIOR CCA ENTRANCE -

      "DECONTAMINATION STATION ENTRANCE. FOR RECOVERY FROM CBR ATTACK, ENTER UPON COMMAND"

   B. IN THE SHOWER AREA -

      "USE HANDS TO SHIELD CANISTERS DURING SHOWER OPERATION. CAUTION: DO NOT TOUCH CANISTERS"

   C. ON THE DOOR LEADING FROM THE IGRA TO THE SHOWER AREA AND ON THE DOOR LEADING FROM THE SHOWER AREA TO THE INTERIOR OF THE SHIP.

      "DO NOT OPEN THIS DOOR UNTIL ORDERED TO DO SO BY STATION ATTENDANT."

   D. ON THE INBOARD SIDE OF THE DOOR LEADING FROM INTERIOR OF THE SHIP TO THE SHOWER AREA-

      "DO NOT BLOCK DECONTAMINATION STATION EXIT"

   E. ON THE INBOARD SIDE OF THE DOOR LEADING FROM THE INTERIOR OF THE SHIP TO THE OGRA -

      "NO ENTRY EXCEPT AS DIRECTED DURING DECONTAMINATION RECOVERY EXERCISE"

23. PORTABLE SCISSOR TRAY SHALL BE SIZED APPROXIMATELY 9"WIDE BY 18" LONG AND 1" DEEP.

24. FOR FURTHER GUIDANCE, SEE NSTM CHAPTER 470.

NO.	PLAN NO.	TITLE
	REFERENCES	

SUBMITTED TO	SUBMIT DATE	RESUBMIT DATE	APPROVAL DATE
PLAN APPROVAL			

M. ROSENBLATT & SON, INC.
NAVAL ARCHITECTS & MARINE ENGINEERS
2341 JEFFERSON DAVIS HWY
ARLINGTON, VA 22202
CONTRACT NO. N00033-89-C-3008

DRAWN BY	P.K. GAUTHIER	5-10-91
CHECKED BY	R. ERLER	5-10-91
REVIEWED BY	O. STEWART	5-10-91

SELECTED RECORD PLAN

MILITARY SEALIFT COMMAND

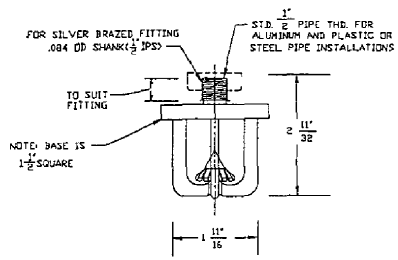
STANDARD PLAN FOR DECONTAMINATION STATION

H94421 STD-802-4844759 A

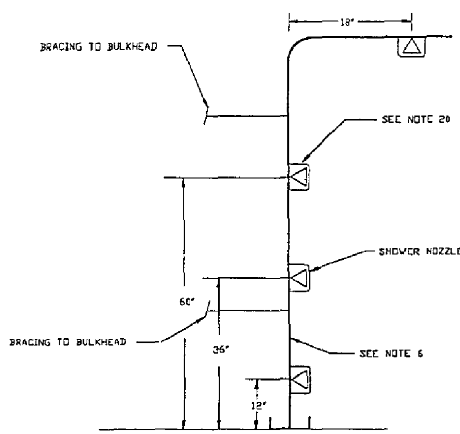
SCALE: NONE SHEET 1 OF 2

STD-802-4844759 A 1

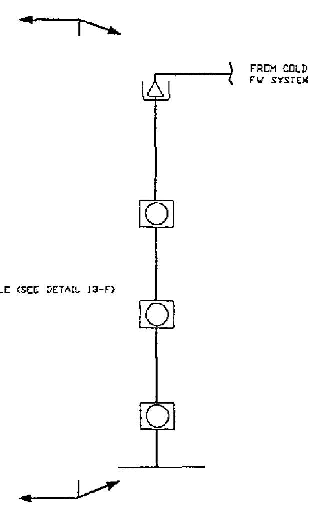
PC	QTY	LIST C[illegible]
1	4	INTERCOM LS AND MIC ([illegible] NOTE 9)
2	1	FAUCET (W/THREADED 3/4" HOSE ATCH SPOUT)
3	1	LIGHT SWITCH
4	1	MIRROR
5	1	PORTABLE STOOL (SEE NOTE 19)
6	1	2'X2'X6" BOOTWASH (APPROXIMATE SIZE)
7	1	2" DRAIN
8	2	4" DRAIN
9	2	BAR GRATING (1" STAINLESS STL) (SEE NOTE 21)
10	4	32 GALLON WASTE CAN (APPROX SIZE)
11	1	15"X21" FIXED WINDOW
12	3	26"X66"X9" WT QA DOOR W/6" VIEWING PORT
13	2	PORTABLE SCISSOR TRAY (SEE NOTE 24)
14	2	26"X66"X9" WT QA DOOR



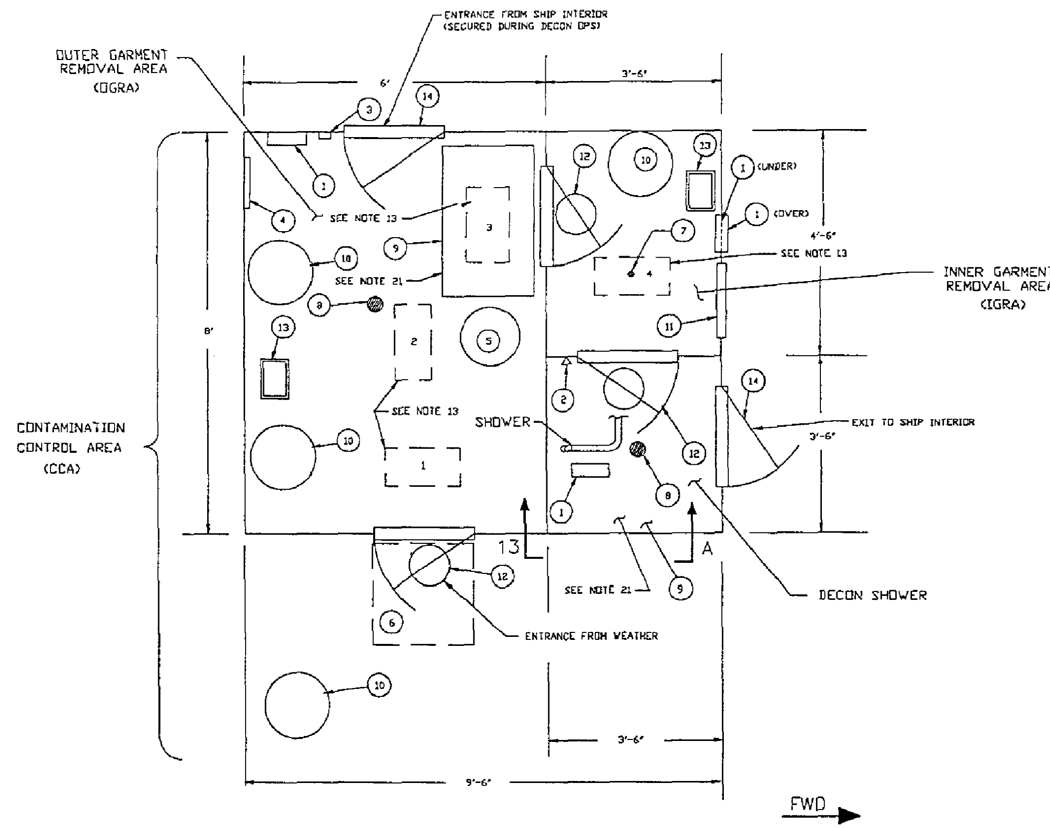
DETAIL 13-F
SHOWER NOZZLE



DETAIL 13-A
SHOWER



FRONT VIEW
SHOWER



PLAN VIEW 9-A

H	94421	STD-802-4844759	A
SCALE: NONE		SHEET 2 OF 2	

MATERIAL LIST

ITEM	DESCRIPTION	QTY	MATERIAL	REMARKS
①	U BRACKET	1	CARBON STEEL (FLAT 3/4 X 3) ASTM A-108	SUGGESTED SOURCE NSN 9510-00-596-3886
②	ARCH BRACKET SUPPORT	2	CARBON STEEL (FLAT 1/2 X 1 1/2) ASTM A-108	SUGGESTED SOURCE NSN 9510-00-596-2028
③	ARCH BRACKET CROSS BAR	1	CARBON STEEL (1" DIA X 2" LENGTH) ASTM A-108	SUGGESTED SOURCE NSN 9510-00-541-9656
④	BASE PLATE	1	CARBON STEEL (PLATE .25 THK)	SUGGESTED SOURCE NSN 9515-00-596-2442
⑤	U-BOLT	4	CARBON STEEL	SUGGESTED SOURCE NSN 5306-00-639-1647
⑥	SHACKLE PIN	1	GALVANIZED STEEL (3/8" DIA. X 4" LENGTH)	SUGGESTED SOURCE NSN 5315-00-221-6345,
				SEE GENERAL NOTE 5
⑦	NUTS	8	CARBON STEEL (3/8" UNC-16)	SUGGESTED SOURCE NSN 5310-00-264-1321
⑧	KEEPER CHAIN	1	CARBON STEEL (1/32" THK)	SUGGESTED SOURCE NSN 4010-00-843-8127 5' LONG
⑨	MACHINE SCREW	1	CRES	SUGGESTED SOURCE NSN 5305-00-945-0505

GENERAL NOTES

1. UNLESS OTHERWISE SPECIFIED,
   ALL DIMENSIONS ARE IN INCHES
   TOLERANCES: PLUS OR MINUS 1/64"
   ANGLES: PLUS OR MINUS 2 DEGREES
2. REMOVE ALL BURRS AND BREAK ALL SHARP EDGES.
3. MACHINE SCREWS (ITEM 9) SHALL COMPLY WITH ANSI-B18.6.3 SLOTTED, FILLETHEAD.
4. ESTIMATED WEIGHTS: FOR DECK EDGE APPLICATION – 5.25 LB INCLUDING BASE PLATE
   FOR BULWARK APPLICATION – 6.5 LB INCLUDING BASEPLATE
   FOR GUARD RAIL APPLICATION – 10 LB INCLUDING BASEPLATE
5. NSN 5315-00-221-6345 IS A PIN WITH A COPPER TOGGLE, EYE COLLAR FEATURE

9	8	7	6	5	4	3	2	1	SH	REVISION STATUS OF SHEETS
–	–	–	–	–	–	–	–	–	REV	

NO.	PLAN NO.	TITLE
1		

REFERENCES

JOHN J. McMULLEN ASSOCIATES, INC.
NAVAL ARCHITECTS & MARINE ENGR
ARLINGTON, VA 22202

DRAWN	M.R. & S	DATE
CHECKED	BGD	DATE 10/21/93
REVIEWED	RH	DATE 10/21/93
	MO	10/21/93
APPROVED FOR JJMA, INC.		DATE

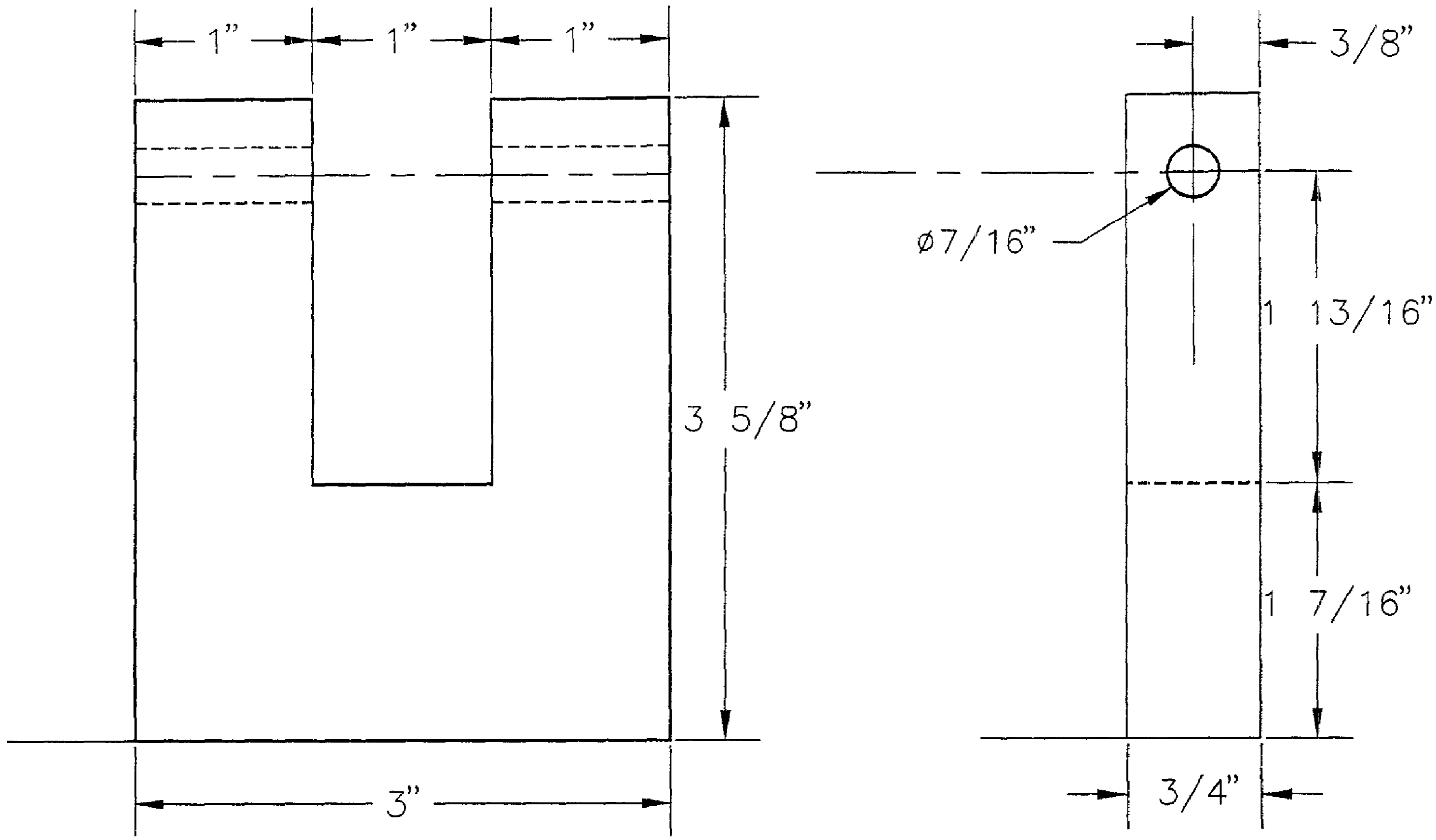
DRAWN	CHECKED
	DATE
PROJECT ENGINEER	DATE
________ BRANCH	DATE
TECHNICAL DIVISION	DATE
C.T.A. ENGR OFFICER	DATE
APPROVED FOR COMSC	DATE

DEPARTMENT OF THE NAVY
MILITARY SEALIFT COMMAND
WASHINGTON, D.C. 20398-5400

CBR-D VARI-NOZZLE HOSE CLIP

SIZE	CAGE CODE	MSC PLAN NO.	REV.
A	94421	123-6633920	–
SCALE : NONE		CONTR GDNC DWG	SHEET 1 OF 9

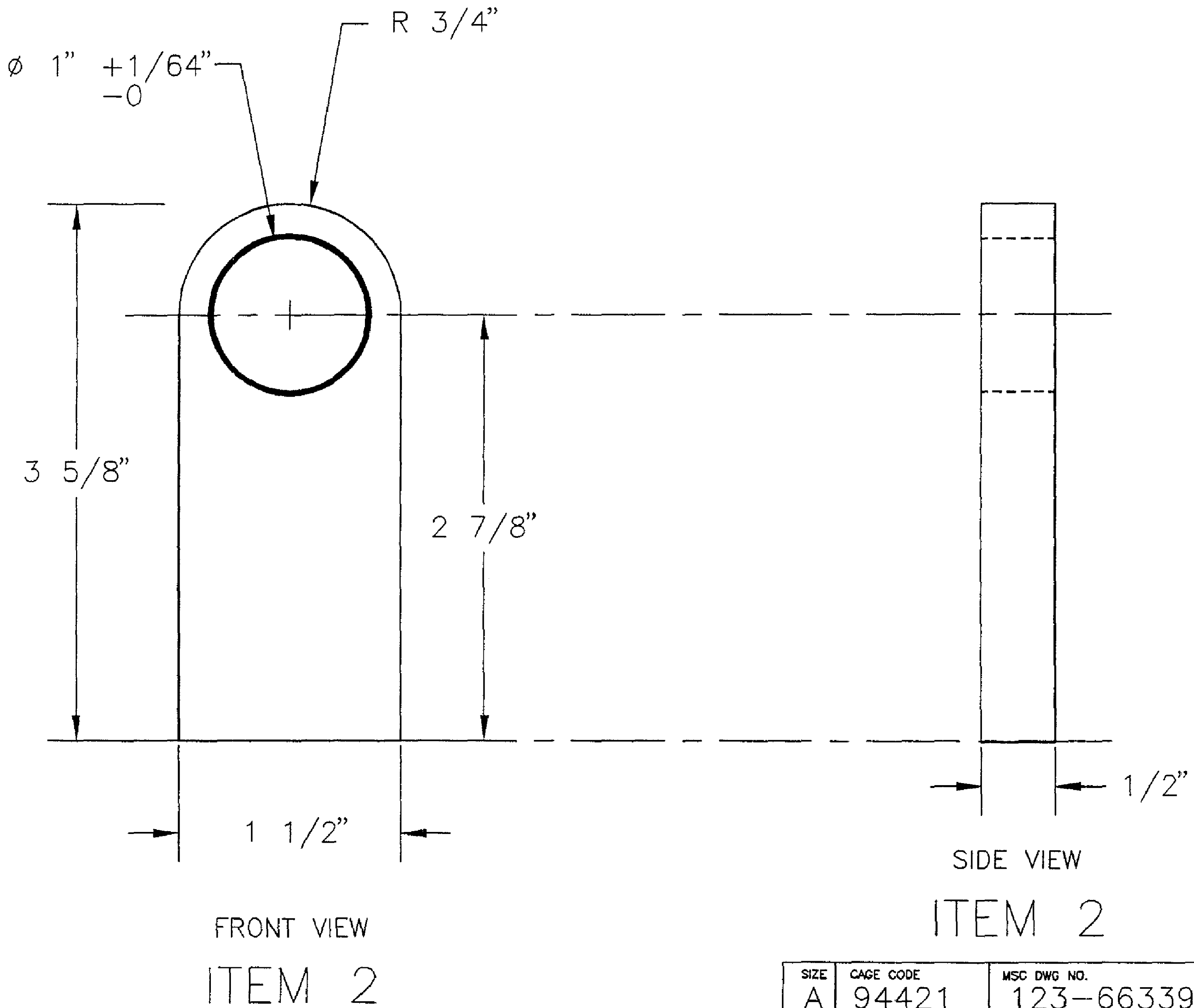
1-C-17



FRONT VIEW
ITEM 1

SIDE VIEW
ITEM 1

SIZE	CAGE CODE	MSC DWG NO.		REV
A	94421	123-6633920		—
SCALE: 1" = 1"		CONTR GDNC DWG	SHEET 2 OF 9	



SIZE	CAGE CODE	MSC DWG NO.	REV
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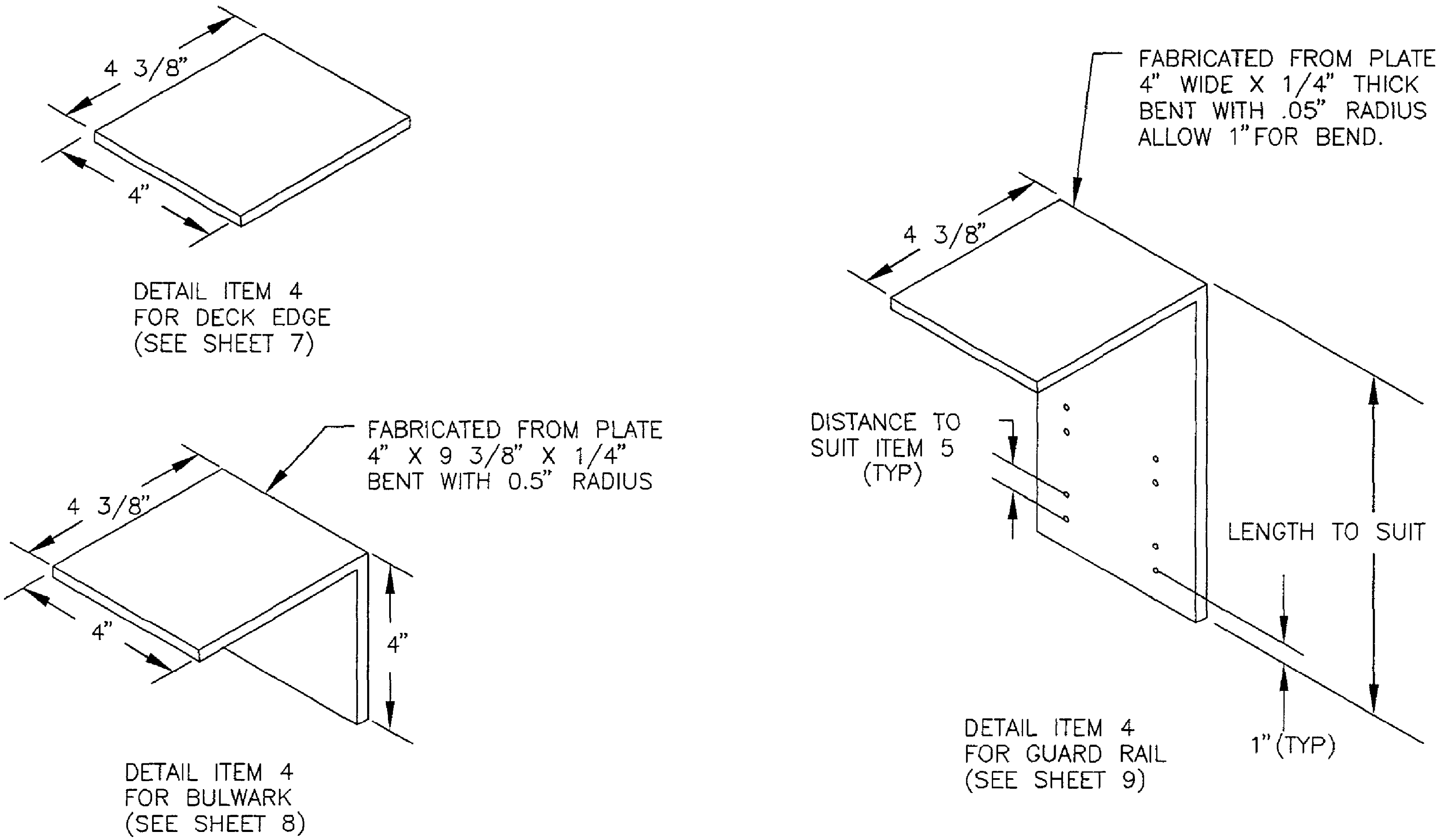
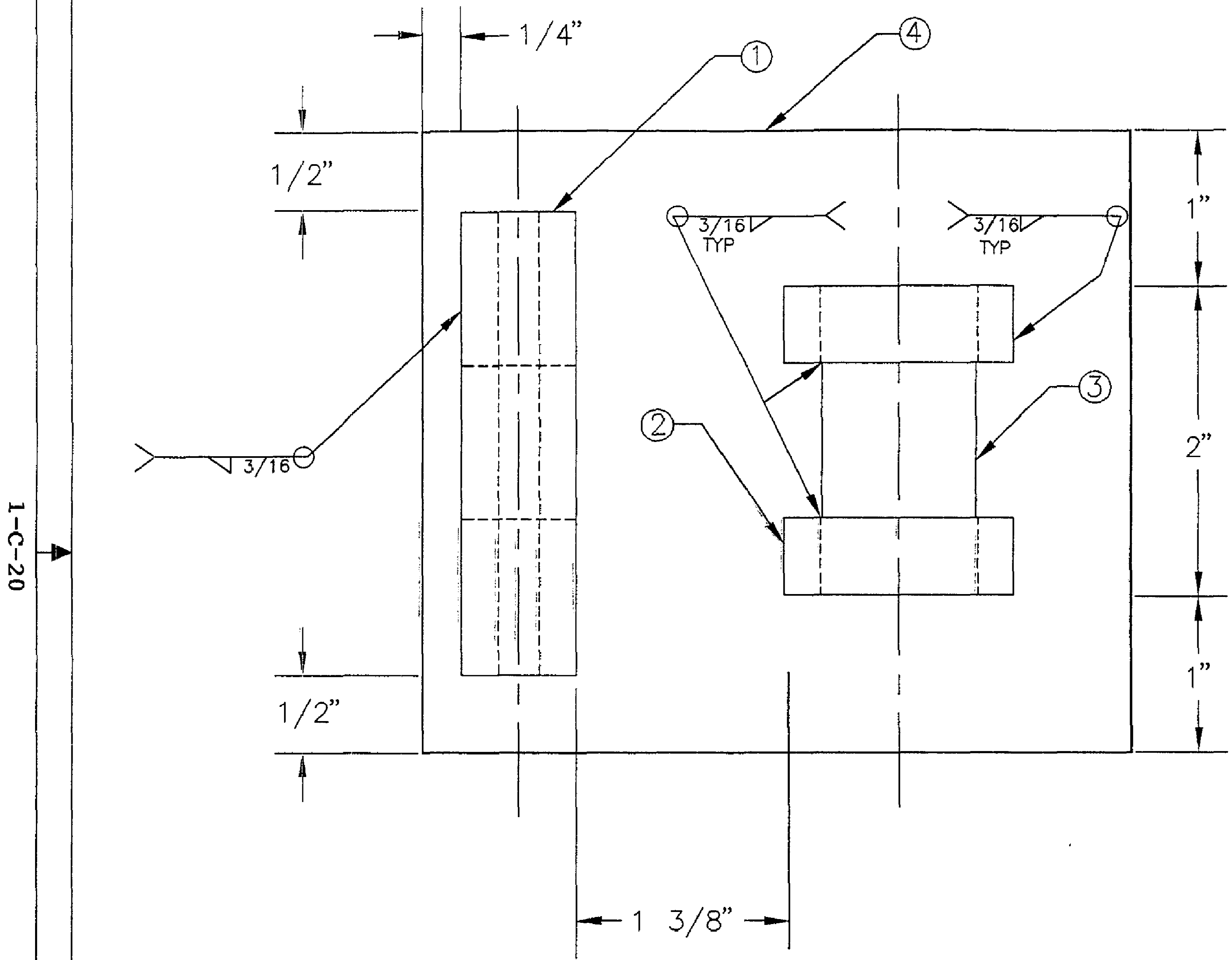
SCALE: 1" = 1"		CONTR GDNC DWG	SHEET 3 OF 9



GUARD RAIL
APPLICATION

SIZE	CAGE CODE	MSC DWG NO.	REV
A	94421	123-6633920	—
SCALE: NONE		CONTR GDNC DWG	SHEET 4 OF 9



TOP VEIW

ASSEMBLY

SIZE	CAGE CODE	MSC DWG NO.	REV
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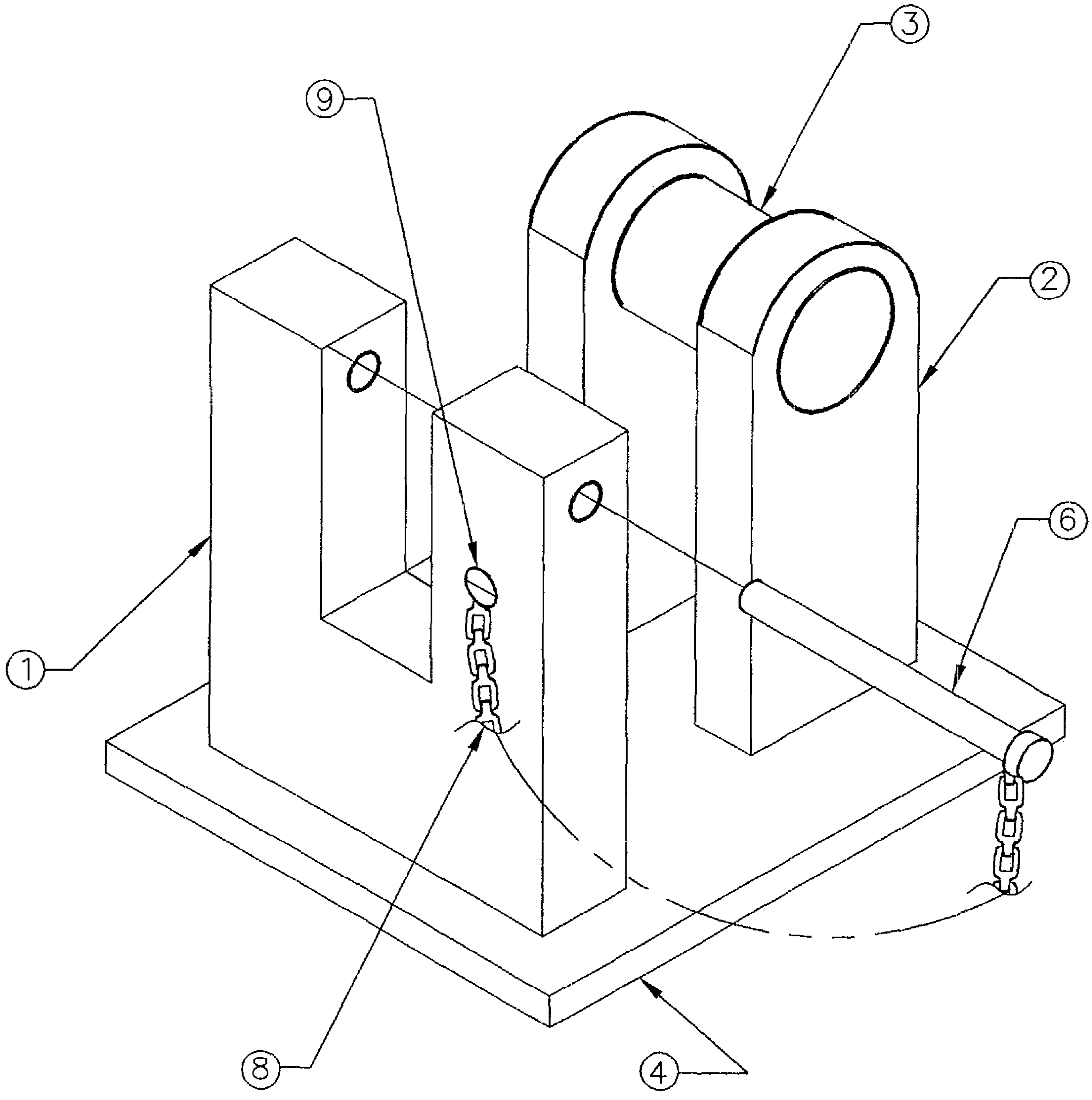
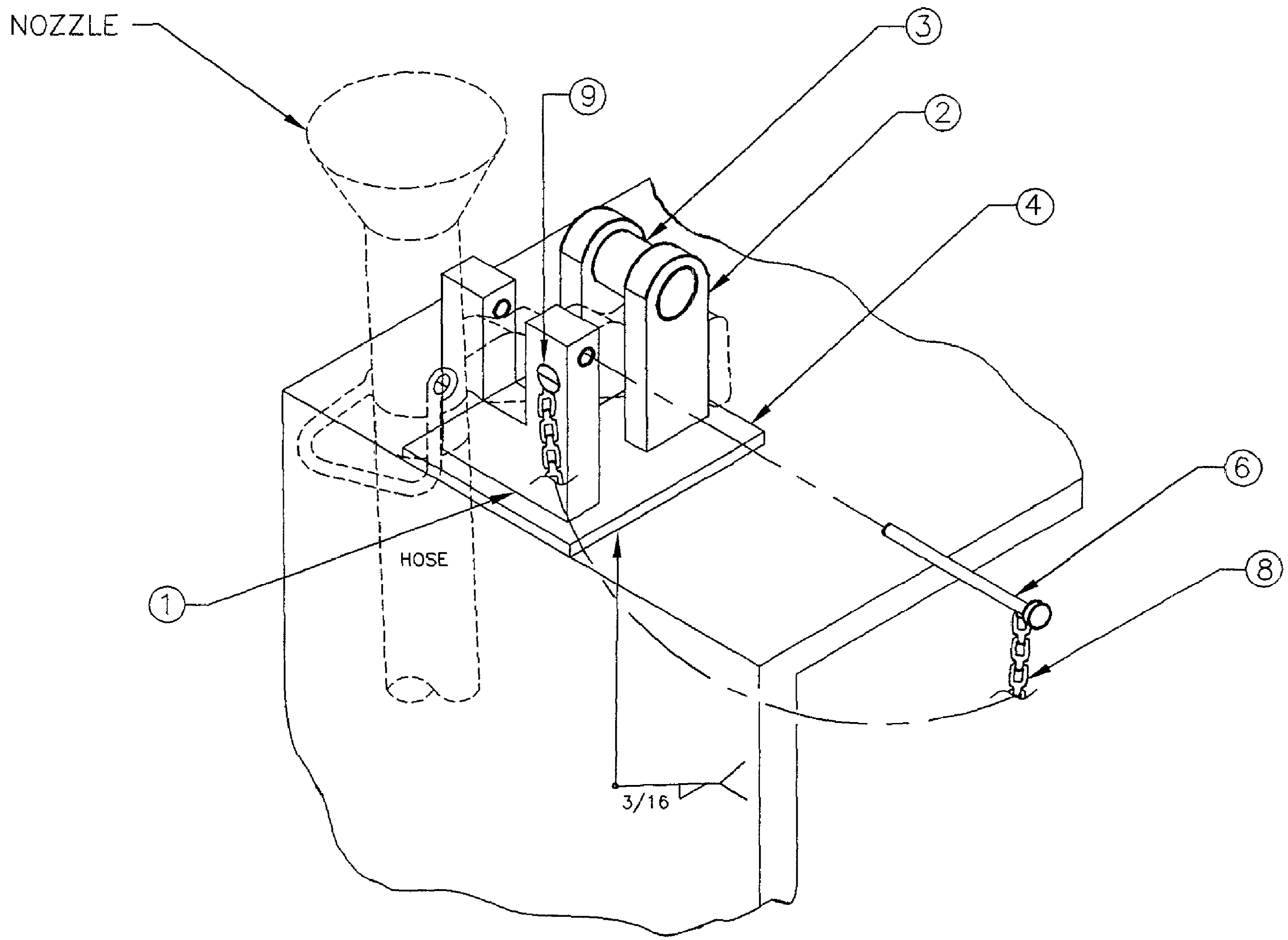
SCALE: 1' = 1"		CONTR GDNC DWG	SHEET 5 OF 9



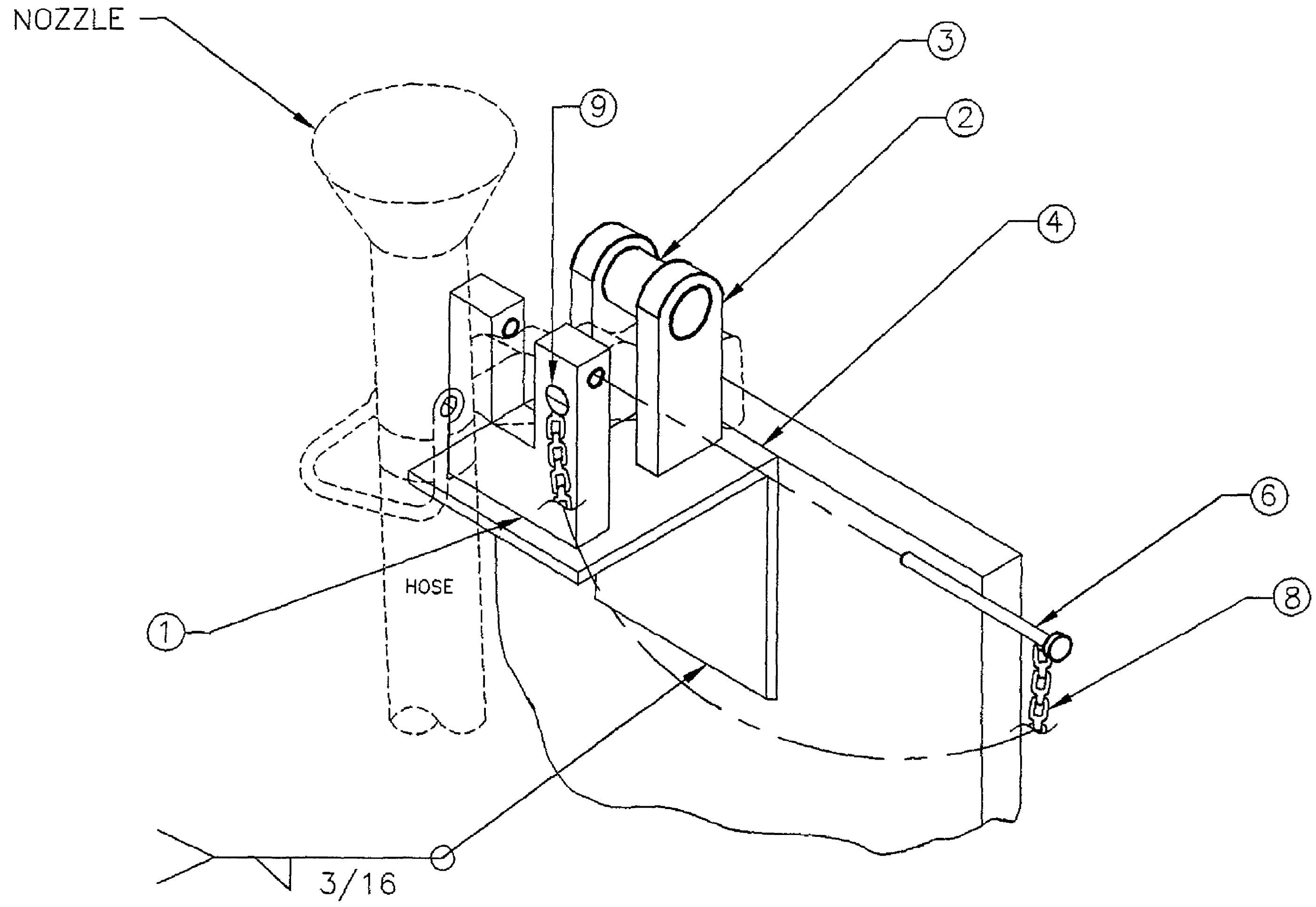
CBR-D VARI-NOZZLE HOSE CLIP ASSEMBLY

SIZE	CAGE CODE	MSC DWG NO.	REV
A	94421	123-6633920	—
SCALE: NONE		CONTR GDNC DWG	SHEET 6 OF 9



DECK EDGE APPLICATION

SIZE	CAGE CODE	MSC DWG NO.	REV
A	94421	123–6633920	—
SCALE: NONE		CONTR GDNC DWG	SHEET 7 OF 9



BULWARK APPLICATION

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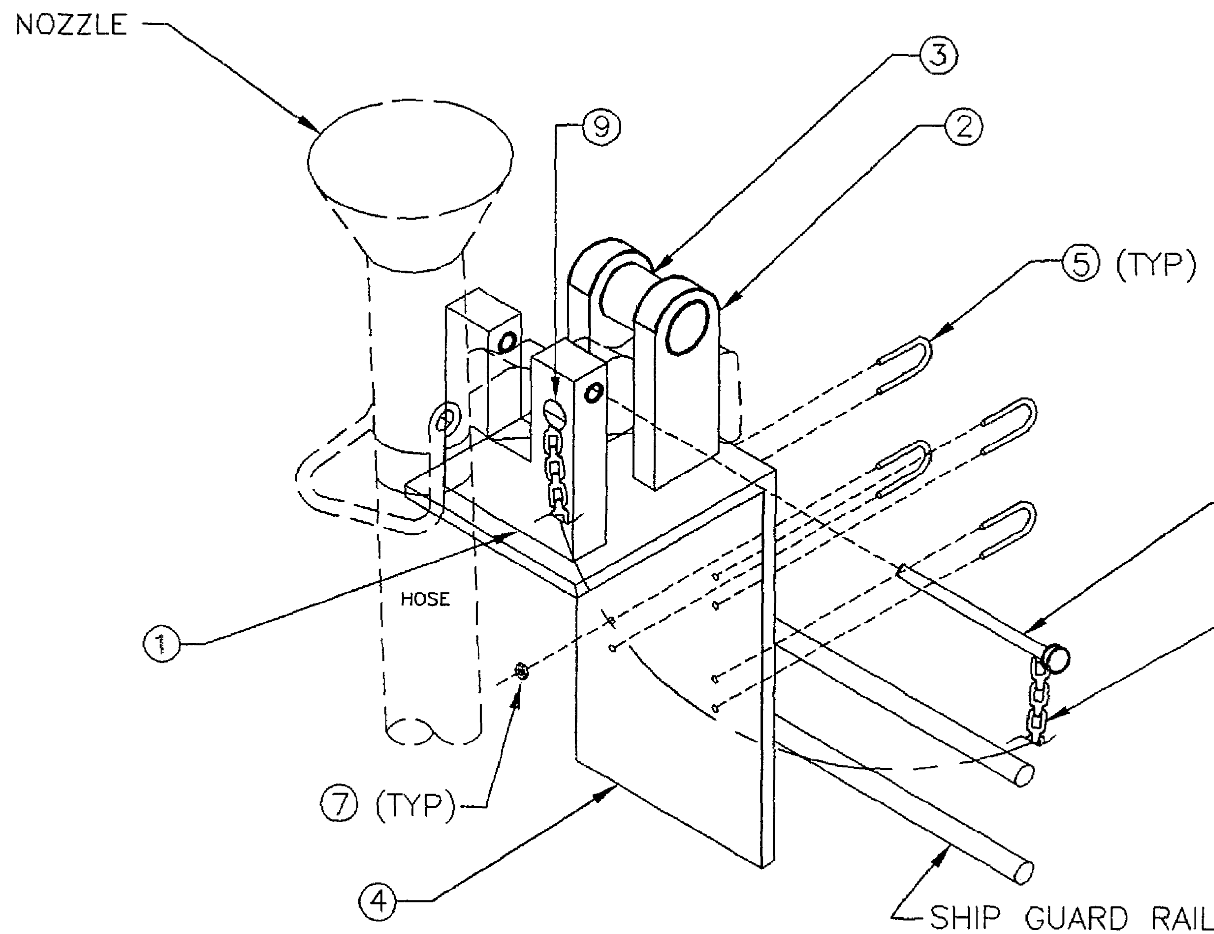
SCALE: NONE		CONTR GDNC DWG	SHEET 8 OF 9



GUARD RAIL
APPLICATION

SIZE	CAGE CODE	MSC DWG NO.	REV
A	94421	123-6633920	—
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PART 2

EMERGENCY BILLS

CHAPTER 1

DAMAGE CONTROL BILL

2-1-1 PURPOSE

This Damage Control Bill organizes ship's personnel to prevent, control, take action against and repair damage. The objectives of shipboard damage control are:

a. To prevent damage before it occurs by:

(1) Maintaining watertight integrity

(2) Eliminating fire hazards

(3) Maintaining ship's emergency equipment

(4) Conducting realistic drills in the proper use of equipment.

b. To controlling damage by:

(1) Combating fire

(2) Controlling flooding

(3) Maintaining stability and buoyancy

c. To accomplish emergency repairs.

d. To protect personnel in emergencies by:

(1) Providing for proper personnel equipment

(2) Safeguarding personnel

(3) Providing first aid treatment to injured personnel

(4) Ensuring proper abandon ship procedures

e. To train the ship's force in:

(1) Damage control organization and techniques

(2) Awareness, use and readiness of equipment

(3) ALL HANDS participation

(4) Egress and evacuation

2-1-2 ORGANIZATION

Shipboard damage control shall be organized for maintenance, drills, and emergency action as follows.

a. Damage Control Central (DC Central). DC Central shall be established near the bridge.

(1) DC Central equipment and manning shall provide for two-way interior and interstation communication, evaluating reports, plotting damage, directing personnel traffic, coordinating care for personnel casualties and directing all emergency action.

(2) A Secondary DC Central located in the engine Repair Locker of ships having two repair lockers and in the single repair locker of other ships shall be established. This Secondary DC Central shall be equipped to take over all functions of DC Central, including plotting damage on the ship's profile plans.

b. Repair Parties

(1) Organization. Ship's complement permitting, three repair parties shall be established. Repair Parties 1 and 3 shall be composed primarily of deck personnel and Repair 2 of engine personnel. Personnel will be assigned to repair parties as shown in the ship's Station Bill. A list showing individual duties, a check list of repair party equipment and a list of individuals responsible for maintaining and using equipment shall be posted in each repair locker.

(2) Duties. In an emergency, repair parties will assemble at their respective repair lockers, pick up required equipment and go to the scene of the emergency. During an emergency, the repair parties not engaged shall stand by with equipment ready to assist. Repair parties shall be familiar with the location and operation of all DC equipment and shall control, limit and repair damage, as directed by DC Central.

c. Quick Response Team

(1) Organization. The Quick Response Team will be composed of three to five crewmembers who are, if possible, day working personnel (i.e., Day Third Assistant Engineer and other experienced deck and engine room personnel). Quick Response Team personnel assignments shall be noted on the ship's Station Bill. The Quick Response Team may be members of repair and zone parties as personnel manning permits.

(2) Duties. The Quick Response Team takes immediate action to combat and control emergencies involving fire and/or flooding. To fight fires, this team uses equipment which can be obtained quickly, including local SCBAs if needed. When an alarm is sounded, the Quick Response Team shall proceed immediately to the casualty location. Initially this team reports to DC Central and then reports to the On-Scene Leader when he arrives at the local Repair Locker.

d. Zones

(1) Organization. The ship's Station Bill sets forth the division of the ship into zones and the assignment of personnel to zone areas to "Button-up" the ship and to patrol all areas (which may not normally be manned) during drills and emergencies. A Zone Area Officer and crewmembers are assigned to each zone to patrol designated stations.

(2) Duties. Under the supervision of a Zone Area Officer, zone area personnel shall:

(a) Make all required closures. This includes securing air ports, watertight doors and hatches, firescreen doors, fumetight doors, vents, manual fire dampers, blowers, fans, flushing systems and all other system openings which may be secured without danger to vital equipment or personnel.

(b) Patrol assigned station areas to locate and report any damage. This includes giving particular attention to locations near damage in adjacent zones from which damage might extend to their zone. Personnel shall be alert to detect fire, smoke, hot bulkheads, water leaks, ruptures in piping or breaks in cables and any other signs of damage. In addition to reporting the results of all patrols and investigations to the Zone Area Officer, zone personnel shall take initial action to control damage before the arrival of repair parties.

(c) Serve as stretcher and material bearers and assist repair parties, as directed. Zone personnel shall aid in confining fires and in establishing boundaries by cooling bulkheads, decks and overheads to prevent heat transmission.

(3) Communication. Zone Area Officers shall maintain continuous communication with their Repair Locker Leader by sound-powered phone.

e. Key Emergency Station Personnel. Key emergency station personnel shall man emergency stations as assigned, report to DC Central and stand by for orders. Key emergency stations shall be located at:

(1) The forward and aft diesel fire pumps (where provided).

(2) The emergency diesel generator.

(3) The main distribution switchboard.

(4) Remote control bilge suction manifolds (where provided).

(5) The CO_2/HALON manifold or the remote control CO_2/HALON release (where provided).

(6) The CO_2/HALON cylinder or bottle room.

(7) The Steering Engine/Gear Room and after docking bridge.

(8) The foam generating station and storage tank.

(9) The I.C. Room. This may be designated a key emergency station if equipped with sound-powered circuits or with an emergency power distribution board.

f. General Duty Assignments. General duty assignments shall provide for evacuation of passengers and troops from damaged and adjacent areas, evacuation and care of personnel casualties, direction and assistance to passengers and troops, salvage of records and funds and destruction of classified information, as directed.

g. Special Duty Assignments. Emergency Assignments Cards (MSC 3541/2) are available at the Master's discretion and may be prepared for each crewmember and posted at his/her bunk to show general emergency stations and duties as listed in the ship's Station Bill. In addition, crewmembers should be aware that additional details of special duty assignments are provided in each of the supplementary emergency bills. Shipboard training and drills must familiarize each crewmember with his/her special duty assignments and ensure that he/she can perform them effectively in casualty situations.

h. Station Bills. Station Bills shall be posted in conspicuous locations throughout the ship. Station Bills include instructions for actions to be taken in the event of fire and collision, CBR attack, abandon ship and man overboard and rescue procedures. Station Bills also show assignments to repair parties, fire stations, zone areas, abandon ship stations and emergency boat crews. Station Bills provide instructions for operating all emergency systems and equipment and for manning vital ship stations. Station Bills also list standard emergency signals and provide safety-at-sea instructions. They will be kept up to date with corrections and modifications made by the Master.

2-1-3 RESPONSIBILITIES

a. Master. The Master is responsible for overall shipboard administration, organization, readiness and training. The Master shall ensure that appropriate Station Bills, instructions and markings are posted. The Master will direct realistic drills sufficient to ensure continuing development of crew skill in performing emergency duties. The Master also shall frequently inspect the ship to ensure that all DC equipment is in working condition. The Master will establish a checkoff list requiring periodical test of power driven DC equipment.

b. Damage Control Officer (DCO). The First Officer is DCO. He is in charge of DC readiness and training. He shall see that appropriate markings and instructions are displayed on DC equipment and at stations. He shall inspect DC equipment frequently and direct action to maintain, repair or replace DC equipment as necessary. The First Officer is responsible for training the crew to ensure continuous and progressive development of the ship's DC organization. During drills and emergencies, the First Officer takes charge of DC Central to receive reports and plot casualty areas on the ship's DC plans or on the status board. He shall direct and coordinate the actions of repair parties and other working parties, and calculate any change in stability. He may, subsequently, evaluate casualty control effectiveness and direct action at the scene.

c. Chief Engineer. The Chief Engineer, in coordination, with the First Officer, shall organize and train engineering personnel and assist in training personnel of other departments. He shall accomplish or direct inspection, testing, marking, maintenance and repair of DC equipment. He is in charge of controlling emergencies in engineering spaces and shall direct the actions of assisting repair parties. During drills and emergencies, he shall take charge in the Engine Room, or where most needed to coordinate and direct action as ordered by the Master.

d. Supply Officer or Comparable Crewmember. The Supply Officer or comparable crewmember is responsible for the cleanliness and preservation of closures, valves, fittings, fire hoses, nozzles, applicators, fire extinguishers and similar equipment located in spaces assigned to the Supply Department. He shall make periodic inspections of all such equipment and shall report deficiencies to the DCO. He shall assist in DC training of Supply Department personnel.

e. CBR Defense Officer. A Third Mate, or another crewmember so designated, is the CBR Defense Officer. He is responsible to the First Officer for conducting CBR defense training, maintaining decontamination stations and equipment and posting required instructions and markings required for CBR defense.

f. Radio Officer. On ships without a MILDET/MILDEPT, the Radio Officer is responsible to the First Officer, through the CBR Defense Officer, for the proper operation and care of radiacs and associated maintenance records. On ships with a MILDET/MILDEPT, the Navy Electronic Technicians (ETs) will be responsible for radiac equipment. The Radio Officer shall familiarize himself thoroughly with radiological detection and monitoring operations and shall assist in CBR defense training. In emergencies, the Radio Officer establishes interstation communications and shall report the casualty situation and the ship's position, as directed by the Master.

g. Navigator. In all emergencies, the Navigator, usually the Second Officer, shall immediately plot the ship's position and give it to the Master and Radio Officer. In abandon ship action, he shall provide the magnetic course and distance to the nearest land to Boat Commanders.

h. Repair Party Leader. The Repair Party Leader is responsible for instructing and drilling repair party personnel and for controlling damage at the scene. He shall direct his repair party into the damaged area, as instructed by DC Central, and shall supervise action including, isolation of damage by making and strengthening closures; isolating sections of vital systems for repair; fighting fire and overhauling debris; cutting away debris; plugging, patching and shoring; repairing ruptured lines of vital DC systems, fire main, steam lines, electrical circuits, bilge and drainage piping and remote control apparatus; strengthening structural members and combating engineering casualties.

i. Zone Area Officers. Zone Area Officers shall organize and train their personnel in emergency duties. During emergencies and drills, they shall be at their zone stations. They shall verify manning of their zones and report readiness to DC Central. Zone Officer responsibilities shall include directing the "Buttoning-up" of their zones by closing watertight fire screen and weather deck doors, scuppers, hatches, scuttles, portholes and fire dampers;

isolating, combating and overhauling debris of zone fires; restationing personnel as needed to prevent personnel casualties; coordinating with Repair Party Leaders in controlling damage; directing the movement of shoring and DC tools and materials; arousing, warning and assisting passengers and troops; locating, investigating and reporting initial and secondary damage; patrolling sections of their zone; reporting equipment damage or failure in their zone and periodically informing the Repair Locker Leader of their zone condition.

j. Senior Deck Watch Officers. Senior Deck Watch Officers shall take all necessary initial action in an emergency. This includes notifying the Master, First Officer, Navigator and Engine Room Watch; coordinating reports; directing investigation; sounding alarms; isolating damage by releasing firescreen doors, closing dampers, shutting down ventilation fans and other appropriate actions; plotting damage; directing repair party action until relieved by the DCO and maneuvering the ship.

k. Senior Engineering Watch Officer. The Senior Engineering Watch Officer shall take necessary action to notify the bridge and the Chief Engineer of any engineering casualties; maintain propulsion and power supply and ship's services; combat engineering casualties and when directed start fire pumps.

2-1-4 CONDITIONS OF READINESS

Two conditions of readiness are established for MSC ships. These are:

a. Emergency

(1) When Set. "Emergency" (Buttoned-Up) condition is set when all hands are called to emergency stations or at any time danger to the ship is imminent.

(2) How Set. Under condition "Emergency," all closures and systems shall be secured except those required for the operation of vital machinery or the health of personnel. All watertight doors, firescreen doors, portholes and other closures are secured. All ventilation is secured except that necessary for main propulsion and the health of the Engine Room watch. During drills, securing of ventilation may be simulated except in the zone in which the casualty is staged. All closures shall be properly made and checked by Zone Officers. All hands shall be trained in establishing and maintaining watertight integrity.

b. Cruising

(1) When Set. "Cruising" condition is set before getting underway, and before and during entering or departing port. Setting this condition is particularly important when the ship is in confined or inland waters, in heavy traffic, heavy weather, low visibility or is in a combat zone.

(2) How Set. "Cruising" condition requires securing, except when actually in use, manhole covers, sounding tubes, bilge and ballast drain systems, fueling stations, hatches and watertight doors below the bulkhead deck (the uppermost deck to which transverse watertight bulkheads extend). These fittings are closed and kept closed while "Cruising" condition is in effect. When opened for use or passage, they must be closed immediately afterward.

c. Modification of Conditions. After either "Emergency" or "Cruising" condition is set, it may be changed or modified only by direction of the Master. Modification of "Cruising" condition may include:

(1) Opening watertight doors to provide necessary ventilation and passage.

(2) Opening shaft alley watertight doors which have remote manual controls.

d. In Port. Watertight doors below the bulkhead deck shall be kept closed during off-working hours and periods of inactivity.

e. Other Precautions. Whether at sea or moored, the Master shall, in addition to the above requirements, take other security precautions and require other closures as necessary for the safety of the ship. He shall ensure the security of the ship and maintenance of watertight integrity as may be dictated by local situations.

2-1-5 EMERGENCY PROCEDURES

a. General. During drills or emergencies, when the general alarm is sound, all stations shall be manned as assigned in the ship's Station Bill. In general (with modifications in CBR defense), the following apply:

(1) The Master assumes command on the bridge. The First Officer takes charge at DC Central. After directing necessary action and determining the reserve stability, he may take charge at the scene. The Chief Engineer takes station in charge of the

Engine Room. After assuring himself that all machinery is operating properly, he may assist in directing damage control at the scene, as directed by the Master. Radio Officers report to assigned stations.

(2) Repair parties and Repair Party Leaders report to their DC repair lockers and prepare to go to the scene of the casualty with necessary equipment. They shall be directed by the DCO and shall take action required to prevent, control and repair damage. Repair parties shall maintain communication with DC Central.

(3) Zone Area Personnel and Officers shall report to their zone, make required closures, patrol assigned areas and assist repair parties as directed. Zone Area Officers shall maintain communication with their Repair Locker Leader and report:

(a) When manned.

(b) When required closures are initially made.

(c) All damage, personnel casualties and other pertinent information gathered by zone patrols.

b. Other Bills. The DC bill establishes the general plan and organization for damage control. Detailed plans and procedures to cope with specific DC emergencies are covered in the following additional bills that are later addressed in Part 2 of this instruction:

Fire Bill
Grounding and Collision Bill
Abandon Ship Bill
CBR Defense Bill
Engineering Casualty Bill
Steering Casualty Bill
Towing and Salvage Bill
Man Overboard Drill
Highline Transfer Bill
Emergency Evacuation Bill
In Port Emergency Bill
Mercy and Rescue Bill
Helicopter Launching and Recovery Bill
HAZMAT Spill Response Bill

c. Station Bills and Emergency Signals. Standard MSC ship's Station Bills for each MSC ship type contain uniform emergency signals, safety-at-sea instructions and assignments to emergency stations and duties. These ship's Station Bills have been reviewed by the Commandant, U.S. Coast Guard and are accepted as adequate and in compliance with regulations. The specified emergency signals shall be used. The general alarm or ship's whistle shall not be used to signal emergencies within the ship except as specified herein. Where installed, the general announcing system (1MC) shall be used for supplementary announcements after the signal, and for emergencies not requiring all hands.

(1) Fire, Collision and General Emergency. For fire, collision and general emergencies, steady ringing of the general alarm bells and a continuous blast of the ship's whistle for at least 10 seconds followed by appropriate announcement on the 1MC system.

(2) CBR Defense. To signal CBR attack or initiate CBR defense actions: steady ringing of the general alarm bells followed by short and long rings ("A") on the general alarm bells for at least another 10 seconds followed by supplementary 1MC announcements.

(3) Abandon Ship. Seven or more short blasts and one long blast on the ship's whistle and the same signal on the general alarm bells, followed by 1MC announcement.

(4) Whistle Signals For Handling Boats

Lower boats	one short blast
Stop lowering boats	two short blasts
Recall and recover boats	a short, a long, and a short blast ("R").

(5) Man Overboard. Three long rings on the general alarm bells ("O"), announcement on the PA system and three long rings on general alarm bells.

(6) Signals For Directing Emergency Boat. Use radio as first choice - otherwise by whistle, light or flags. Whistle signals should not be used to direct an emergency boat when other ships are in the vicinity because of conflict with passing signals.

Turn to starboard	one
Turn to port	two
Dead ahead	three
Towards ship	four
Stand off, we are maneuvering (Danger Signal)	five

(7) Steering Casualty. One long and two short rings on the general alarm bells ("D"), announcement on the PA system, one long and two short rings on the general alarm bells. When other ships are in the vicinity, international code flag hoist "D" and/or one long and two short blasts on the ship's whistle will be used to advise: "Keep clear of me - I am maneuvering with difficulty."

(8) Dismissal From Any or All Drills. Three short blasts on the ship's whistle and the same signal on the general alarm bells, followed by PA announcement.

(9) Other Emergencies Not Requiring All Hands. Announcement on the PA system or pass the word.

d. Standard Safety-at-Sea Instructions. Safety-at-sea instructions will be included in all MSC ship's Station Bills.

2-1-6 DAMAGE CONTROL TRAINING

a. Training. See CMPI 410 and COMSCINST 3120.2D.

b. Appraisal of DC Readiness. There are four methods of evaluating DC readiness.

(1) Comparing time required for a drill with time previous drills.

(2) Noting omission of duties or equipment; comparing errors made in each drill with errors during previous drills.

(3) Evaluating the effectiveness of drills or exercises (pick-up of man overboard, shoring, pumping, coverage of washdown system).

(4) Examining the condition and observing the operation of emergency equipment and systems.

PART 2

EMERGENCY BILLS

CHAPTER 2

FIRE BILL

2-2-1 PURPOSE

This Fire Bill organizes the ship's company for firefighting. The objectives of shipboard firefighting are to:

a. Discover and report fire promptly.

b. Combat fire.

c. Isolate damaged areas systematically.

d. Safeguard life and property.

e. Maintain firefighting equipment in readiness.

f. Continue the ship on its assigned mission.

g. Train and instruct the crew.

2-2-2 ORGANIZATION

a. The organization of the ship's crew to combat fire is based on the ship's Station Bill and Damage Control Bill, which establishes:

(1) Damage Control Central

(2) Quick Response Team

(3) Repair parties

(4) Zone personnel

(5) Key emergency station personnel

(6) Emergency duty assignments

(7) Watch on deck and in Engineroom

b. In Port

(1) In port, watch officers shall, in addition to duties and stations indicated on the ship's Station Bill, take immediate action to locate, isolate and extinguish any fire.

(2) All hands onboard, in port, whether on duty or not, will assist in firefighting and in preparation to get underway.

2-2-3 RESPONSIBILITIES

a. Master. The Master is responsible for ensuring the efficient organization, training and supervision of firefighting procedures. The Master shall:

(1) Conduct inspections and drills to assure readiness to cope with any fire.

(2) Ensure that qualified personnel are assigned to firefighting duties.

(3) Take appropriate emergency action including maneuvering ship, requesting assistance, directing preparation of lifesaving equipment, notifying MSC Area Commander and diverting from the mission.

(4) Direct use of fixed HALON or CO_2 firefighting systems on ships with a single shot capability. On ships with a two shot capability, he will direct or delegate the authority for the use of the second shot if its use is necessary. He may direct use of delegate authority to use these systems to the watch officer responsible for the space. This delegation must be recorded in the ship's DC Book and Main Space Fire Doctrine instruction. Fixed CO_2 systems with makeup CO_2 shall be considered one shot systems requiring appropriate release authority.

b. First Officer. The First Officer, as DCO, is in charge of and directs firefighting from DC Central on the Bridge. He shall:

(1) Receive and evaluate reports condition.

(2) Direct the plotting of fire spread and firefighting progress on the status board.

(3) Direct appropriate countermeasures in areas outside machinery spaces.

(4) Direct the evacuation of people from danger areas.

(5) Direct movement of backup personnel.

(6) Direct medical personnel.

(7) Direct dewatering of flooded compartments as soon as possible.

(8) Train ship's personnel in firefighting.

(9) Conduct frequent inspections to ensure that all firefighting equipment is in good working order.

c. Chief Engineer. The Chief Engineer, in coordination with the First Officer, shall organize and train engineering personnel and shall assist (as appropriate) in training personnel of other departments. He shall accomplish or direct inspection, testing, marking, maintenance and repair of firefighting equipment for which he is responsible. He is in charge of fighting fires in engineering spaces, directs firefighting action and coordinates his action with DC Central.

d. Deck Watch Officer. The Senior Deck Watch Officer shall take all necessary initial action to:

(1) Sound fire alarm signal to alert crew.

(2) Secure all ventilation systems from Bridge if an actual fire exists or if in any doubt. Where blowers must be reset individually, only the affected zone will be secured during each drill.

(3) Close firescreen doors (master switch).

(4) Close watertight doors that are Bridge controlled.

(5) Maneuver or stop ship.

(6) Notify Master and First Officer and assume the responsibilities of DCO until relieved.

e. Senior Engineer Watch Officer

(1) The Senior Engineer Watch Officer shall take action necessary to start fire pumps, begin dewatering, prepare for maneuvering and, when directed, shall de-energize all general lighting and power circuits that pass through the fire area.

(2) He shall direct use of the first shot of fixed Halon or CO_2 firefighting systems in accordance with the Main Space Fire Doctrine on ships with a two shot capability. On ships with a single shot capability, he will use the system when directed by the Master.

f. Quick Response Team. The Quick Response Team immediately proceeds to the location of the fire. They will begin to fight the fire with the nearest fire hose or extinguisher. If unable to approach the fire without protective equipment, they will report the situation to the Bridge, DC Central and the repair party, withdraw from the fire area and set boundaries to slow or prevent the spread of fire while waiting for the fully equipped repair party.

g. Repair Party. The Repair Party Leader will direct the On-Scene Leader to proceed to the location of the fire with assigned men, personnel protective equipment and firefighting equipment. When the nature and extent of the fire has been determined, the On-Scene Leader will direct personnel to isolate the fire, evacuate personnel in the immediate area, use all means available to extinguish the fire, maintain communication with the bridge and report progress.

h. Radio Officer. The Radio Officer shall establish inter-station communications and report the ship's position and the fire, as directed by the Master and prepare and send all appropriate messages.

i. Zone Area Officers. Zone Area Officers are responsible to the First Officer. They shall:

(1) Supervise the "Buttoning-up" of their zones by securing watertight, firescreen and weather deck doors; scuppers, hatches, scuttles, port holes and fire dampers.

(2) Isolate and combat fires.

(3) Evacuate embarked personnel and crew from dangerous areas.

(4) Maintain constant communication with the Repair Locker Leader to report personnel casualties or equipment failures, results of direct investigation and patrols and zone condition.

(5) Direct evacuation of casualties and assist the Repair Party Leader at the scene.

j. Personnel Discovering a Fire. Proper immediate action in the first few minutes of any fire is essential. Therefore, any person aboard ship, underway or inport, who discovers a fire, shall immediately:

(1) Spread the alarm by shouting "FIRE," passing the word via phone, activating a local fire alarm pull box or sending another crewmember to pass the word. When the person discovering the fire cannot extinguish it immediately without assistance and another crewmember is not available to pass the word, the discovering crewmember should isolate the area while proceeding to the nearest manned control station to pass the word.

(2) Notify the Bridge or quarterdeck immediately by telephone or by messenger. Report the exact location of the fire by deck, frame, side of ship and compartment description. Report the extent and class of fire.

(3) Take charge at the scene, until relieved by a senior officer or by arrival of a repair party.

(4) Attempt to extinguish the fire using appropriate fire extinguishers or other firefighting equipment in the area to prevent it from spreading.

(5) Make progress reports to the Bridge.

(6) Remove flammable material from the area.

(7) Check the temperature of surrounding bulkheads and report any developments to the Bridge.

(8) Carry out orders of senior officers.

Fighting fires is an ALL-HANDS job. It is expected and required that all hands will know these instructions, the types of fires, proper use of extinguishers and how to take initiate action under varying conditions. What is done in the first few minutes of a fire is often far more important than any action in the following several hours.

2-2-4 CONDITION OF READINESS

At the sound of the general alarm, condition "Emergency" will be set.

2-2-5 EMERGENCY PROCEDURES

a. Fully Manned. When, because of a fire underway or inport with all hands onboard, the fire alarm signal is sounded, all fire stations shall be manned as assigned in the ship's Station Bill.

(1) The Master assumes command on the Bridge.

(2) The First Officer takes charge at DC Central. After directing necessary initial action, he may take charge at the scene.

(3) The Chief Engineer takes charge of the Engineering Department and directs firefighting in engineering spaces in coordination with DC Central.

(4) The Quick Response Team shall immediately proceed to the location of the fire and begin fighting the fire with the nearest fire hose or extinguisher. If unable to approach the fire without protective equipment, they will report conditions to the Bridge, DC Central and the repair party, withdraw from the fire area and set boundaries to slow or prevent the spread of fire while waiting for the fully equipped repair party.

(5) Repair Party Leaders and repair party personnel report to their DC locker, pick up equipment and, unless otherwise instructed, will begin fighting fire in their area without waiting for orders from DC Central.

(6) Repair Party Leaders shall:

(a) Direct investigation of fire by SCBA or OBA man, equipped and monitored.

(b) Determine the following:

1. Exact location

2. Nature of fire

3. Extent of fire

4. Safest access routes, ensuring isolation of fire and maintenance of watertight integrity

5. Equipment required

6. Locating of secondary boundaries

(7) The remainder of the repair party shall investigate the surrounding area, set up secondary boundaries, establish and maintain communications and provide continuous progress reports to DC Central. They shall take all necessary steps to isolate and extinguish the fire.

(8) The Repair Party Leader, after completing his initial investigation, directs the On-Scene Leader to fight and extinguish the fire, to evacuate casualties from the scene and to render first aid as required.

(9) The electrician assigned to the repair party, when directed, de-energizes lighting and power circuits that pass through the fire areas and connects necessary emergency circuits.

(10) Zone Area Officers and personnel man fire stations, secure ventilation and fire dampers, close watertight doors, close firescreen doors and confine the fire to impede its progress. They fight fire in their areas until relieved by the repair party and

evacuate crew and casualties. Zone Area Officers establish communication with their respective Repair Locker Leader and report when manned, when closures have been made, extent of damage, casualties, progress and other pertinent information gathered by zone personnel. Zone personnel also help repair parties and dispatch men and provide assistance as directed by DC Central.

b. In Port, When All Hands Are Not Aboard. A fire in the ship or one spreading to the ship shall be fought by a composite fire party. This party shall consist of all available personnel onboard. All hands shall be immediately on duty and shall make themselves available and muster at the quarterdeck or as directed by the Watch Officer over the general announcing system. They shall assist in firefighting and preventing the spread of fire and shall aid in preparations to get underway. The Senior Deck Officer onboard shall be in charge and will normally take station at the scene. The Master shall be responsible for compliance with port regulations and shall ensure that personnel onboard know how to contact shore-based firefighting.

2-2-6 RE-ENTRY

a. Re-entry to be determined on a case-by-case basis using tools and indicators as guides such as bulkhead thermometers to determine if sufficient space cooling has occurred. Once installed on the bulkheads, deck and overhead of the effected space, the temperature readings on the various bulkhead thermometers should be monitored noting any rise or fall in readings. For safe re-entry, a gradual fall in thermometer temperature is required. A steady or increasing temperature reading indicates the fire may not have been extinguished and additional firefighting action is required.

b. If operation of the ship's main engine is paramount, re-entry must be accomplished within a normal time frame. However, a hard and fast rule regarding the correct length of time to wait prior to re-entry does not exist for every situation.

2-2-7 SIGNALS

a. Fire Stations. The fire alarm signal is a steady ringing of the general alarm bells and a continuous blast of the ship's whistle for at least 10 seconds followed by appropriate announcement on the PA system. If necessary, word will be passed over the PA system, giving information concerning the location of the fire (by deck, frame and side number and compartment) and the extent and type or class of the fire.

EXAMPLE: "Class "A", mattress fire, Compartment 4-37-0-1"

b. Dismissal. The signal for dismissal from fire stations is three short blasts of the ship's whistle and the same signal on the general alarm bells, followed by PA announcement.

c. Drills. At all fire drills, the word should be passed "This is a drill." In case of an actual fire, the word should be passed "This is not a drill."

2-2-8 FIREFIGHTING TRAINING

a. The Master shall be responsible for a continuing shipboard firefighting training program for the entire crew.

b. Formal Training. All hands should be detailed, in rotation whenever possible, to attend formal firefighting training at MSC or USCG approved firefighting schools. Refresher training every 3 years is required.

c. Indoctrination. All newly assigned personnel shall be instructed and trained in basic firefighting actions.

d. Topics for Instruction. The First Officer with the assistance of the ship's Department Heads, Repair Party Leaders, Zone Area Officers and designated key personnel shall schedule training and instruct and drill the crew in a continuing firefighting training program. This training will include specific duty assignments and all aspects of firefighting. Training methods will include demonstrations, skill tests and the drills specified in operating instructions. The following should be emphasized:

(1) Chemistry of fire

(2) Classes of fires

(3) Portable fire extinguishers

(4) Fire prevention afloat

(5) Navy and MSC standard couplings, hoses and nozzles

(6) Fire detecting systems

(7) Confinement of fire

(8) Organization of shipboard repair parties

(9) Zone organization

PART 2

EMERGENCY BILLS

CHAPTER 3

GROUNDING AND COLLISION BILL

2-3-1 PURPOSE

This Grounding and Collision Bill establishes assignments and responsibilities of key personnel, and general procedures for the rapid and effective control of damage resulting from grounding and refloating the ship and collisions. Groundings and collisions can be prevented through safe and proper navigation, good seamanship, strict adherence to the Rules of the Road and the effective use of radar. All aids to navigation must be used and due regard given to all dangers to navigation. The Navigator must fix and project the ship's position as frequently as circumstances require. The Deck Officer on Watch must be kept informed of the position of the ship and of all other information he needs to keep the ship out of danger. The Watch Officer must be familiar with and frequently consult the appropriate chart to ensure the safety of the ship. The Deck Officer on Watch must always keep in mind that if he is uncertain of the safe navigation of the ship in restricted waters, he must not hesitate to stop and anchor if necessary, until he can proceed with assurance of safety.

2-3-2 ORGANIZATION

The ship's key personnel shall be organized for the control and repair of collision damage as follows:

Master	In command on bridge
First Officer	DC Central
Chief Engineer	Engine Room or at scene
Radio Officer	Radio Room
Second Officer	Bridge
Repair Party Leaders	In charge of repair parties

2-3-3 RESPONSIBILITIES

a. Master. The Master is responsible for organizing and preparing the crew to correctly respond to groundings and collision, and to limit and repair grounding and collision damage.

He shall assure that deck officers are skilled in the use of radar and radar plotting, know the Rules of the Road, practice accurate navigation and good seamanship to ensure prevention of collisions and groundings.

b. First Officer. In the event of collision as grounding, the First Officer, as DCO under the Master, shall ensure that condition of readiness "Emergency" is properly set, plot a secondary flooding boundary, calculate changes in stability and advise the Master.

c. Chief Engineer. The Chief Engineer shall inspect engineering spaces for damage and shall maintain power, light and other utilities as requested by the DCO. If the grounding or collision damage is in an area remote from engineering spaces, the Chief Engineer may go to the scene and direct the action, coordinating with the DCO.

d. MILDEPT/MILDET OIC or Radio Officer. The MILDEPT/MILDET OIC or Radio Officer shall transmit necessary reports as directed by the Master.

e. Navigator. The Navigator shall fix the ship's position and inform the Master and Radio Officer. He shall log time, sea state, wind and weather conditions. In a collision, he shall log the name of the other ship. The Navigator will retain any plotting sheets in use at the time of the collision or grounding.

f. Senior Engineering Watch Officer. The Senior Engineering Watch Officer shall answer all bells expeditiously, maintain light and power, warm up the main fire pump and ready the bilge pumps.

2-3-4 CONDITION OF READINESS

At the sound of the general alarm, "Emergency" condition will be set. Ventilation may be restored in the Engine Room and in other areas not affected by the grounding or collision.

2-3-5 EMERGENCY PROCEDURES

When either collision or grounding is imminent, the following emergency actions will be taken:

a. Sound alarm (if time permits).

b. Close Watertight doors, firescreen doors and secure ventilation.

c. Set condition "Emergency."

d. Direct repair parties to scene.

e. Plot damage area on DC display plans and set secondary flooding boundaries.

f. Send radio report (on Master's order).

g. Calculate the ship's stability status.

h. After determining the area and extent of damage and directing zone personnel to assist Repair Party Leaders as necessary, the Master may direct zone personnel remote from the damage area to clear away and lower designated boats to the embarkation deck.

i. If the ship is grounded, conduct a complete sounding survey all around the ship with a lead line and also determine whether screw and rudder are free.

2-3-6 RECOVERY ACTIONS FOR GROUNDING

If there is significant damage, loss of propulsion and power or weather and wave action is likely to drive the ship further aground, contact the MSC Area Commander and Fleet Commanders immediately to request salvage assistance. Salvage of MSC Ships, COMSCINST 5420.2F, provides further guidance on salvage services. When there are no ruptures in the hull that can cause flooding when clear of the shoal and the ship has propulsion or other means to prevent regrounding after freeing, take these actions:

a. Determine type of bottom under the ship and evaluate the probability of further damage when freeing the ship. Soft sand or mud is unlikely to cause damage, hard rock and coral may cause further damage during retraction attempt.

b. Using prior to grounding drafts fore and aft, determine from after grounding drafts and effects of flooded compartments what change in displacement and trim are required to free the ship.

c. If the ship is on a soft bottom with minimal change in displacement (1-2 ft. at one end, no change or deeper at other end), there are no openings in the hull and screws and rudder are free, the Master may attempt to back off the shoal.

d. If there is a change in draft, determine from the trim and stability book data whether jettisoning water ballast, fuel, cargo, and other items will allow the ship to free itself. The Master must determine whether or not to jettison based on his estimate of possible further damage to the ship resulting from remaining until salvage assistance arrives. He must consider the ability of the ship to free itself, the value of cargo and equipment to be jettisoned, environmental effects of jettisoned oil or other items and effect on stability of jettisoning fuel or cargo.

e. If The Master calculates that jettisoning combined with a high tide will free the ship, then the Master may attempt to back off at high tide.

f. When attempts to free the ship are unsuccessful, or weather, wave and bottom conditions are not suitable for freeing attempts, consideration should be given to ballasting to hold the ship in place, thus preventing it from being driven farther aground, capsizing or suffering further damage from wave action.

2-3-7 SIGNALS

In case of an imminent or actual collision or grounding, the Senior Deck Watch Officer will sound the general alarm bells and ring the ship's bell rapidly for at least 10 seconds. The threat or casualty will be announced on the general announcing system, followed by necessary instructions.

PART 2

EMERGENCY BILLS

CHAPTER 4

ABANDON SHIP BILL

2-4-1 PURPOSE

This Abandon Ship Bill establishes assignments of key personnel and defines their duties in preparing to abandon and abandoning ship. Abandon ship procedures are spelled out in detail in the Lifeboat Training Guide, COMSCINST 12410.1C.

2-4-2 ORGANIZATION

The ship's key personnel shall be organized for abandoning ship as follows:

a.	Master	In command on bridge.
b.	First Officer	In charge of preparation and launching operation.
c.	Chief Engineer	In charge of the Engine Department. Ensures vital services are maintained during the launching process.
d.	Navigator	Fixes ship's position and informs Master and Radio Officer.
e.	Boat Commanders	At boat stations, ready all boats for launching.
f.	Boat Commanders (second in command)	At boat stations, ready boats in absence of Boat Commanders.

2-4-3 RESPONSIBILITIES

a. Master. The Master is responsible for preparing the crew for abandoning ship. He is responsible for the readiness and proper use of all lifesaving equipment.

b. First Officer. The First Officer is in charge of launching procedures. He shall direct readying and launching of all boats, liferafts and lifefloats.

c. Chief Engineer. The Chief Engineer will maintain power and lights until notified by the Master to abandon the engineering spaces. He shall then secure the operating machinery and lift the boiler safety valves by means of the hand lifting gear. He shall ensure that the emergency generator is left operating.

d. Radio Officer. The Radio Officer shall transmit, as directed by the Master, the distress signal and other messages. He shall also ensure that the portable emergency radio is carried to the abandon ship station as provided in the Station Bill.

e. Navigator. The Navigator shall fix the ship's position and inform the Master and Radio Officer. He shall also determine and provide to Boat Commanders the magnetic course and distance to nearest land.

f. Boat Commanders. Boat Commanders shall supervise their boat crews in preparing to abandon ship. Boat Commanders shall direct the safe embarkation and seating of their passengers and crew and shall lower their boats to the water when the signal is sounded, clear away from the ship's side and stand by to pick up other personnel or to receive further orders. The second-in-command of senior officers' boats (Master, Chief Engineer, First Officer and First Assistant Engineer) shall supervise their boat crews in clearing away and swinging out their boats.

2-4-4 CONDITIONS OF READINESS

Prior to the decision to abandon ship, "Emergency" would have been set as a result of fire, collision or other casualty. "Emergency" will be maintained to the maximum extent possible throughout preparation to abandon ship.

2-4-5 EMERGENCY PROCEDURES

The Master may, before making the decision to abandon ship, do the following:

a. Direct that all boats be cleared away, swung out and lowered to the embarkation deck.

b. Direct personnel assigned to inflatable liferafts to ready them for launching.

c. Report by radio, the emergency situation and the possibility of abandoning ship.

2-4-6 SIGNALS

The standard signals or alarms for abandoning ship are as follows:

a. Seven or more short blasts and one long blast on the ship's whistle and the same signal on the general alarm bells, followed by PA announcement.

b. Lowering the boats from the embarkation deck will be accomplished on the Master's signal of one short blast of the whistle.

c. Stop lowering boats - two short blasts.

d. Recall and recover boats - a short, a long and a short blast ("R").

PART 2

EMERGENCY BILLS

CHAPTER 5

CBR DEFENSE BILL

2-5-1 PURPOSE

This Chemical, Biological and Radiological Defense (CBR-D) Bill organizes ship's personnel for defensive measures against chemical, biological and radiological attack (CBR Defense). The objectives of CBR-D are to minimize the effects of CBR attack by:

a. Establishing and executing defensive measures at sea and in port.

b. Determining and establishing the required Mission Oriented Protective Posture (MOPP).

c. Prescribing and delegating responsibilities for defensive measures.

d. Conducting drills, training and emergency action.

e. Setting "EMERGENCY" (Buttoned-Up) condition of readiness under CBR attack.

f. Evacuating and caring for casualties.

g. Manning emergency stations and carrying out special duty assignments.

h. Monitoring and decontaminating exposed personnel.

i. Maintaining and using detection equipment.

2-5-2 ORGANIZATION

The crew is organized for shipboard CBR-D in conjunction with damage control as set forth in the ship's Station Bill. CBR-D includes training, drills and emergency action to "Button-Up" and minimize the effects of a CBR attack. The shipboard organization includes the following.

a. Repair Parties. Repair parties will be responsible for the following CBR-D measures. The lockers will be augmented by members of the crew to allow the complete manning of these additional tasks.

(1) Responsible for assisting in material decontaminatio under the direction of the DECON teams.

(2) Rig the Washdown Countermeasure (WDCM) System and test at the appropriate MOPP level.

(a) Ensure fire hoses are not kinked or fouled.

(b) Nozzles are in fog position and produce an efficient fog spray on a hose and clip system.

b. CBR-D DECON/Survey Team Personnel

(1) Organize DECON station teams and set up all equipment required in the DECON station.

(2) Responsible for monitoring nuclear, biological and chemical effects.

(3) Ensure that all required radiacs and chemical kits and DECON supplies are pre-staged.

(4) Determine and mark boundaries of contamination.

(5) Accomplish initial decontamination of topside areas after monitoring.

c. In Port (Anchored or Moored)

(1) When conditions dictate, sufficient qualified personnel shall be aboard to minimize the effects of attack by:

(a) Complying with applicable CBR-D procedures as stated in MSC 3541-4 or USCG Form 3256.

(b) Getting the ship underway.

(c) Carrying out defensive countermeasures - "Buttoning-Up" the ship, rigging the Water Washdown Survey.

(2) All crewmembers aboard ship are in duty status during emergencies.

2-5-3 EQUIPMENT

a. Washdown. All MSC ships will be provided with a fixed countermeasure washdown system or sufficient wye gates, fire hose, all-purpose nozzles and nozzle clips or hang brackets on which to secure the vari-nozzles to generate a washdown for CBR-D. All hands should know the location of the fixed WDCM activation points and the location of the washdown clips in their area (they are painted international orange) so that they can help rig the washdown system quickly.

b. Protective Clothing. Allowances of Chemical Protective Overgarments (CPO), Chemical Protective gloves and boots and gas masks are authorized in the MSC CBR-D Material Condition of Readiness Policy (see Appendix C). This clothing shall be distributed to the crew as an emergency item. The ship's training allowance should be used in CBR-D drills. The CPO should not be used in radiologically contaminated environments, shipboard foul weather gear will be used as protective clothing in these situations.

c. Radiacs. Radiac allowances in COMSCINST 9670.1E are provided all ships to detect and measure radiation hazards. Radiacs should be stowed in a suitable space, protected from moisture and checked, calibrated and repaired ashore by authorized radiac repair shops (see Radiac Policies and Procedures Manual for location of radiac repair shops).

d. Decontamination (DECON) Stations. Personnel DECON stations shall be located on each ship in accordance with the MSC CBR-D Material Condition of Readiness Policy and NAVSEA directives. Each station shall be properly marked, have a separate entrance to and exit from the shower area and be equipped in accordance with MSC policy. Where no formal DECON station is installed, the ship shall designate a temporary DECON station at the weather entrance near a shower. During CBR crew training and drills, emphasis will be placed on DECON routes, traffic control and DECON procedures.

e. DECON Equipment. One or two DECON areas will be established for decontaminating ship's portable gear. The areas shall be in suitable locations providing good overboard drainage of contaminated liquids. Material and equipment readily available aboard ship should be used for performing surface decontamination; e.g., salt water detergents, soap solutions, hypochlorite, scrubbers, chippers or paint sprays.

2-5-4 RESPONSIBILITIES

Key personnel have the following responsibilities for CBR-D.

a. Master

(1) Responsible for the administration, organization and training of the crew in CBR-D.

(2) Maneuver the ship to avoid or minimize the effects of CBR attack.

(3) Direct preparatory measures before a CBR attack.

(4) Evaluate the readiness of ship and personnel before and after a CBR attack.

(5) Order DECON actions for personnel and the ship following control of structural damage, fire and flooding.

(6) Responsible for seeing that inspections and drills are performed to assure readiness for CBR-D. Using material and equipment available aboard ship for surface decontamination shall be emphasized.

(7) Prepare to render aid and assist evacuation of highly contaminated ships or areas as directed by the Senior Officer Present Afloat (SOPA) or the Officer in Tactical Command (OTC).

(8) Prepare the ship to get underway or to continue on its mission.

(9) When moored in port, ensure that sufficient personnel are aboard to maintain ship's readiness to avoid and minimize the effects of CBR attack.

(10) Establish Maximum Permissible Exposure (MPE) for the crew. The recommended MAXIMUM limits for MPE is 150 rads, and casualty dose at 250 rads.

(11) Designate the appropriate MOPP level for the ship.

(12) Ensures proper messages are prepared and sent.

b. First Officer

(1) Assist the Master in analyzing the tactical situation in CBR warfare attack and defense techniques.

(2) Coordinate with the CBR-D Officer the training and exercise of the crew in CBR-D procedures.

(3) Coordinate preparatory measures prior to CBR attack.

(4) In the absence of a Medical Department, provide for the first aid treatment, monitor food and water after an attack and supervise personnel decontamination.

(5) Ensure radiological and chemical/biological hazard areas on the ship are plotted.

c. Chief Engineer

(1) Organize the Engineering Department for emergency operations. Carry out preparatory measures applicable to the Engineering Department.

(2) Secure the evaporators when a sudden shock is experienced or when the CBR alarm is sounded to prevent contamination of fresh water. NOTE: Evaporators shall be secured during a chemical or biological attack, because the evaporators will not raise the temperature of the water enough to kill the agents.

(3) Keep the Master informed regarding the status of the plant.

(4) Act as the technical assistant to the Master on engineering matters. Consider propulsion and auxiliary requirements during operations and decontamination phases of the ship.

(5) In port, moored or anchored, prepare to get the ship underway.

d. Supply Officer or Chief Steward

(1) Take all possible precautions to prevent contamination of food supplies and messing equipment.

(2) Serve no food or drink following a CBR attack except with the approval of the Medical Service Officer (MSO) or Medical Department Representative (MDR) and then only after it has been inspected and monitored for contamination.

(3) Issue additional materials and equipment required for decontamination.

(4) Prepare to feed personnel in uncontaminated spaces during the DECON period.

(5) Ensure the continued indoctrination and training of Supply Department personnel in CBR-D procedures.

(6) Carry out preparatory defensive measures applicable to the Supply and/or Steward Department.

(7) Ensure clean clothing is available at the DECON station exit.

(8) Be prepared to DECON clothing in ship's laundry.

e. CBR-D Officer

(1) Advise the Master on matters concerning CBR-D.

(2) Coordinate with the First Officer/Chief Mate to organize personnel for CBR-D.

(3) Maintain responsibility for custody of and issue CBR-D equipment.

(4) Direct and coordinate the training of ship's crew in CBR-D procedures.

(a) Supervise accomplishment of preparatory measures prior to attack.

(b) Ensure that the ship is effectively prepared and trained for CBR-D.

(5) In association with the ship's First Officer and Master, determine the following for the ship.

(a) Ready Shelter. Located just inside the weather envelop and has access to deep shelter. Any space inside the skin of the ship shall be considered ready shelter.

(b) Deep Shelter. Located low in the ship and near the centerline. Deep shelter should have as many steel decks and bulkheads as possible between deep shelter and the skin of the ship.

(c) Survey Routes. Internal and external survey routes and monitoring stations.

(6) Keep informed of recommended practices for defense against CBR warfare agents and collaborate with the First Officer/ Chief Mate in developing defensive measures and training plans.

(7) Coordinate the monitoring and DECON teams and maintain a log of personnel exposure.

(8) Plot fall out progress, calculate stay times for radiological events and recommend station rotations.

(9) Responsible for ensuring DECON stations are properly equipped.

(10) Responsible for controlling distribution of individual dosimeter by maintaining a record of issue.

f. Radio Officer or OICMILDEPT

(1) Maintain radiac equipment under the direction of the CBR-D Officer.

(2) Establish communication with the cognizant MSC commander.

(3) Comply with orders issued to MSC ships by the SOPA or OTC during an emergency.

(4) Prepare and send appropriate messages.

g. Navigator

(1) Assist the Master on the Bridge.

(2) Fix the ship's position and pass it to the Radio Officer.

(3) Maintain a plot of radioactive/chemical clouds and fallout areas, wind force and direction and tide and currents. Recommend course changes to the Master to avoid contaminated areas.

h. Repair Party Leaders

(1) Remain alert to fire, envelop failure and flooding and respond accordingly.

(2) Conduct internal surveys as directed.

i. Medical Service Officer/Medical Department Representative

(1) Treat casualties of CBR warfare agents and maintain records required to document exposure to CBR warfare agents.

(2) Inspect the food and water supply as soon as practicable following CBR attack.

(3) Keep abreast of developments in the medical aspects of CBR-D and act as technical advisor to the Master and CBR-D Officer.

(4) Examine exposed personnel after completion of decontamination and monitoring and keep the Master informed.

(5) Maintain necessary medical CBR-D equipment and supplies, including CW sampling kits if available.

(6) Assign medically trained personnel to the DECON station.

(7) Ensure that a secondary treatment station is available.

j. In Port, Relief Watch Officers. Assist as directed by ship's Senior Officer.

2-5-5 SIGNALS

The CBR-D alarm is a steady ringing of the general alarm for not less than 10 seconds followed by short and long rings ("A") on the general alarm bell for at least another 10 seconds. Supplementary PA announcements shall be made.

2-5-6 EMERGENCY PROCEDURES

During drills and in actual emergencies, upon sounding of the CBR-D alarm, all stations shall be manned as assigned in the ship's Station Bill. Ships in port shall comply with "Nuclear Attack Instructions for MSC Ships in Port," MSC 3541-4 or USCG Form 3256, which shall be posted on the bridge, in the Engineroom and in several other conspicuous places aboard ship. The MSC form is stocked at COMSC and is requisitioned through normal supply channels.

CHEMICAL, BIOLOGICAL AND RADIOLOGICAL ATTACK MOPP LEVELS

CHEMICAL AND RADIOLOGICAL MOPP LEVELS

SUMMARY OF ACTIONS FOR CHEMICAL AND BIOLOGICAL ATTACK

NOTE: The Summary of Actions for Chemical and Biological Attack listed below must be tailored to each ship.

REQUIRED PRE-DEPLOYMENT ACTIONS

STEPS	RESPONSIBILITY	ACTIONS
1	CBR-D Officer	Inventory all equipment for: - Shelf Life - Current Pubs/Manuals - Outfitting to maximum current authorized levels - Current calibration of Radiacs
2	CBR-D Officer	Test all CBR-D Alarms.
3	Master Chief Mate CBR-D Officer	Review and update CBR-D Bill, Assign appropriate personnel to DECON and Survey teams.
4	CBR-D Officer	Measure Crew, DECON and Survey MSO teams for mask size.
5	Chief Mate	Conduct an operational inspection of the following ship's systems: - Washdown Countermeasure (WDCM) System - Ventilation - Radiacs
6	CBR-D Officer	Remain current on shipboard CBR-D training.
7	Chief Mate CBR-D Officer	Determine and correct all deficiencies prior to deployment.
8	CBR-D Officer	Ensure all equipment with shelf life that will expire during the deployment are replaced prior to deployment. Ensure all radiacs where the calibration dates will expire during deployment are recalibrated prior to deployment.

AREA OF KNOWN OR SUSPECTED CHEMICAL OR BIOLOGICAL THREAT

MOPP - 1

NOTE: The Master should assess the operating environment and conditions in determining the personnel that are required to don the CPO suits.

STEPS	RESPONSIBILITY	ACTIONS
1	CBR-D Officer	Issue all gear to entire crew. DO NOT OPEN UNLESS DIRECTED BY MASTER.
2	Each crewmember	Adjust masks for immediate use. Canister not installed.
3	Chief Mate CBR-D Officer	Test all portable and installed monitoring and detection equipment and systems.
4	Master Chief Mate CBR-D Officer	Review standards of operation in CB environment.

AREA OF KNOWN OR POSSIBLE CHEMICAL OR BIOLOGICAL THREAT

MOPP - 2

NOTE: The Master should assess the operating environment and conditions in determining the personnel that are required to don the CPO suits.

STEPS	RESPONSIBILITY	ACTIONS
1	Entire crew	Maintain mask and canister on person.
2	Chief Mate	Stage and test WDCM.
3	CBR-D Officer	Test Chem/Bio Alarms.
4	CBR-D Officer MSO	Pre-stage DECON and monitoring equipment at DECON stations and conduct an operational inspection.
5	CBR-D Officer	Pre-stage canteens at operating stations.
6	CBR-D Officer	Post limited number of M9 paper at strategic locations

CHEMICAL OR BIOLOGICAL ATTACK PROBABLE

MOPP - 3

NOTE: The Master should assess the operating environment and conditions in determining the personnel that are required to don the CPO suits.

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Set Condition CRUISING.
2	Chief Mate	Strike below all non-essential porous material. - Lines - Canvass
3	Master	All non-essential personnel off weather decks.
4	All personnel on weather decks or at key operating stations	Fit MCU-2/P canisters, don CPO suits, hood down personnel DECON kit in mask carrier, medical supplied items stored in jumper cargo pocket.
5	CBR-D Officer	Fill water canteens.
6	CBR-D Officer MSO	Dispense NAPP only upon order of Master.
7	CBR-D Officer	Set up identified DECON stations.
8	Chief Mate	Activate WDCM intermittently, enough to keep decks wet.
9	Chief Mate Chief Engineer	Secure non-essential ventilation.
10	CBR-D Officer	Pre-stage and monitor M9 paper at all predesignated sites.
11	ENTIRE CREW	Fit MCU-2/P with canister maintain in carrier on person.

CHEMICAL OR BIOLOGICAL ATTACK IMMINENT

MOPP - 4

NOTE: The Master should assess the operating environment and conditions in determining the personnel that are required to don the CPO suits.

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Set Condition EMERGENCY.
2	Selected Personnel	Don masks/gloves, hood up.
3	CREW	Proceed to deep shelter. Don masks.
4	Chief Mate	Active WDCM continuously.
5	Radio Officer	Prepare messages.
6	Chief Mate Chief Engineer	Secure all non-essential equipment and nonessential ventilation.
7	Master	Re-evaluate and reduce number of topside personnel, shifting them to deep shelter.
8	Master	Implement mandatory water drinking regimen.

CHEMICAL / BIOLOGICAL ATTACK

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Sound Alarm.
2	ALL HANDS	Brace of shock.
3	Navigator CBR-D Officer	Plot point of CH/BIO release and possible associated hazard area.
4	Master Navigator	Commence tactical maneuvering.
5	Radio Officer	Send messages.
6	CBR-D Officer	Determine if hit.

CHEMICAL / BIOLOGICAL OPERATIONAL RECOVERY

STEPS	RESPONSIBILITY	ACTIONS
1	Chief Mate	Secure WDCM System.
2	Survey team(s)	Conduct internal survey. Mark, report and isolate contaminated areas.
3	CBR-D Officer	Advise Master of current or predicted CH/BIO hazard based upon all available information.
4	DECON team(s)	Commence DECON of affected internal areas.
5	CBR-D Officer	Conduct rapid external survey of all vital topside stations.
6	DECON Team(s)	Commence external DECON according to Master's priority.
7	Chief Mate Chief Engineer	Purge ship, after external surveys indicate ventilation intakes are free from contamination.
8	Master	When internal & external DECON is complete, reevaluate MOPP level and modify as the situation permits.

SUMMARY OF ACTIONS FOR RADIOLOGICAL ATTACK

NOTE: The Summary of Actions for Chemical and Biological Attack listed below must be tailored to each ship.

AREA OF KNOWN OR SUSPECTED NUCLEAR THREAT

MOPP - 1

STEPS	RESPONSIBILITY	ACTIONS
1	CBR-D Officer	Issue all masks to entire crew.
2	Each crewmember	Adjust masks for immediate use. Canister not installed.
3	Chief Mate CBR-D Officer	Test all portable and installed monitoring and detection equipment and systems.
4	Master Chief Mate CBR-D Officer	Review standards of operation in a nuclear environment.

AREA OF KNOWN OR POSSIBLE NUCLEAR THREAT

MOPP - 2

STEPS	RESPONSIBILITY	ACTIONS
1	Entire crew	Maintain mask and canister on person. Issue personal dosimeters to all hands.
2	Chief Mate	Stage and test WDCM System.
3	CBR-D Officer	Test Nuclear Alarms.
4	CBR-D Officer MSO	Pre-stage DECON, monitoring and detection equipment at DECON stations and conduct an operational inspection.
5	CBR-D Officer	Pre-stage canteens at operating stations.

NUCLEAR ATTACK PROBABLE

MOPP - 3

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Set Condition CRUISING.
2	Chief Mate	Strike below all non-essential porous, absorbent and flammable material.
3	Master	All non-essential personnel off weather decks.
4	All HANDS	Fit MCU-2/P canisters maintain in carrier and on person.
5	CBR-D Officer	Fill water canteens.
6	CBR-D Officer	Warm up and test RADIAC.
7	CBR-D Officer	Set up identified DECON stations.
8	Chief Mate	Activate WDCM intermittently, enough to keep decks wet.
9	Chief Mate Chief Engineer	Secure non-essential ventilation.

NUCLEAR ATTACK IMMINENT

MOPP - 4

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Set Condition EMERGENCY.
2	ALL HANDS	Don masks.
3	Non-essential Crew	Proceed to deep shelter.
4	Chief Mate	Active WDCM continuously maneuvering ship as required to maintain maximum attainable coverage.
5	Radio Officer	Prepare messages.
6	Chief Mate Chief Engineer	Secure all non-essential equipment and non-essential ventilation.
7	Master	Re-evaluate and reduce number of topside personnel, shifting them to deep shelter.
8	Master	Implement mandatory water drinking regimen.
9	CBR-D Officer	Pass MPE and casualty dose.
10	CBR-D Officer	Order continuous operation and monitoring of appropriate detection equipment.

NUCLEAR ATTACK

STEPS	RESPONSIBILITY	ACTIONS
1	Master	Sound Alarm.
2	ALL HANDS	Brace of shock.
3	Navigator CBR-D Officer	Plot point of nuclear detonation and possible associated hazard area.
4	Master Navigator	Commence tactical maneuvering.
5	Radio Officer	Send messages.
6	Chief Mate Chief Engineer	Check essential equipment for normal operation.

NUCLEAR

OPERATIONAL RECOVERY

STEPS	RESPONSIBILITY	ACTIONS
1	CBR-D Officer	Advise Master of Fallout arrival.
2	CBR-D Officer	Advise Master of estimated time and level of peak intensity.
3	CBR-D Officer	Inform Master of actual time and level of peak intensity.
4	CBR-D Officer	Inform Master of cessation of fallout.
5	Chief Mate	Secure WDCM.
6	Chief Mate Chief Engineer	Ensure all recirculating ventilation is secured to contaminated areas.
7	CBR-D Officer	Conduct rapid internal survey, determine, isolate and decontaminate hot spots.
8	CBR-D Officer	Rotate personnel as required.
9	CBR-D Officer	Calculate safe stay times for internal survey, vital topside stations and DECON teams.
10	DECON Teams	Conduct external survey.
11	CBR-D Officer	Evaluate results of external survey, deploy DECON teams to clear or reduce radiation levels to vital stations.
12	DECON teams	Clear or reduce radiation levels to vital stations commence DECON.
13	ALL HANDS	Remove protective masks clear areas only.
14	Master	Evaluate MOPP levels.

2-5-7 TRAINING

a. Responsibility of Master. The Master shall be responsible for ensuring that continuing shipboard instruction of the crew in CBR-D and general decontamination procedures are a part of the ship's Phase II damage control training. This training is a long range continuing program for the entire crew.

b. Equipment. The ship shall make full use of the ship's CBR-D training supplies.

c. Formal Training. For ships with a CBR-D capability, the designated CBR-D Officer shall have attended MSC's 5-day Chemical, Biological and Radiological Defense course. For CIVMARs, this is required training for the Third Officer and this course is required for promotion and/or retention.

d. Phase II Training. The ship's CBR-D Officer, in concert with the Chief Mate, shall be responsible for conducting, at a minimum, general shipboard CBR-D training, exercises and for the training of the DECON and Survey teams.

(1) General CBR-D training for the crew shall include, but not be limited to the following topics, donning and doffing of the CPO suits and rubberized overgarments, the use of the gas mask, general personnel DECON procedures and buddy and self aid.

(2) Specific CBR-D training for the DECON and survey teams shall include, but not be limited to, the use of Radiac equipment, chemical detection equipment, decontamination of personnel and equipment, how to rig and operate the ship's WDCM, how to set up and use the DECON station and the donning and doffing of chemical protective overgarments.

(3) It is suggested that the ship conduct CBR-D training on a weekly basis for the crew and/or the DECON and survey teams. This training should be comprised of lectures and/or exercises lasting about 1 hour in length. The lectures and/or exercises should be of such a nature that they will naturally lead up to the CBR-D drill. The drill should be a test for effectiveness of the training lectures and exercises.

e. General. The Chief Mate, with the assistance of the CBR-D Officer, shall schedule Phase II training and instruct and exercise the ship's crew, DECON and survey teams.

f. Exercises. COMSCINST 3121.9 requires that ships with a CBR capability conduct a quarterly CBR-D drill. This drill should be an entire ship's exercise in the form of a scenario. It is recommended that the drills be alternated between Chemical/

Biological Attack and a Nuclear Attack scenario. This drill should involve the entire crew donning their masks (without canisters) and exercise the DECON and survey teams in survey techniques and personnel and material decontamination. The ship's WDCM should be rigged and operated at each drill.

g. References

(1) Chapter 470 NSTM

(2) Chapter 070 NSTM

(3) NWP 62-1

(4) U.S. Navy CBR-D Handbook for Training

PART 2

EMERGENCY BILLS

CHAPTER 6

ENGINEERING CASUALTY BILL

2-6-1 PURPOSE

a. This bill does not apply to ships with class specific Engineering Casualty Control Manuals.

b. This Engineering Casualty Bill organizes ship's personnel to prevent, minimize and correct operational casualties to machinery, electrical and piping systems. It provides general guidance. Some procedures may not apply or will require modification for ship specific equipment. The objectives of shipboard engineering casualty control are to:

(1) Prevent damage to machinery before it occurs by:

(a) Continuous detailed inspections procedures.

(b) Maintenance of all machinery in a state of readiness.

(c) Elimination of fire hazards.

(d) Realistic drills in the proper use of machinery and piping.

(2) Minimize damage which may occur by:

(a) Speedy corrective action.

(b) Combating fire.

(c) Maintenance of stability and buoyancy.

(3) Protect personnel in emergencies by:

(a) Safeguarding personnel.

(b) First-aid treatment of injured personnel.

c. Make emergency repairs as quickly as possible to permit the ship to accomplish its mission.

d. Train personnel in engineering casualty control techniques.

2-6-2 ORGANIZATION

a. Shipboard engineering casualty control depends upon watch personnel in engineering spaces acting under the Chief Engineer.

b. Control of the Engineering Department is centered in the engineroom (or Control Engineroom).

c. Engineering casualty control is primarily the responsibility of Engine Department personnel as follows:

(1) Chief Engineer (in overall charge of charge of engineering casualties).

(2) First Assistant Engineer (in charge of engineroom or control engineroom in twin screw ships).

(3) Second Assistant Engineer (in charge of other engineroom in twin screw ships).

(4) Watch Engineers (in charge of engineroom on assigned watch). Assist as directed when Chief or First Assistant Engineer arrives.

(5) Junior Engineer (as directed in fireroom -- if assigned).

(6) Chief Electrician (at main switchboard).

(7) Assistant Electricians (station bill assignment or as directed).

(8) Engine Department personnel not on watch (assist as directed when required).

2-6-3 RESPONSIBILITIES

a. <u>Chief Engineer</u>

(1) The Chief Engineer is responsible for the proper operation, maintenance and, within limits of the ship's resources, the repair of propulsion and auxiliary machinery and of all mechanical and electrical equipment aboard ship not specifically assigned to other departments. He is also responsible for piping

and wiring, and for maintaining and controlling damage to the compartments in which machinery under his cognizance is located, unless such compartments are assigned to other departments.

(2) He shall ensure that men in his department, particularly new men, are thoroughly instructed and drilled in safety precautions to be taken against fire. He shall inspect fire extinguishing and steam smothering systems for which he is responsible and ensure that they are in working order before sailing.

(3) He shall not permit the speed of the engines to be altered except on orders of the Bridge Watch Officer or when emergencies require the engine watch to change speed to safeguard vital machinery. In such case, he shall so notify the Bridge, indicating the cause, corrective action and probable duration of any stoppage.

(4) He shall anticipate and maintain required allowances of spare parts and shall submit timely requests for replacement parts.

(5) He shall ensure the continued indoctrination, training and drills of engine officers and crew in engineering casualties.

(6) He shall be subordinate only to the Master of the ship and shall conform to the policies and comply with the orders of the Master.

(7) The Chief Engineer is responsible for determining the adequacy of the Engineering Casualty Bill and shall make appropriate changes and recommendations to the Master.

b. First Assistant Engineer

(1) He shall be prepared to assume the duties and responsibilities of the Chief Engineer and act in his place when the Chief Engineer is absent from the ship.

(2) He shall assign and supervise the engineering casualty control duties of the Second, Third and Fourth Assistant Engineers, also junior engineers and engine crew as directed by the Chief Engineer.

c. Watch Engineers

(1) They shall be in charge of engineering personnel assigned to their watches and shall see that they are properly trained and instructed in their regular and emergency duties.

(2) They shall check the operational condition of machinery in the Engine Department before relieving the watch, and shall report immediately to the Chief Engineer any defects which may

affect the operation of the ship. They shall not alter engine speed, except on orders from the Bridge Watch Officer or in an emergency requiring change of speed to safeguard vital machinery. They shall carry out all instructions and orders of the Chief Engineer concerning the operation and maintenance of machinery.

(3) They shall take immediate corrective action to limit in engineering casualties occurring on their watches, notifying the Chief Engineer and the Bridge as soon as possible.

d. Chief Electrician/Electrician

(1) He shall maintain assigned electrical machinery and equipment in good operating condition under the concept of preventing electrical and resulting engineering casualties through preventive maintenance.

(2) He shall plan and make preparations for emergency electrical repairs under casualty conditions.

2-6-4 CONDITIONS OF READINESS

When conditions of readiness are set, the engineering plant will be placed in readiness as follows:

a. "Emergency" Condition (Steamships)

(1) Fuel Oil Service System

(a) Fuel oil service suction shall be shifted to the full settling tank and the other tank shall be filled immediately.

(b) Fuel oil transfer system will be secured, but shall be kept in a condition of readiness.

(c) Standby fuel oil pump shall be warmed up and have suction lined up to the high suction on the standby settler.

(2) Fire Pumps

(a) Both the electric and/or the steam driven fire pumps in the Engine Room will be put in operation on the firemain and will maintain a minimum pressure of 100 psi at the discharge manifold.

(b) Emergency diesel fire pumps fore and aft will be manned and cut in.

(3) Bilge Pumps

(a) Electric bilge pump shall be tested and lined up to bilge main.

(b) Submersible bilge pump shall be tested and lined up to pump port and starboard engineroom bilges.

(c) General service pump shall be warmed up and kept in standby to bilge or fuel oil system.

(4) Warm up the following machinery.

(a) Idle ship's service generators.

(b) Standby lube oil pump.

(c) Port fuel and auxiliary feed pumps.

(5) Put both main and auxiliary feed pumps.

b. "Emergency" Condition (Diesel Ships)

(1) Fuel Oil Service System

(a) Fuel oil service suction shall be shifted to full service tank. The slack tank shall be filled from settling tank by purifying. Settlers shall then be filled from double bottoms.

(b) Emergency diesel generator fuel tank shall be pumped full.

(2) Fire Pumps

(a) Electric and steam fire pumps in engine spaces will be put in operation on the firemain. A minimum pressure of 100 psi at the discharge manifold will be maintained.

(b) Emergency diesel fire pumps, if installed, shall be manned and cut-in, maintaining a minimum of 100 psi at the discharge manifold.

(3) Bilge Pumps. Bilge pumps shall be tested and lined up to the bilge main. In ships with pumps which are used for both fire and bilge mains, these pumps shall be operated as deemed necessary.

(4) Warm up the following machinery.

(a) When cruising with one generator on the line, a second generator shall be warmed up and paralleled. Other generators, if installed, shall be lined up ready for starting.

(b) All auxiliary pumps shall be on standby.

c. "Cruising" Condition (In Both Steam & Diesel Ships)

(1) During normal "Cruising" condition, machinery required to operate the plant in the most efficient and economical manner will be used.

(2) When the ship is in confined or inland waters, in heavy traffic, heavy weather, low visibility or in a combat zone, additional machinery shall be started or warmed up as advisable.

2-6-5 EMERGENCY PROCEDURES

The following is a list of engineering casualties which may occur while operating a ship's engineering plant, and the indicated, corrective action in each case. All emergencies cannot be anticipated, so engineering personnel must familiarize themselves with data in Manual of Engineering Instructions and other publications pertinent to engineering casualty control. The basic requirement is to know your plant thoroughly.

a. Bilge Fire in Machinery Spaces

(1) Responsibility

(a) All engine personnel on watch.

(b) Chief Engineer.

(c) Repair Party, on arrival. The Repair Party will be under direction of the Chief Engineer in engineering spaces.

(2) Action

(a) Notify Bridge and Chief Engineer.

(b) Close WTDs.

(c) Secure ventilation.

(d) Attempt to extinguish fire with dry chemical or CO_2 portable extinguishers, foam, water fog or fixed CO_2/Halon in that order.

(e) If it gets out of control, secure the plant and evacuate the space.

(f) Push all stop buttons and close all remote controls at engineroom emergency stop station.

(g) When all personnel are out, the individual with authority to release the fixed smothering system must be notified. He shall then turn on the fixed CO_2 or HALON smothering system.

(h) If necessary, use foam from topside and cool surrounding bulkheads with water.

(i) When under control, re-enter with foam nozzle, extinguish remainder of fire and cool down compartment. The fire party entering must wear SCBAs or OBAs.

(j) Ventilate compartment and check for proper no steam available.

(k) Pump out compartment and light off boilers if no steam available.

(l) Post reflash watch.

b. Electrical Fire in Main Switchboard

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) Repair Party on arrival, under direction of Chief Engineer.

(2) Action

(a) Notify the Bridge and Chief Engineer.

(b) Secure power to affected section of switchboard.

(c) Secure ventilation and close WTDs.

(d) Start all steam-driven auxiliaries, if available.

(e) Approach as close to fire as possible. Open panels, protective covers or guards to gain access to source of fire.

(f) Use HALON, dry chemical or CO_2 to extinguish fire. (Use CO_2 hosereel if available.)

(g) Use water fog only as second choice where switchboard is located on upper platform (water or foam will damage electrical equipment).

(h) If fire gets out of control, secure plant and evacuate.

(i) Push all stop buttons and close all remote controls at engineroom emergency stop station. Seal off compartment.

(j) When all personnel are out, <u>the individual with the authority to release the fixed smothering system must be notified</u>. <u>He shall then</u> turn on the fixed CO_2 or HALON smothering system.

(k) Cool surrounding bulkheads and deck with water.

(l) Send SCBA or OBA man to investigate area.

(m) Evaluate extent of fire and the situation and use extinguishing agent(s) required to control the fire.

(n) Ventilate the area and check oxygen content with oxygen indicator.

(o) Post reflash watch and observe all safety precautions.

(p) Investigate for extent of damage and make temporary repairs, if possible.

(q) Chief Engineer advise Master regarding extent of damage and operational readiness.

c. <u>Flooding of Engineroom (Steamships)</u>

(1) <u>Responsibility</u>

(a) All watch personnel.

(b) Chief Engineer.

(c) Repair Party, on arrival, under direction of Chief Engineer.

(2) <u>Action</u>

(a) Notify Bridge and Chief Engineer and make required closures.

(b) Open main bilge injection valve and close main circulator sea suction.

(c) Evacuate space if necessary.

(d) Emergency generators:

1. Start emergency generator manually if not already running on automatic start.

2. Make sure feedback switch to engineroom switchboard is open.

3. When voltage is built up, check to see that emergency generator breaker is closed.

(e) Line up valves to the submersible bilge pump by remote control and close switch at emergency switchboard.

(f) Rig electric submersible portable pumps and peri-jet eductors.

(g) Determine cause of flooding and sound all adjoining compartments to determine extent of flooding. Report to DC Central. <u>Chief Mate should determine stability before attempting to trim ship</u>.

(h) Trim ship, if possible, as necessary.

(i) Establish flooding boundaries.

(j) Repair damage causing flooding (if possible).

(k) Pump out machinery space.

(l) Check affected machinery and repair where necessary.

(m) Dry out boiler firebox brickwork.

(n) Take samples of settlers and all fuel oil tanks to determine serviceable fuel.

(o) Test boiler water and feed water. If possible, fill boiler with reserve feed.

(p) Light off boiler using diesel oil.

(q) If steam is available, check turbine lube oil for water and start steam standby pump, if available. Use gravity tank bypass if upper lube oil piping system is damaged.

(r) Use either or both main turbines if possible.

(s) Try to get electric power to steering gear. Otherwise use hand steering.

(t) Initiate drying out and repair of affected electric machinery.

(u) Chief Engineer advise Master regarding extent of damage and operational readiness.

d. Flooding of Engineroom (Diesel Ships)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) Repair Party, on arrival, under direction of Chief Engineer.

(2) Action

(a) Notify Bridge and make required closures.

(b) Evacuate space if necessary.

(c) Emergency generator:

1. Start emergency generator manually if not already running on automatic start.

2. Make sure feedback switch to engineroom switchboard is open.

3. When voltage is built up, check to see that emergency generator breaker is closed.

(d) Line up valves to submersible bilge pump.

(e) Rig electric submersible portable pumps and peri-jet eductors.

(f) Determine cause of flooding and sound all adjoining compartments to determine extent of flooding and report to DC Central. Chief Mate should determine the stability before attempting to trim ship.

(g) Trim ship, if possible, as necessary.

(i) Establish flooding boundaries.

(j) Repair damage causing flooding.

(k) Pump out machinery space.

(l) Check affected machinery and repair where necessary.

1. Wash out generators and motors which were submerged in salt water, and dry them.

2. Refill contaminated engine sumps with clean oil.

3. Check out necessary electrical circuits and motors. Secure other circuits until time is available for repair.

(m) Start generator and place power on necessary available circuits.

(n) Start necessary auxiliaries and get underway if possible.

(o) Use power feed through emergency board if direct feed line to steering motors is damaged.

(p) Sound all double bottoms to check on possible other damage and serviceable fuel.

(q) Repair all unserviceable machinery as soon as possible.

(r) Chief Engineer advise Master regarding extent of damage and operational readiness.

e. Water in Fuel Oil (Steamships)

(1) Responsibility

(a) All engine watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(d) Chief Electrician.

(2) Action

(a) If burning off low suction, change to high suction.

(b) If water is still present, change to the other service tank.

(c) If both settlers are contaminated with water, ring telegraph to stop.

(d) Secure all burners.

(e) Secure steam to main engine and trip the generators.

(f) Leave auxiliary steam line open.

(g) Electrician start emergency diesel generator.

(h) Strip main switchboard except for forced-draft blower.

(i) Line up emergency diesel generator for feeding main switchboard.

(j) Take suction from any double bottom tank having warm fuel oil, using the transfer or general service pumps as booster pumps to the service or standby fuel oil pump. The settler fuel oil service tank valves must be closed.

(k) Start forced-draft blower and air out boiler.

(l) Recirculate oil to burners and light off boiler.

(m) If steam is lost, use regular cold-start procedure, using diesel oil.

NOTE: Fuel oil service pump takes diesel oil suction and recirculates to fuel oil system for cleaning lines of water and fuel oil.

(n) When contamination has been corrected on settlers, shift to fuel oil suction.

(o) When steam is raised, cut in fuel oil heaters.

f. Rupture of Main Steam Piping (Steamships)

(1) Responsibility

(a) All engine watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(d) Repair party, on arrival, under direction of the Chief Engineer.

(2) General. Rupture of main steam piping in any space can be expected to fill that space with steam to such an extent that it will have to be evacuated and secured from the outside.

(3) Action

(a) Notify Bridge via telegraph.

(b) Close main boiler stop valve locally if possible; use remote control if installed.

(c) Simultaneously close the throttle valve; stop the engine and secure the fires.

(d) Open safety valves on boiler by hand, using remote control if possible.

(e) Continue to feed the boiler to maintain water level, if possible.

(f) If evacuation is necessary:

1. Start the steam lube oil pump if it is not already running and open atmospheric exhaust valve.

2. Place ventilation on high.

3. Leave by means of shaft alley escape or lowest escapes.

(g) Repair Party enters, protected by water fog curtain. They secure all valves and open safety valves.

(h) After the space has cooled, the damage can be isolated and as much of the plant operated as possible.

(i) Power panels may have to be dried out before they can be used.

g. Loss of Lube Oil to Main Bearings (Steamships)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) Assistant Engineer.

(2) Action

(a) Ring telegraph to stop.

(b) Stop the engine immediately; use astern throttle to keep engine from rotating.

(c) Engage and lock the jacking gear and/or apply the shaft brake if so equipped.

(d) At the same time, make every effort to regain lubricating oil pressure.

(e) Immediately inspect all bearings and try to determine which have been overheated.

(f) Secure gland sealing steam and main air ejectors to minimize rotor distortion.

(g) Shift strainers and clean lubricating oil strainer basket in use at time of casualty. Notice if flakes of bearing metal are present.

(h) Start lube oil purifier if not in use.

(i) Continue circulation until bearings are cool.

(j) Take bearing-wear micrometer readings of all bearings and axial clearances where means are provided.

(k) Remove and inspect bearings.

(l) If bearings are not wiped, return to normal operation.

(m) Chief Engineer advise Master regarding damage and operational readiness.

h. <u>Loss of Lube Oil to Main Engine (Diesel)</u>

(1) <u>Responsibility</u>

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) <u>Action</u>

(a) Ring telegraph to stop.

(b) Stop main engine and notify Bridge.

(c) Check for lube oil system failure as follows:

<u>1</u>. Pump failure.

2. Dirty strainers.

3. Pump suction line from sump flanges, slack or gasket deterioration.

4. Rupture in lube oil line.

(d) Restore lube oil pressure as soon as possible.

(e) Check for hot bearings and for bearing metal in strainers. Indications of overheating of bearing metal will necessitate inspection of all bearings and journals.

(f) Resupply sump to normal level.

(g) Notify bridge when conditions permit getting underway.

i. Loss of Vacuum in Main Condenser (Steam)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Ring telegraph to slow and slow down engine.

(b) If vacuum drops below 20", ring telegraph to stop and stop the main engine.

(c) Shift all auxiliary exhaust to auxiliary condensers.

(d) Causes of loss of vacuum may be:

1. Excessive air leakage into the vacuum system.

2. Insufficient gland sealing steam.

3. Vent valve on idle condensate pump open.

4. Loop-seal valve closed.

5. Bypass valve on drain tank open.

6. Drain-tank float valve stuck open.

7. Taking make-up feed from empty feed bottom.

8. Leakage of flanges, fittings or valve stem packing under vacuum.

9. Failure of condensate pump.

10. Insufficient steam to air ejectors.

11. Foreign matter lodged in the air ejector nozzle.

12. In case of lowered vacuum over a period of time, erosion of the air ejector.

13. Improper drainage of condensate from condenser.

14. Low speed of condensate pump

15. Condensate pump air bound because the vent connection from the first stage is closed or not opened wide.

16. Insufficient flow of circulating water.

17. Main injection valve and overboard discharge valve not wide open.

18. Inadequate speed of main circulating pump.

19. Plugged tubes due to mud, shells, small fish or kelp trapped against the injection strainer bars or in the inlet water chest.

20. Air trapped in condenser.

21. High injection temperature.

22. Dirty condenser on water side and steam side.

j. Loss of Water in Boiler (Steam)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Cut off fuel oil supply to all burners on affected boiler.

(b) Notify Bridge by ringing telegraph to half speed and slow down engine according to steaming capacity of other boiler.

(c) Close feed check valves.

(d) Open superheater circulating valve to atmosphere.

(e) Open actuating valve on steaming boiler, and close it on affected boiler.

(f) Close main boiler stops and completely isolate from other boiler.

(g) Lift safety valves by hand to relieve the pressure gradually.

(h) Close the burner register shutters and, if possible, diminish the air supply to the boiler by stopping the blowers.

(i) It is essential that no attempt be made to restore the normal water level by increasing the supply of feed water. By allowing the boiler to cool gradually, any parts that may have become overheated will be subjected to an annealing process, thus minimizing possible damage to the boiler pressure parts.

(j) When the boiler has cooled, make a careful inspection of water and fire sides of the boiler.

(k) Chief Engineer to advise the Master regarding extent of damage and operational readiness.

k. Boiler Tube Failure (Steam)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) General. To prevent serious injury to personnel and to reduce the extent of damage to the boiler whenever a serious steam leak occurs from the sudden leading of a tube or other cause, the action shall be taken to the extent that circumstances permit.

(3) Action

(a) Cut off fuel oil supply to all burners on the affected boiler.

(b) Notify Bridge by ringing telegraph to half speed and slow down engine according to steaming capacity of the other boilers.

(c) Continue to feed boiler through auxiliary feed check and secure main feed check valve.

(d) Open superheater circulating valve to atmosphere.

(e) Open actuating valves on steaming boiler and close on affected boiler.

(f) Close boiler steam stops and isolate affected boiler completely.

(g) Gradually open the safety valves as soon as possible to relieve the pressure.

(h) If the blowers are running, increase their speed to drive the escaping steam up the smoke pipe and thus keep it out of the fireroom.

(i) Start the auxiliary feed pump and continue feeding the affected boiler. Special care must be taken to maintain the water at the proper height in all other boilers in use and to provide additional water from the reserve tanks, if necessary, to prevent a shortage in the main feed tank.

(j) After the pressure has decreased and the fires are out, stop the blowers and close all possible sources of air flow into the boiler furnace. Allow the boiler to cool slowly.

(k) When the boiler has cooled sufficiently, make necessary repairs as circumstances permit.

(l) Chief Engineer to advise Master regarding damage and operational readiness.

l. Diesel Generator Engine Failure (Diesel)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Ring telegraph to stop.

(b) Stop main engine.

(c) Check probable causes of failure.

1. Check throttle.

2. Check overspeed trip.

3. Shift fuel oil filter.

(d) Attempt to restart generator and check pressures, temperatures and RPM for normal operation (generator won't start or abnormal condition exists, light off standby generators).

(e) When full power is restored to main switchboard, start main engine lube oil pump and circulate.

(f) Check main engine bearings for overheating and for wiped metal in strainers. (Indications of overheating or wiped metal require further inspection of bearings and journals.)

(g) Notify Bridge.

(h) Start all necessary machinery.

(i) Notify Bridge when ready to get underway.

(j) Stop emergency generator and inspect transfer panel on emergency switchboard.

m. Main Engine Failure (L.P. Turbine) (Steam)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Ring telegraph to stop and stop main engine.

(b) Disengage coupling to L.P. pinion.

(c) Remove expansion joint between H.P. and L.P. turbines.

(d) Blank off the end of the crossover pipe.

(e) Remove the blank flange underneath the crossover pipe and on top of the condenser.

(f) Install the emergency piping on the H.P. exhaust directly to the condenser.

(g) Make sure the guarding valve is closed and locked.

(h) In such case, the unit should be operated on reduced steam temperature and not with superheat as under normal conditions.

(i) Under these conditions, not more than half power, ahead only, can be maintained with the H.P. turbine alone.

(j) Chief Engineer to advise Master regarding damage and operational readiness.

n. Main Engine Failure (H.P. Turbine) (Steam)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Ring telegraph to stop and stop main engine.

(b) Disengage coupling to H.P. pinion.

(c) Remove the expansion joint between the H.P. and L.P. turbines.

(d) Blank off receiver pipe at H.P. turbine.

NOTE: To operate the L.P. turbine alone, a special flange is provided for the L.P. steam inlet. This flange will accommodate an inlet elbow through which steam at throttle pressure is admitted through an orifice to the L.P. turbine.

(e) Install emergency piping from main steam to L.P. turbine.

(f) Under these conditions, not more than half full power shall be maintained with the L.P. turbine alone.

NOTE: When operating under these emergency conditions, the pressure in the L.P. turbine should not be permitted to exceed 25 lbs. gauge.

(g) Chief Engineer to advise Master regarding damage and operational readiness.

NOTE: These connections, together with the blind flanges, elbows and bolts that belong with them, should be kept in a convenient place and not used for any other purpose. Although they may never be used during the life of the ship; if they are required, the need will be urgent. Therefore, all these items must be immediately available.

o. Loss of Main Engine Jacket Cooling Water Pressure (Diesel)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Check water temperature from main engine. If temperature is high, reduce RPM to slow.

(b) Ring up telegraph.

(c) Check probable causes of failure:

1. F.W. circulating pump stoppage or loss of suction.

2. Loss of water because of leak in piping or cooler.

(d) If pump has stopped, light off standby pump and circulate water.

(e) When temperatures are normal, notify Bridge of readiness to resume full speed.

(f) Check pump for cause of failure and repair if necessary.

(g) If engine water temperature continues to rise while running slow, and recovery of water pressure will be delayed, STOP main engine.

p. Fracture of Main Engine High Pressure Fuel Line to Injector (Diesel)

(1) Responsibility

(a) All watch personnel.

(b) Chief Engineer.

(c) First Assistant Engineer.

(2) Action

(a) Reduce engine speed or stop as required.

(b) Notify Bridge.

(c) Cut out cylinder fuel injection pump and secure fuel to pump (main engines with individual pumps only).

(d) Replace fractured line with spare.

(e) Open fuel valves to injection pump and place pump back in service.

(f) Notify Bridge.

(g) Resume speed.

(h) Check pyrometer and firing pressure of cylinder involved.

2-6-6 DAMAGE CONTROL FITTINGS, EQUIPMENT AND MARKINGS

a. Fittings and Equipment

(1) The Chief Engineer shall ensure, through frequent personal inspections or by qualified subordinates, that firefighting equipment and stations, the emergency generator, pumps and all other DC equipment under cognizance of the Engine Department are in good operating condition.

(2) The Chief Engineer shall inspect, test, mark, maintain and repair of DC equipment for which he is responsible.

b. Damage Control Markings

(1) Label plates shall be installed in accordance with COMSCINST 9280.3D.

(2) Stencil system identification on all piping, indicating direction of flow in each compartment.

(3) Operating instructions shall be provided for DC machinery.

(4) Identification markings shall be provided for all stowed DC equipment, fixed and portable.

2-6-7 ENGINEERING CASUALTY TRAINING

Engineering casualty drills shall be held at least once a week while the ship is at sea and shall include training of all engineering watch officers and other watch personnel in the action necessary to correct engineering casualties.

a. All drills shall be made as realistic as possible and shall be conducted as though an actual emergency existed.

b. When necessary to improve proficiency in drills, crewmembers shall be mustered before and after drills and given appropriate instruction or practice.

c. Whenever possible, personnel casualties will be simulated during drills.

d. All drills shall be held in accordance with COMSCINST 3541.6A, Engineering Casualty Exercises.

PART 2

EMERGENCY BILLS

CHAPTER 7

STEERING CASUALTY BILL

2-7-1 PURPOSE

This Steering Casualty Bill specifies responsibilities and establishes procedures to be followed during a steering casualty.

2-7-2 ORGANIZATION

Personnel responsible for action in response to a steering casualty during normal steaming conditions are:

Master

First Officer

Chief Engineer

Senior Deck Officer

Senior Engineering Watch Officer

Junior Deck Officer on Watch

Junior Engineering Watch Officer

Electrician

Helmsman on Watch

2-7-3 RESPONSIBILITIES

a. Master. The Master will plan procedures and organize personnel to counter and correct steering casualties. When notified of a steering casualty, the Master shall take charge on the Bridge.

b. First Officer. The First Officer is responsible for all training. When notified of a steering casualty, the First Officer shall report to the Bridge and supervise action to correct the casualty.

c. Chief Engineer. The Chief Engineer is responsible for the readiness of the steering gear. He shall coordinate with the First Officer in training all personnel involved in the various methods of "change-over."

d. Senior Deck Officer on Watch. The Senior Deck Officer on Watch shall be responsible for shifting steering from the bridge, passing the word "Steering Casualty" and notifying the Master. He shall display the proper signal or lights and direct any emergency maneuvering until relieved by the Master. He shall then direct his Helmsman to report to the Steering Engine Room.

e. Senior Engineering Watch Officer. The Senior Engineering Officer on Watch upon hearing the "Steering Casualty" alarm, shall send the Junior Watch Engineer to the Steering Engine Room. He shall then notify the Chief Engineer and alert the watch to stand by to answer all bells. In ships not carrying Junior Engineers, the Chief Engineer or First Assistant Engineer shall report to the Steering Engine Room or shall relieve the Watch Engineer so that he can report to the Steering Engine Room.

f. Helmsman on Watch. The Helmsman on Watch shall report to the Steering Engine Room and shall take over the trick wheel when directed.

2-7-4 CONDITION OF READINESS

Usually, the condition of readiness shall remain as it was before the steering casualty. However, at the discretion of the Master, the condition of readiness "Cruising" or "Modified Cruising" will be changed to "Emergency" if the steering casualty occurs in heavy traffic. In fog or heavy traffic, a qualified man should be posted on standby in the Steering Engine Room, ready to take immediate action in the event of a steering casualty.

2-7-5 PROCEDURES

a. On the Bridge

(1) If the alternate steering control does not work, then the Helmsman, on discovering that the rudder does not respond, shall notify the Watch Officer and will shift to alternate steering control.

(2) The Senior Deck Officer on watch shall:

(a) Sound the steering casualty signal.

(b) Send the Helmsman to the Steering Engine Room.

(c) Notify the Master, the Engine Room Watch Engineer and the First Officer.

(d) Ring the engine telegraph to STANDBY.

(e) Direct emergency maneuvering of the ship, steering with engines, stopping engines or backing down to take way off the ship.

(f) Direct the Lookout or Signalman to hoist two black balls if in daytime or, if at night, turn off the masthead and range lights and turn on the two red not under command lights. (The sidelights are left on as long as the ship is making way through the water.)

(g) Notify the Master of the course and speed of surrounding traffic.

(3) The First Officer will report to the bridge and supervise activities. The Deck Officer will go to after steering upon being properly relieved by the First Officer.

b. In the Engine Room. The Senior Engineering Watch Officer shall:

(1) Notify the bridge and Chief Engineer of a steering failure whenever the steering alarm sounds.

(2) Direct the Junior Engineering Officer on watch to report to the Steering Engine Room and shift to alternate steering to regain steering control.

(3) Open the guarding valve and stand by to answer all bells.

c. In the Steering Engine Room

(1) The Engineer shall regain steering control by trick wheel and shift to bridge or Emergency Steering Station as directed by the Bridge.

(2) The Deck Officer shall contact the Bridge, keep the Bridge informed and shall relay to the Engineering Officer orders to change over steering to Bridge or Emergency Steering Station.

(3) The Helmsman shall man the designated trick wheel and shall adjust and check the gyro repeater.

(4) The Electrician shall check out the defective unit and estimate how long the unit will be out of commission.

d. At Emergency Steering Station. The Able Bodied Seaman on Watch shall proceed to the Emergency Steering Station and remove the covers from the wheel, compass and phones. He shall then man the sound powered telephone and shall stand by for further orders.

2-7-6 SIGNALS

The signal for a steering casualty is one long and two short rings on the general alarm bells ("D"), and or announcement on the PA system. When other ships are in the vicinity, international code flag hoist "D" and/or one long and two short blasts on the ship's whistle will be used to advise: "Keep clear of me - I am maneuvering with difficulty." Two black balls, or similar objects of not less than 0.6 meters in diameter, will be hoisted on the mast or wherever can be seen most easily. At night in international waters, the masthead and range lights are turned off and the two red not under command lights are turned on. (The sidelights are left on as long as the ship is making way through the water.)

NOTE: If danger to the ship is imminent, as in heavy traffic, the Master may also sound the general alarm to alert all hands.

2-7-7 TRAINING

Steering gear casualty drills, including the changeover to emergency steering units, shall be held for each watch (deck and engine) at least once each month as required by COMSCINST 3120.2D, Administrative and Operating Procedures for MSC Ships. The drills shall be conducted as though an actual emergency exists and all personnel concerned shall be trained in changeover procedures. Changeover instructions shall be posted in the Steering Engine Room and valves, pins and levers shall be clearly marked, as required by USCG.

PART 2

EMERGENCY BILLS

CHAPTER 8

TOWING AND SALVAGE BILL

2-8-1 PURPOSE

This Emergency Towing and Salvage Bill prescribes basic procedures and assigns responsibilities and duties for towing, being towed or salvaged by ships not tasked with such evolutions as normal operations.

2-8-2 ORGANIZATION

a. Ship's force shall be organized as follows:

Master	In command on bridge.
First Officer	In charge of operations on forecastle or fantail.
Chief Engineer	In charge of Engineroom.
Second Officer	On bridge.
Deck Watch Officer	Phone talker with Master.
Designated Officer or Seaman	Phone talker on forecastle or fantail.
Radio Officer	Establishes and maintains radio telephone and/or radio communications.
Boatswain	Assists First Officer on forecastle or fantail.
Electrician	Supply and maintains emergency lighting and electrical equipment on forecastle or fantail.

Deck Department	Reports to forecastle or fantail to assist as directed by the First Officer.

b. Whenever the ship is towing or being towed, a towing watch will be maintained to observe towing conditions, keep the Deck Officer on Watch informed via sound powered phone and be prepared to veer and heave in chain as ordered by the bridge. A cutting torch, ax and unshackling kit will be available on the forecastle when the ship is being towed (on the fantail when the ship is towing) to part the chain or hawser in an emergency.

2-8-3 RESPONSIBILITIES AND DUTIES

a. Master. The Master is in command of towing and salvage operations and is responsible for preparing, organizing and training the crew in towing and salvage procedures. He shall ensure that towing gear and equipment is onboard and shall inspect it periodically to ensure its readiness.

b. First Officer. The First Officer, under the Master, is in charge of towing and salvage operations on the forecastle or fantail. He shall organize and train personnel and shall ensure that the ship has onboard allowances and maintenance of towing and salvage equipment and that the equipment is maintained.

c. Chief Engineer. The Chief Engineer shall assign additional engineers to each engineroom and station a qualified crewman in the Steering Engineroom during towing maneuvering periods.

d. Radio Officer/MILDEPT/MILDET/OIC. The Radio Officer or MILDEPT OIC is responsible for testing and efficient operation of the radio telephone and radio equipment. He shall contact the other ship and maintain communication as directed by the Master.

e. Second Officer. The Second Officer is responsible for readying and displaying the proper signal flags, and/or flashing signal lights as directed by the Master. If the MILDEPT is assigned a Signalman, this sailor will be responsible for all signal flags and flashing light communications. The Second Officer shall arrange with the other ship for whistle signals to be used in lieu of or to supplement flags or signal lights. Additionally, he will accurately determine the ship's position at all times and advise the Master of any immediate or potential navigational hazard which may affect the towing or towed vessel. The Second Officer shall ensure that the ship is showing the proper towing or being towed lights.

2-8-4 CONDITION OF READINESS

Ships engaged in towing or salvage operations will set and maintain "Cruising" condition.

2-8-5 TOWING PROCEDURES

a. Ship's Towing Gear. A ship not specially designed for towing (with a towing engine and other specialized equipment) can tow another ship only by using a fixed towline. Using a fixed towline, the only way to cushion stresses is to veer the tow to a scope of hawser long enough to provide a good catenary in the line. The towline usually is secured to a towing pad which, if installed, should be on the ship's center line. See page 2-8-8 for typical layout of ship's towing gear.

b. Approaching Disabled Ship for Towing. Whether a tow is approached from windward or leeward depends upon the relative drift of the towing ship and the tow. Some separation should be maintained when maneuvering close to the tow to permit hauling off from a dangerously close position. The following are recommended approach procedures to be used after determining the relative rate of drift of the tow and towing vessel:

(1) If the tow drifts slower than the towing ship - approach to windward and on the same heading.

(2) If the tow drifts faster than the towing ship - approach to leeward and on the same heading.

(3) Take care to avoid drifting into collision and to not approach so close that even a turn with full rudder will not prevent the ship's stern colliding with the tow.

(4) Where wind and sea are not a factor, come alongside from astern of the tow, on the same heading and as close as prudent. Pass a heaving line as soon as possible and haul in the tow's messenger line. In passing, maneuver the ship's stern as close to the tow's bow as is safely possible to facilitate hauling in the towing cable.

c. Taking a Ship in Tow. In good weather this presents no special difficulty. The towing vessel starts ahead slowly on the same course as the disabled ship and maneuvers carefully to prevent a sudden strain on the line. This is the critical point in towing. Strain on the towline can be eased by veering it slowly and closely controlling engine speed. In heavy weather, towing should not be attempted unless exceptional circumstances make it necessary.

d. Scope of Hawser. When towing, it is important to keep the ships "in step;" that is, to adjust the scope of the towline, so that the ships meet and ride over seas at the same time. If one ship is in the trough and the other is on a crest, the towline will first slacken and then come taut with a sudden jerk, producing heavy stress. When a large ship is being towed, 200 fathoms is about the minimum scope between ships for a good shock absorbing catenary. If a sufficiently long scope is not available, speed must be reduced.

e. Towing Speed. Under normal conditions, a large ship may be towed at a speed of 5 to 9-1/2 knots. If the shaft(s) of the towed ship can be lubricated, a slight increase in speed may be obtained with the towed ship's screw(s) turning over freely.

f. Towing Ship Procedures for Taking in Tow

(1) Hold a conference including all officers, the boatswain and other key personnel to ensure that all understand the entire task.

(2) Prearrange communications between ships for routine and emergency orders.

(3) Ascertain readiness of both ships for towing.

(4) Position pelican hook (if onboard) on fantail near stern chock and secure with wire preventers to both port and starboard bitts. Present practice is to use a towing pad installed and conveniently located for this purpose.

(5) Prepare and secure towing wire pendant or bridle properly.

(6) Take the tow hawser.

(7) Bend on 3" messenger to the outboard end of the tow hawser. Fake down this messenger clear for running and pass the other end through the stern chock.

(8) Stop off 16 thread messenger outboard on both sides of the ship with sail twine, clear for running, from the forecastle to the fantail. Two messengers are used to provide the Master with greater maneuvering freedom. This step may not be required if towing ship approaches towed ship stern to.

(9) Determine relative drift of the two ships. When close enough, pass the messenger to the tow (line throwing gun or heaving line). The bridge will notify the fantail by telephone from which side the messenger is being passed so that the appropriate 16 thread messenger may be bent on the 3 inch messenger.

(10) Have tow haul in messenger and towline and connect up. When the tow has secured its towline, shackle the towline eye to the ship's towing pad, pendant or bridle.

(11) Advise Bridge of readiness to proceed.

(12) Pass engine orders by RPM speeds, increasing speed slowly a few RPM at a time.

(13) Direct towed ship, when towline is secured, to veer its towline as necessary in getting underway for a good catenary.

(14) Set towing watch on fantail. Assign additional personnel as required and show proper tow lights at night.

(15) To let go the tow, simply trip the pelican hook. The manila messenger is attached to the towline and is hauled in at the same time. The ship's stern is maneuvered as close to the tow's bow as possible to facilitate the tow heaving in the towline.

(16) Advise Bridge.

g. Ship Being Towed

(1) Hold a conference including all officers, the boatswain and other key personnel to ensure that all understand the entire task.

(2) Prearrange communication between ships for emergency and routine orders.

(3) Maintain, if possible, sufficient power for anchor windlass, steering engines, towing lights and emergency power.

(4) Stop off one of the anchors and break the anchor chain in preparation for attaching the towline.

(5) Break out towing wire. Lead its end forward, along side that the towing ship will approach, in through the bow chock, and shackle it to the anchor chain. Attach the manila messenger to the other end and lead it aft.

(6) Receive heaving line from towing ship and bend it on to the messenger. Pass the messenger and then the towline.

(7) Veer chain to desired length. Towing strain is taken by the chain on the windlass wildcat, with the windlass brake set up and stoppers or preventers secured to bitts.

(8) Set towline watch. Show proper lights at night.

(9) To cast off, towing ship trips the pelican hook and tow hauls in towline and messenger.

h. Salvage Operations. Masters of ships diverted to undertake salvage, rescue or mercy missions shall keep their Administrative Area Commander fully advised regarding the situation as required by COMSCINST 3120.2D. They shall evaluate any danger to their ship and personnel and shall not unnecessarily endanger either. The specific course of action in each case will, of course, be governed by the circumstances, the practice of good seamanship and the Master's judgment.

2-8-6 COMMUNICATIONS AND SIGNALS

Communications by radio telephone and/or radio, between towing ship and the tow is essential. Under favorable conditions, power megaphone can be used for direct communication. Signals specified in International Code of Signals (H.O. No. 102), Section 2 Towing, shall be used in towing operations.

a. Signals by day. By day, signals are sent by a signal flag, exhibited by hand or by hoisting.

b. Signals by night. By night, signals are sent by flashing light. Whistle signals also can be used at night. Avoid confusing other ship with blinker or whistle signals.

2-8-7 PRECAUTIONS

a. If the propeller shaft(s) on the towed ship is not locked, the main engine lubricating system must be operating to prevent bearing failures when the propellers start to turn.

b. In an emergency, it may be necessary to cast off the towline immediately. Sledge hammers, axes, cable cutters and cutting torches should be on hand for emergency use.

c. When towing in freezing temperatures with ice on deck, remove ice from towing stations, if possible, and have sand available.

d. Use a line-throwing gun to pass shot line where heaving lines cannot be used. On order of the First Officer, all hands will take cover when line throwing gun is fired.

e. During towing if the towline comes clear out of the water, it has an excessive strain on it and may part. All hands at towing stations should then take cover and notify the Bridge so that appropriate action may be taken to relieve the strain.

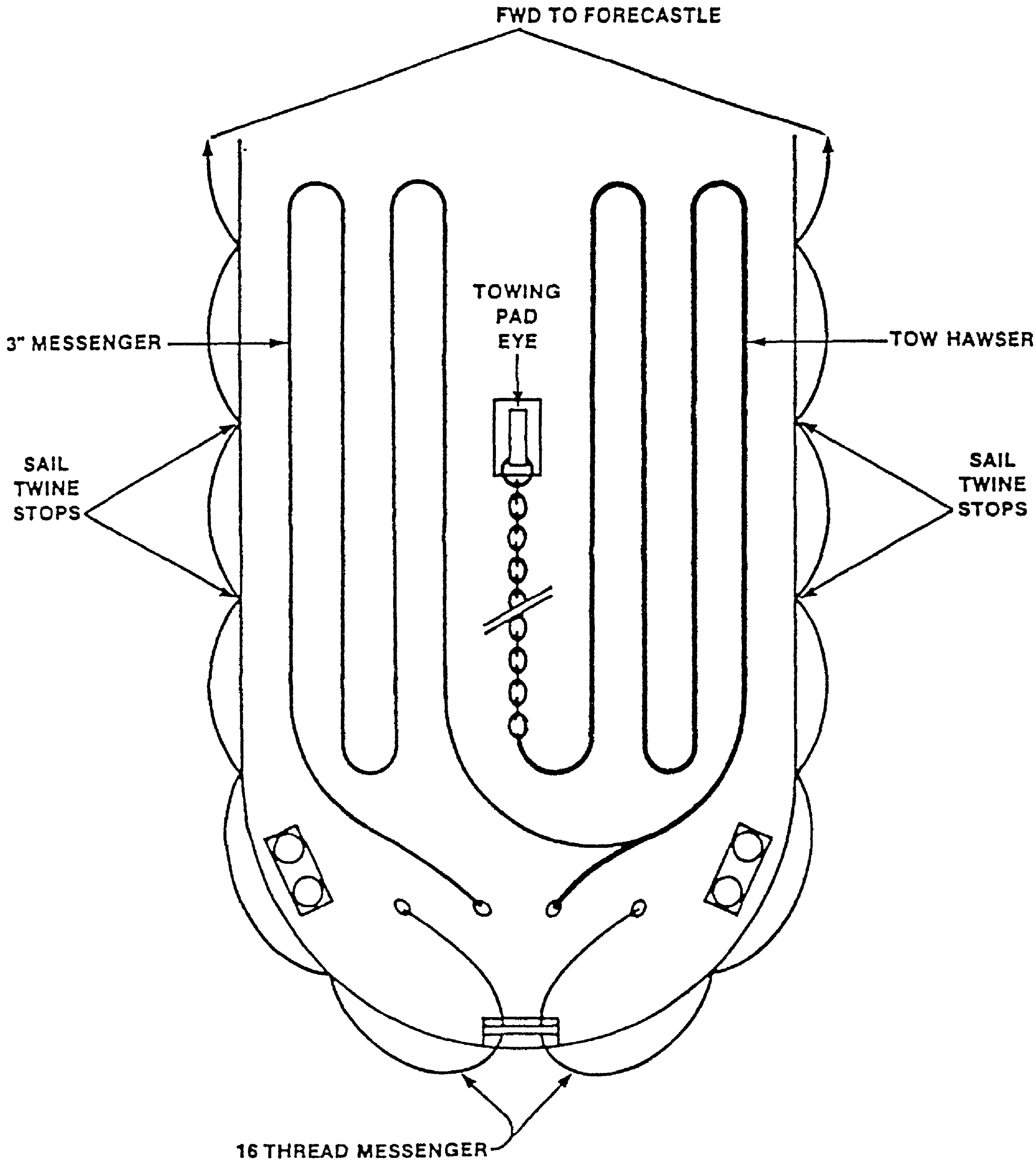
2-8-8 TRAINING

In accordance with COMSCINST 3120.2D, towing and salvage gear will be inspected for readiness during annual Phase III training. In addition, instruction will be given and discussion conducted covering typical towing and salvage operations and problems.

a. Case Studies. Excellent preparation for towing and salvage can be accomplished by discussion of appropriate lessons learned from casualties or MSC casualty reviews.

b. Study of Procedures. Deck personnel should study the towing procedures and techniques described in seamanship texts available in the ship's training libraries so that they can apply the best method in any situation. Knight's "Modern Seamanship" is the best readily available source of information on towing. Crenshaw's "Ship Handling" presents a slightly different viewpoint and also should be studied. Other references on towing equipment and procedures include ATP 43, "Ship to Ship Towing" and NAVSHIPS 0925 000 1000, "U.S. Navy Towing Manual" Volumes I and II.

RIGGING OF TOWLINE ON FANTAIL



FOR ILLUSTRATION PURPOSES ONLY

PART 2

EMERGENCY BILLS

CHAPTER 9

MAN OVERBOARD BILL

2-9-1 PURPOSE

This Man Overboard Bill prescribes responsibilities and establishes procedures to ensure the recovery of personnel lost overboard.

2-9-2 ORGANIZATION

Emergency crews for man overboard shall be organized for action as follows.

a. Launching Crews. Assignment of personnel and their duties shall be as provided in the ship's Station Bill.

b. Emergency Boat Crew. Assignment of personnel and their duties shall be as provided in the ship's Station Bill.

2-9-3 RESPONSIBILITIES

a. Reporting Man Overboard. Anyone who sights a person falling overboard shall throw the nearest ring buoy(s) over the side (at night, the ring buoy should have a waterlight attached) and shall immediately notify the Bridge, reporting side of the ship from which man fell overboard. After making this initial report, he shall:

(1) Keep man overboard in sight.

(2) Point to the direction of the man in the water.

b. Deck Watch Officer/Master. On receiving a man overboard report, the Senior Deck Watch Officer (unless relieved by the Master) shall:

(1) Maneuver the ship as necessary to avoid the man in the water (turn stern away from man overboard).

(2) Release the bridge wing life ring with floating smoke signal/water light attached on the side the man fell over.

(3) Sound man overboard alarm.

(4) Station additional lookouts to locate and keep the man in the water in sight.

(5) Maneuver the ship as necessary. Approach directly if man is clearly seen, coming right around or backing down. When man cannot be seen, or at night, use the Williamson turn.

(6) At night, man ship's searchlight. Train it continuously on ring buoy, raft or other floating object to provide a reference point toward which man can swim.

(7) Designate emergency boat to be launched for recovery of man overboard.

(8) Designate alternate standby boat to be cleared away.

(9) Reduce speed as necessary for launching emergency boat.

(10) Direct launching of boat by whistle signal.

(11) Direct the boat to the man in the water by ship's radio, whistle, blinker or searchlight.

(12) Maneuver to recover and hoist boat.

NOTE: Past procedure has been to station an armed shark watch. Rifle fire to drive off sharks is now generally considered to be ineffectual and dangerous. This is because of the difficulty of hitting a shark under water due to the distortion of light rays in water, the difficulty of killing a shark with rifle fire and the danger of blood in the water attracting other sharks and arousing them to a "feeding frenzy." There is also the additional danger of an inexperienced rifleman hitting the man in the water. For these reasons the armed shark watch is discontinued.

c. First Officer. The First Officer is in charge of launching the emergency boat. He immediately proceeds to the emergency boat and then to the standby boat and supervises their preparation for launching as follows:

(1) Turns on embarkation lights at night.

(2) Directs clearing away and lowering boats to the embarkation deck.

(3) Directs warping boats into position with sea painters led forward (and aft if necessary).

(4) Receives readiness reports from Emergency Boat Commanders.

(5) Assigns additional or replacement personnel if needed.

(6) Directs embarkation of emergency boat crew.

(7) Reports readiness to launch emergency and standby boats to Bridge.

(8) Directs winch control man, supervises launching and gives "lower away" when directed by Master.

(9) After launching boat, verifies readiness of standby boat if needed, ensures cargo net, embarkation ladder and heaving lines are available for use in recovery.

(10) Directs overhauling falls to assure sufficient slack for recovery.

(11) Ensures that bow and stern sea painters are ready for recovery of boats.

(12) Directs hoisting of boat after Boat Commander signals "hoist away."

(13) Directs debarkation of crew.

d. Emergency Boat Commander. The Emergency Boat Commander shall immediately muster his crew at the designated boat and:

(1) Report readiness or discrepancies to the First Officer after checking the following:

(a) Engine in good order.

(b) Life jackets donned and clothing adequate.

(c) Blankets, lifeline and ring buoy in boat.

(d) Emergency radio in boat.

(e) Ship's Medical Services Officer (if carried) is aboard with first aid kit and resuscitator.

(f) A stokes litter rigged with flotation gear is in the boat.

(2) In accordance with the Lifeboat Training Guide, COMSCINST 12410.1C, emergency boat is lowered to a launching position.

(3) Launch boat when directed and immediately clear away from the ship's side.

(4) Establish communication with the ship.

(5) Maneuver boat to man overboard. If the man is not in sight, maneuver as directed by ship's signals.

(6) Approach man overboard, keeping him on the windward side.

(7) Recover man overboard, place him in Stokes litter, wrap in blankets and provide medical assistance while returning to ship.

(8) Recover boat safely and expeditiously.

e. Chief Engineer. The Chief Engineer shall:

(1) Assign sufficient engineroom personnel to maneuver the ship.

(2) Assign the Electrician to standby with tools to repair electrical casualties, particularly while hoisting boats.

f. Senior Engineer Watch Officer

(1) Turns electricity on for searchlights, emergency boat winches and embarkation lights.

(2) Stands by on operating platform.

2-9-4 CONDITION OF READINESS

a. Emergency boats shall at all times have their sea painters led out, ready for immediate launching.

b. Floating heaving lines will be readily available to recover a man overboard, to throw to a survivor alongside or to assist a lifeboat coming alongside.

2-9-5 EMERGENCY PROCEDURES

a. Ship Maneuvering. General procedures are covered above under responsibilities. The immediate man overboard maneuver is to put the rudder hard over in the direction the man went over to swing the ship's stern away from the man in the water. Then, ring buoys and signal markers are dropped, the alarm is sounded, lookouts are stationed and the ship is maneuvered to get back to the man in the water as quickly as possible. Under favorable conditions, stopping and backing down is recommended. In heavy weather, it is preferred to use the Williamson turn, which requires about 5 minutes longer than backing down or circling, but is a sure method of returning to spot where the man fell overboard. During this delay, the emergency boats are cleared away and readied for launching.

(1) Description of Williamson Turn. The Williamson turn is executed by immediately putting the rudder hard over toward the side from which the man fell overboard and maintaining normal cruising speed. As the ship's head approaches 60 degrees from the original course, shift the rudder. As soon as the ship steadies on the reciprocal course, the engines are stopped and the ship will drift to approximately the position at which the man fell overboard.

(2) Use of Life float. The probability of recovering a man overboard is increased by dropping a raft or float overboard immediately after the alarm is sounded. The raft or float provides a large marker for the ship as well as a visible safe haven for the man in the water to swim to, if he can. Both ship and man will be aiming for the same visible location. The ship can keep its searchlight on the raft or float at night as a guide for both ship and man.

b. Lifeboat Handling. The Lifeboat Training Guide, COMSCINST 12410.1C, contains general lifeboat handling procedures. Good seamanship will guide procedures for recovery of a man overboard in specific situations.

2-9-6 SIGNALS

a. Man Overboard. Three long rings on the general alarm bells ("O"), announcement over the 1MC followed three long rings on the general alarm bells ("O"). Prescribed visual and sound signals if in sight of other ships are the International Code flag "Oscar" and the danger signal sounded on the ship's whistle.

b. Whistle Signals for Handling Boats

Lower Boats	One short blast
Stop lowering boats	Two short blasts
Recall and recover boats	A short, a long and a short blast ("R").

c. Signals for Directing Emergency Boat. The boat is directed to the man in the water by means of the radio whenever possible. Otherwise the following whistle, blinker or flag signals are used:

Turn to starboard	One
Turn to port	Two
Dead ahead	Three
Towards ship	Four
Stand off, we are maneuvering	Five or more short blasts (danger signal).

d. Dismissal. Three short blasts of the ship's whistle and the same signal on the general alarm bells, followed by 1MC announcement.

2-9-7 TRAINING

Emergency boats and launching crews shall be instructed and drilled in all aspects of day and night man overboard procedures. As prescribed in COMSCINST 3120.2D, daytime man overboard drills shall be held at least once a month, night drills at least once every 6 months. The Williamson turn should be practiced along with other recognized maneuvers during drills. Drills shall be conducted realistically, using a dummy as the man overboard. Shipboard recovery of the dummy also should be practiced in rough weather.

PART 2

EMERGENCY BILLS

CHAPTER 10

HIGHLINE TRANSFER BILL

2-10-1 PURPOSE

This bill establishes procedures for highline transfer of personnel, mail and/or light freight between two ships. It covers equipment, preparation and rigging the highline and communications between the ships.

2-10-2 ORGANIZATION

MSC ships shall be organized for highline transfer as follows:

a. Bridge. Sufficient personnel shall be detailed to hoist signals, to man sound-powered phones and the radio telephone, to serve as messengers and for other duties as directed by the Master. The most experienced Helmsman shall be at the wheel.

b. Transfer Station. Sufficient men shall be provided at the transfer station on deck to tend the highline, the inhaul or outhaul lines, the phone and distance line, the stretcher or chair and to serve as signalman and line thrower. Men shall be dressed and equipped for ready identification as provided by this bill.

c. Engineroom(s). The Engineroom shall have an additional engineering officer (the First Assistant Engineer) on the platform, the most experienced Throttlemen at the throttle and one qualified man in the Steering Engineroom during transfer operations.

2-10-3 RESPONSIBILITIES

a. Master. The Master is responsible for the organization and training of the crew in highline transfer procedures. He shall ensure that highline equipment allowances are onboard, properly marked and ready for use. He shall review this Bill and NWP 14D, Replenishment At Sea, periodically, to remain abreast of proper transfer procedures and the latest revisions. The Master shall conn the ship during the approach and through station-keeping, casting off and maneuvering-clear periods.

(1) While ship-to-ship transfers are relatively simple under favorable conditions, transfers may be difficult and dangerous during high winds, heavy seas or freezing weather. Under such adverse conditions, the Master will exercise his good judgment regarding the best transfer procedures for particular rescue, mercy or supply mission-by highline if the sea is too rough for boats and if the other ship is so equipped or by any of the other methods which good seamanship may dictate (see Chapter 13 of this Part, Mercy and Rescue Bill).

(2) When helicopters are available, they should be used to the maximum extent possible. Transfer by helicopter is generally faster and safer than by highline. Helicopters are particularly recommended for transferring the sick and disabled. If the ship has a helicopter landing area, patients (including litter cases) may be placed aboard the helicopter and transported with a minimum of exposure. If a landing area is not available, patients must be picked up individually by seat, sling or special basket.

b. First Officer. The First Officer, under the Master, is in general charge of the crew at the transfer station on deck. He is responsible for training all personnel involved in highline transfer operations. He shall inspect all highline transfer equipment periodically to assure that equipment is properly marked and ready for use. He shall familiarize himself with all provisions of this bill, and NWP 14D. He is responsible for the preparation, rigging and readiness of all highline equipment. To augment the deck crew, the First Officer will task department heads to provide qualified personnel for the transfer station.

c. Chief Engineer. The Chief Engineer will ensure the proper performance of the engineering plant and auxiliaries during highline transfers. He shall assign an additional engineer in each Engineroom and a qualified crewman in the Steering Engineroom during approach, station-keeping and maneuvering-clear periods. He shall ensure the proper operation of the electric portable megaphone, sound-powered telephones and lighting for night transfers.

d. Radio Officer. The Radio Officer will test and operate the radio-telephone and will establish contact with the other ship when directed by the Master. He shall man the radio-telephone throughout the operation as directed by the Master. Where the transfer station is some distance from the Bridge, sound-powered phones or walkie-talkies may be used for communications. If used, the Radio Officer shall check out the walkie-talkies.

e. Second Officer. The Second Officer shall break out this Bill and NWP 14 for ready reference during highline operations. He shall ready the required signal flags and shall make the appropriate signals as directed by the Master. He or another deck officer shall check the ship's course and speed as directed by the Master.

2-10-4 CONDITION OF READINESS

In ships preparing to engage in highline transfer with another ship, "Cruising" condition shall be set and maintained throughout the approach, station-keeping and maneuvering-clear periods.

2-10-5 PROCEDURES

Deck personnel must study applicable provisions of this Bill and NWP 14D to obtain detailed information on highline transfer procedures. NWP 14D is the basic authority on equipment and procedures and will govern in the event of conflict will this Bill.

a. Method of Transfer. There are two primary methods of transferring personnel between ships alongside, Personnel STREAM and Synthetic Highline. Personnel STREAM is the preferred method when one of the ships is equipped with a STREAM (Standard Tension Replenishment Alongside Method) rig. Synthetic highline is used between two ships, when neither has a STREAM rig.

(1) Personnel STREAM. Personnel STREAM requires that one of the ships be equipped with a STREAM rig. This system can be used with one-, two- or six-man transfer chairs or a Stokes litter. This method is safer and faster than synthetic highline and does not require changing the rig from replenishment operations. Detailed procedures are in NWP 14D.

(2) Synthetic highline. Synthetic highline is limited to a maximum safe load of 600 pounds. Only double braided polyester line (MIL-R-24537) and the personnel STREAM transfer rig may be used for transfer of personnel by highline. In the past, manila line was used because it stretched less than available nylon lines. Manila has been replaced by polyester which has greater strength and durability. The highline is 4-inch, double-braided polyester at least 350 feet in length. The inhaul is 3-inch plaited polyester at least 350 feet in length. The outhaul/messenger is plaited polyester made up as follows: 400 feet of 3-inch circumference line and 200 feet of 1-1/2 inch circumference line. Further description of the equipment and procedures for synthetic highline transfer is in NWP 14D.

b. Equipment. Two padeyes, for securing the highline and the outhaul snatch block on the receiving ship, are welded, one above the other, well up on the ship's structure in a clear area. Tripods are used in some cases. Logistics support ships (AO, AE and AFS) are equipped with STREAM and other replenishment systems.

(1) The transfer-at-sea chair is provided with a 1/2-inch wire preventer 2 feet long, and with a quick-acting safety belt; the Stokes litter is rigged with a protective frame and flotation bags. Flotation bags are orange painted canvas or orange-colored nylon bags filled with plastic foam or fibrous glass. A safety anchor shackle (5/8-inch or larger) is used to attach the trolley block to the chair, litter or freight bag. A pelican hook may not be used for transferring personnel or light freight. Manila handling lines, (2-1/4 inch) 12 feet long, are attached to the trolley block, to the transfer chair and to the head and foot of the litter to assist in handling on deck.

(2) The phone and distance line is 300 feet of sound-powered phone cable braided into 1-1/2" polypropylene (NSN 6145-000923-5787). It has markers to indicate the distance between ships and carries the bridge-to-bridge telephone line. The distance line is passed to the delivery ship from the receiving ship by a special distance line messenger. Heaving lines, messenger lines and hauling lines (inhaul and outhaul lines of 1-1/2 inch manila, 350 feet long) complete the highline gear.

(3) Line-throwing guns or bolos are used by the delivery ship to pass a shot line to the receiving ship. The bolo is preferred and should be used in daylight. Two line-throwing guns are required, one as a standby. The MK 87 Mod 1 line-throwing rifle adapter kit, SW350-A1-MMO-010, is used on M-14 rifles to propel a rubber projectile. The guns should be tested before use by firing a blank cartridge.

(4) MSC ships may serve as either delivery or receiving ships and should be prepared to furnish the transfer gear as delivery ship if necessary. Smaller ships which cannot meet minimum highline manning requirements in accordance with NWP 14D, will be exempted from acting as a delivery ship in personnel highline transfers. When conducting a transfer with a Navy ship, MSC ships usually serve as the receiving ship. When engaging in a transfer with a merchant ship, the MSC ship will serve as the delivery ship, providing all gear, including the distance line with attached bridge-to-bridge sound-powered phone line.

(5) In synthetic highline transfer, all lines-highline, inhaul and outhaul must be tended by hand. Lines may not be spooled on capstans or winches.

c. Preparation by the Delivery Ship. the delivery ship provides the highline gear (except for the phone and distance line) and is responsible for the condition of the equipment and fittings. In particular, the highline must be inspected before each transfer for evidence of rust, broken inner strands, cuts or other signs of weakened condition. The First Officer, in charge of highline operations, directs crewmembers to:

(1) Break out highline gear and ready it for use on the appropriate side. See that all lines are faked down and clear for running. Provide the transfer station with the tools required for emergency breakaway, rigging and unrigging.

(2) Detail men to tend the highline (25 men) inhaul line (10 men), to secure the phone/distance line and to tend the phones.

(3) Test the line-throwing gun.

(4) Test the sound-powered phones at stations.

(5) Test and ready the electric megaphone for use on the Bridge.

(6) Rig station marker on the rail or at other appropriate location. This marker is a 3-foot square green bunting with a white letter "P" in the center.

(7) Equip the Line Thrower with a red safety helmet, red jersey or vest and a life jacket.

(8) Equip the Signalman with a green safety helmet, a green jersey or vest and a life jacket.

(9) Equip all other topside personnel near the transfer station with life jackets and appropriate colored safety helmets.

(10) Rig portable sound-powered phones from the ship's transfer station to the Bridge.

(11) Rig snatch blocks to provide a direct lead for the inhaul line.

d. Preparation by Receiving Ship. The receiving ship is responsible for notifying the delivery ship when it is ready to receive personnel. The receiving ship furnishes the phone and distance line. The First Officer of the receiving ship directs crewmembers to:

(1) Prepare the phone and distance line in accordance with NWP 14D. Detail men to send the phone and distance line over to the delivery ship and to tend it. The "zero" end of the phone and distance line is secured to the rail of the delivery ship and the slack is hauled in on the receiving ship. The men tending the phone/distance line on the receiving ship must keep it taut; the distance separating the ships is read at the rail of the receiving ship. When receiving from a Navy ship, be prepared to receive an additional station-to-station sound-powered phone line.

(2) Detail men to receive the messenger line and to haul, attach and tend the following lines:

(a) The highline

(b) The outhaul line

(3) Equip the Signalman with a green safety helmet and green jersey or vest and a life jacket.

(4) Equip all other topside personnel near the transfer station with life jackets and appropriately colored safety helmets.

(5) Clear the working deck area of any personnel not detailed to the highline operation.

(6) Test sound-powered phones.

(7) Test and ready the electric portable megaphone for use on the Bridge.

(8) Rig station marker on the rail at appropriate location. This marker is a 3-foot square green bunting with the letter "P" in the center.

(9) Rig portable sound-powered phones from the ship transfer station to the Bridge.

(10) Rig snatch blocks to provide a direct lead for the outhaul line.

(11) Provide the transfer station with tools required for emergency breakaway, rigging and unrigging.

e. <u>Maneuvering</u>

(1) the delivery ship is normally the control ship and maintains course and speed.

(2) The receiving ship is normally the approach ship and makes the approach, maintains station alongside and clears away from the delivery ship.

(3) Course and speed are selected in relation to wind and sea. It is advisable to maintain a cruising speed of at least eight knots because steering control is difficult below this speed. Changes in speed while on station are to be ordered as a change in number of revolutions. Steering orders are given to the helmsman by actual course in degrees or half degrees.

(4) Distance between ships should be based on ship types, sea state, wind and type of rig. Further guidance is provided in NWP 14D.

(5) When steady on course and speed, the delivery ship (or the receiving ship when the delivery ship makes the approach) hoists signal flag ROMEO at the dip on the side where her transfer gear is rigged. When ready for the approach, ROMEO is hoisted close-up.

(6) The receiving ship, having taken station 300 to 500 yards on the delivery ship's quarter, will hoist ROMEO at the dip on the side her gear is rigged when ready to come alongside. She will hoist ROMEO close-up after the delivery ship's ROMEO is close-up and when commencing her approach.

(7) The receiving ship begins her approach at a speed three to five knots greater than the delivery ship's speed, slowing so as to be moving at the delivery ship's speed when in position alongside.

(8) As soon as the first line has been secured, both ships haul down ROMEO.

f. Transfer Procedures. NWP 14D, Replenishment at Sea, is the basic authority on equipment and procedures for highline transfer and for fueling-at-sea. NWP 14D may be consulted for more detailed instructions covering unusual circumstances or for fueling-at-sea procedures which are not addressed by this Bill. All specified safety precautions will be observed. These include:

(1) All gear will be maintained in good condition and inspected before each transfer.

(2) For Synthetic Highline transfers, all lines - highline and hauling lines - must be tended by hand. They will not, under any circumstances, be led to capstans or winches. The highline will be kept taut by a minimum of 25 men, more if necessary.

(3) A shackle (5/8" or larger) will be used to secure the chair, litter or freight bag to the trolley block. A pelican hook may not be used.

(4) Personnel being transferred must wear international orange life jackets (except patients in letters equipped with flotation gear). Tending lines of 2-1/2 inch nylon, 12 feet long, are attached to the trolley block, the transfer chair and to the head and foot of the litter to assist in handling on deck.

(5) Personnel being transferred by chairs should be instructed to unhook the quick-release belt and get out of the chair if the rig fails and the chair falls into the water.

(6) A lifeguard ship should be stationed astern of the ships transferring personnel. If a lifeguard ship is not available, each ship shall have an emergency boat and crew ready for rescue operations.

(7) If, during transfer, the highline parts causing a litter to fall into the water, the inhaul and outhaul lines must be cast loose, free for running, so that the patient will not be dragged into the vicinity of the screws of either ship.

2-10-6 SIGNALS

Communications between ships will be established by radio-telephone. The signal flag ROMEO will be used as described above. Flag and light signals are in addition to the lights and shapes required by the International Rules of the Road. Electric portable megaphones may be used for emergency communications. After the distance line and phones are passed, signals between ships will be given via sound-powered phones, paralleled by hand and flag signals. All communications and signals to be used in highline transfer operations are explained in NWP 14D. These include sound-powered phones, electric megaphones, visual flag hoist signals, hand signals and emergency breakaway signals. All signals should be shown on a convenient board for ready reference and hand signals on the back of the signal paddles. Walkie-talkies may be used for communications between the Bridge and the transfer station.

2-10-7 TRAINING

All personnel engaged in highline transfer operations shall be instructed and drilled in their duties. As required by COMSCINST 3120.2D, highline dummy practice drills will be conducted quarterly and a highline transfer drill will be included in annual Phase III DC exercises. If an assisting ship is not available, a dry-run will be held with the transfer gear rigged on the foredeck. Because the highline is used frequently in rescue and mercy missions, and must be ready for transfer-at-sea operations involving mail and light freight, it is important that the gear be ready for immediate use and that personnel be well trained in both the entire overall transfer operation and in their specific duties. Proficiency is maintained by checking crew performance and transfer gear readiness during practical "dry-run" transfers.

PART 2

EMERGENCY BILLS

CHAPTER 11

EMERGENCY EVACUATION BILL

2-11-1 PURPOSE

This Emergency Evacuation Bill establishes a general plan for the emergency evacuation of personnel and patients from dockside or midstream and for receiving them aboard ship in local emergencies. It is to be supplemented by each ship's more detailed Emergency Evacuation Plans as required by COMSCINST 3120.2D.

2-11-2 ORGANIZATION

The casualty evacuation organization will vary depending upon the situation. The number of ship's personnel required to assist in embarkation will be determined by the Master. However, in a large scale evacuation, an all hands operation may be required, particularly when time is limited. Detailed instructions for caring for evacuees aboard ship will be covered in each ship's Emergency Evacuation Plans.

2-11-3 RESPONSIBILITIES

a. Master. The Master will maneuver the ship to the area designated for the evacuation of personnel and patients as directed by the operational commander. He shall prepare an evacuation plan adapted to the specific operations.

b. First Officer. The First Officer shall assist the Master in planning and directing the rapid embarkation of personnel and patients. He shall prepare for emergency evacuation operations by rigging booms, floats, cargo pallets and lifeboats, as appropriate. He shall advise the Master regarding the number of crew men required to assist in the evacuation, and any required assistance by the Chief Engineer in devising special rigs. He shall plan the best methods of embarking patients and evacuees via gangways or side ports, by means of cranes or cargo booms and pallets, or in lifeboats.

c. Chief Engineer. The Chief Engineer shall assist the First Officer, as directed by the Master, in fabricating rigs required to facilitate boarding of evacuees and patients. He shall run all evaporators as soon as an evacuation lift has been ordered. When evacuees are on board, he shall advise the Master of the water consumption and shall request restricted water hours if necessary.

d. Supply Department Representative. A Supply Department representative will provide linens, blankets and berthing for evacuees. He shall also provide adequate food and meal servings to accommodate all on board.

2-11-4 CONDITION OF READINESS

This Bill does not set a specified condition of readiness. The Master shall set the condition of readiness appropriate for the area and the situation.

2-11-5 EMERGENCY PROCEDURES

a. Dockside. Evacuees and patients shall board via gangways. Those unable to walk shall be carried aboard in litters and stretchers. Boarding of litter patients may be expedited by hoisting them aboard on cargo pallets by means of cranes or cargo booms rigged over the dockside.

b. Offshore. Boarding evacuees and patients in midstream presents a more difficult and at times hazardous problem. Boarding procedures for evacuees will vary with circumstances. In general, for evacuation from ships, boats and other small craft, ladders, boarding nets and life lines will be rigged over the side for evacuees to board. Cranes and cargo booms will be rigged and appropriate cargo pallets will be equipped with litters for hoisting litter patients. Sideports will be used as appropriate, with an outrigger improvised for the hoisting rig. Where feasible, lifeboats can be lowered and used to hoist evacuees and patients directly aboard. Care should be taken not to overload lifeboats beyond their allowed capacities. When accepting evacuees and patients by helicopter, adherence to the provisions established in the Helicopter Launching and Recovery Bill will be required.

2-11-6 SIGNALS

The Master, in his evacuation plan, shall provide for any special signals necessary to facilitate rapid embarkation.

2-11-7 TRAINING

Before undertaking a casualty evacuation, the Master shall brief all officers and crewmembers involved in the evacuation and shall conduct drills or dry runs necessary to ensure the readiness of equipment and familiarity of all hands with their casualty evacuation duties. The Medical Services Officer shall instruct appropriate personnel in handling casualties. Instruction shall include the training crewmembers who will serve as stretcher bearers.

PART 2

EMERGENCY BILLS

CHAPTER 12

IN-PORT EMERGENCY BILL

2-12-1 PURPOSE

This Inport Emergency Bill establishes general procedures covering inport emergencies. These procedures may be modified by the Master or Relief Officer as circumstances dictate.

2-12-2 ORGANIZATION

Inport emergencies during normal duty hours will be handled in accordance with procedures outlined in other emergency bills. However, emergencies often occur when few crewmembers are available. This is true during ship's inport periods when the full crew is not aboard or when only night relief personnel are aboard. A ship's manning during inport periods between 1700 and 0800 and on Saturdays, Sundays and holidays can include only of the following personnel:

Relief Deck Officer | Gangway Watch

Oiler | Watertender (Steamships only)

Relief Engineer Officer

2-12-3 RESPONSIBILITIES

a. <u>Master</u>. The Master, or an individual designated by the Master, is responsible for preparing the Deck Night Order Book daily and for assuring that the Relief Officers are competent and are instructed in their duties and responsibilities. They must be familiar with the ship and its DC equipment, and are aware of the following.

(1) Location of nearest fire alarm boxes.

(2) Location of repair lockers.

(3) Port authorities to be contacted in an emergency, including telephone numbers.

(4) Whereabouts of the Master, including phone numbers.

(5) Material condition of readiness of the ship.

(6) Ship's Station Bill and inport instructions.

(7) Personnel available aboard.

b. Damage Control (DC) Officer. The First Officer is the DC Officer. The DC Officer is responsible for setting the required material condition of readiness, as directed by the Master, before the Relief Officer takes the watch. As directed by the Master, he shall instruct the Deck Relief Officer on the items above as well as his duties, the status of any work in progress and the condition of DC equipment which may affect the safety or readiness of the ship. The First Officer posts in each repair locker the locations of the following.

(1) Submersible pumps and electrical outlet locations.

(2) Eductors and 4-inch hoses.

(3) Semirigid stretchers.

(4) Shoring material.

c. Chief Engineer. The Chief Engineer is responsible for preparing the Engine Night Order Book daily. He shall provide Relief Engineers with the following information and orders.

(1) Machinery in operation

(a) Changes in procedures required by operations (such as cargo or repair work).

(b) Precautions to be taken in operating specified machinery.

(2) Locations of Engineroom firefighting equipment and emergency fire pumps.

(3) Location of DC locker and associated equipment.

(4) Whom to notify in case of emergency.

(a) Deck Relief Officer.

(b) Port Authority.

(c) Chief and First Assistant Engineers, including phone numbers.

(5) Material readiness of standby engineroom machinery.

(6) Specific duties.

d. Relief Deck Officer. The Relief Deck Officer shall familiarize himself with the Master's Night Order Book and with all other pertinent instructions. He shall safeguard the ship by maintaining an alert watch and carrying out all assigned duties as prescribed in written instructions. He shall know the number and capabilities of personnel available aboard to assist in event of emergency. In the absence of the ship's regular senior officers, he shall act as DC Officer and shall take control of emergency.

e. Relief Engineer Officer. The Relief Engineer Officer shall familiarize himself with the Engine Night Order Book and with all other pertinent instructions. He shall ensure the proper operation and safety of the engineering plant by keeping an alert watch and carrying out all assigned duties efficiently. In an emergency, he will be responsible for coordinating action with the DC Officer.

2-12-4 CONDITION OF READINESS

A modified "Cruising" condition of readiness will be set between the hours of 1700 and 0800 on holidays and weekends, when the normal working crew is not on board. This modified "Cruising" condition will consist of closing all fittings and manual watertight doors below the load waterline. This will enable the Relief Deck Officer to close all other electrical WT doors from the Bridge in event of emergency and thus prevent progressive flooding in case of a hull or pipe rupture.

2-12-5 EMERGENCY PROCEDURES

In event of an emergency in port when the full crew is not onboard:

a. Deck Relief Officer. The Deck Relief Officer shall:

(1) Alert all onboard by steady ringing of the general alarm bells for at least 10 seconds and a continuous blast of the whistle for at least 10 seconds.

(2) Close remote controlled fire screen doors and watertight doors and initiate any other action to "Button-Up" the ship - such as securing ventilation.

(3) Notify local authorities.

(4) In the absence of the ship's regular senior officers, assume the duties of the DC Officer and prepare to counter the emergency with available equipment and personnel.

(5) Notify the Master and other ship's personnel as required by the Night Order Book.

(6) Post a messenger at the gangplank to direct local authorities to the scene of the emergency.

b. Relief Engineer Officer. The Relief Engineer Officer will ready necessary engineering machinery. In the event any machinery cannot be activated immediately, he shall notify the DC Officer of any delays and/or limitations. In the absence of the ship's regular engineering officers, he shall be in charge of action to control casualties in engineering spaces, coordinating his action with the DC Officer and shall see that the Chief Engineer and First Assistant Engineer are notified.

c. All hands. All hands onboard are considered in duty status during emergencies. All hands onboard will report to the quarterdeck immediately upon sounding of the alarm. All hands shall assist in controlling the casualty as directed by the DC Officer.

2-12-6 TRAINING

The Master and Chief Engineer are responsible for the adequate instruction of respective Relief Officers. Administrative Area Commanders shall assign Relief Officers to firefighting and DC training, as authorized by CMPI-410, to ensure their readiness to cope with emergencies.

PART 2

EMERGENCY BILLS

CHAPTER 13

MERCY AND RESCUE BILL

2-13-1 PURPOSE

The Mercy and Rescue Bill prescribes responsibilities and establishes procedures to ensure the safe expeditious transfer of injured or seriously ill personnel from ship to aircraft, from aircraft to ship and from ship to ship for medical care and treatment and for transfer to shore medical facilities. The same procedures are followed in rescuing survivors of disaster at sea.

2-13-2 ORGANIZATION

a. Bridge. Sufficient personnel shall be detailed to hoist signals, man sound-powered phones and the radiotelephone and for other duties as assigned by the Master.

b. Emergency Crews. Emergency crews for mercy and rescue transfer operations shall be organized for action as follows.

(1) Launching crews. Assignment of personnel and their duties shall be as provided in the ship's Station Bill.

(2) Emergency boat crew. Assignment of personnel and their duties shall be as provided in the ship's Station Bill.

(3) Flight deck crew. Assignment of personnel and their duties shall be as provided in the ship's Station Bill and the Helicopter Launching and Recovery Bill.

2-13-3 RESPONSIBILITIES

a. Master. The Master is responsible for planning, organization, training the crew and executing mercy and rescue transfers. The Master shall maneuver the ship to provide a lee for launching boats and to provide a lee between his ship and the personnel to be rescued. Because the method of removing survivors from lifeboats will depend on weather conditions, the Master shall direct the rescue according to his best judgment.

b. First Officer. The First Officer, under the Master, is in charge of the crew on deck at the emergency boat launching or transfer station. He is responsible for the recovery of survivors and the emergency boat. The First Officer trains all personnel who participate in mercy and rescue transfer operations.

c. Chief Engineer. The Chief Engineer shall:

(1) Assign sufficient Engineroom personnel to maneuver the ship.

(2) Assign the Electrician to standby with tools and equipment for electrical casualties, particularly while hoisting boats.

(3) Assign an additional engineer in each Engineroom and a qualified crewman in the Steering Engineroom during transfer operations.

d. Supply Department Representative. A Supply Department representative will provide blankets and berthing as needed. He shall arrange for adequate food and meal servings to accommodate all onboard, including immediate servings of soup, sandwiches and warm beverages to survivors.

e. Navigator. The Navigator shall calculate the course, distance and time to rendezvous when directed by the Master. He shall ready required signal flags and shall make appropriate signals when directed by the Master. He shall test and ready the signal searchlight. He shall assist the Master in conning the ship during transfer operations.

f. Senior Engineering Officer on Watch. The Senior Engineering Officer on Watch shall energize searchlights, embarkation lights, emergency boat winches and ready the plant for emergency maneuvering.

g. Boat Commander. The Emergency Boat Commander shall:

(1) Establish communication with the ship and with any aircraft on designated frequencies.

(2) Maneuver the emergency boat as directed by radio, whistle, blinker or flag signals from the ship.

(3) Relay information from the ship to boats not equipped with radios.

(4) In the case of a transfer from a plane on the water, the Boat Commander shall approach the stern of the plane and stand off at a safe distance. He shall direct heaving of a buoyant lifeline to the rubber liferaft after the raft rows clear of the plane.

h. Radio Officer. The Radio Officer shall establish and maintain communications on the scene between the emergency boat, ship(s) and aircraft; he shall supply to the aircraft pilot requested information on sea state and wind direction and velocity.

2-13-4 CONDITION OF READINESS

In ships preparing for mercy and rescue transfer operations with aircraft or ship-to-ship, "Cruising" condition shall be set and maintained throughout the operation. "Emergency" condition shall be set by the Master if conditions warrant.

2-13-5 EMERGENCY PROCEDURES

a. General. MSC ships are frequently called upon to participate in mercy or rescue missions. Procedures vary depending upon whether the transfer is from another ship, from a helicopter or from a seaplane. A rescue mission may also involve a disabled ship or aircraft. An important factor in any mercy or rescue situation is the maneuverability of the ship or plane and the availability of its lifesaving equipment. Each of these procedures will be covered in a general manner; specific procedures will depend upon the situation, weather and sea conditions and the judgment of ships' officers. Transfers to and from helicopters will be in accordance with the Helicopter Launching and Recovery Bill.

b. Ship-to-Ship Transfer

(1) Precautions. Ship-to-ship transfers are relatively simple under favorable conditions, but, high winds, heavy seas or freezing temperatures will make such transfers difficult and dangerous. The Master must use his good judgment to select the best procedure - by highline transfer if the sea is too rough for boats and if the other ship is so equipped; by emergency boat where appropriate and even by shooting a line across and hauling or drifting a boat or a raft down and hauling it back and forth in heavy seas. Under extreme conditions, it may even be appropriate to maneuver a ship close to a wreck to pick survivors up directly from the water. The method selected will depend upon the conditions. The Master's decision will be based on and evaluation of the risk of each procedure.

(2) Maneuvering. The Master will maneuver the ship to provide a lee for the emergency boat and to pick up the emergency boat.

(3) Launching. Launching the emergency boat under adverse conditions will be aided by proper use of frapping lines, bow and stern painters, mattresses slung over the side and prompt skillful action of the emergency boat crew and the launching crew. Procedures for launching and handling boats are described in detail in COMSCINST 12410.1C, Lifeboat Training Guide.

(4) Use of liferaft. In heavy seas, an inflatable liferaft can be used by first shooting a messenger to the other ship with an outhaul line attached. The inflatable liferaft should be inflated on deck, then the outhaul and inhaul lines attached by passing them through and attaching them to the towing rings as a bridle so that the strain is distributed evenly around the raft. Because currently approved rafts were not designed for rescue work, this method will serve to strengthen the raft for rescue purposes.

(5) Swimmers. A strong swimmer will be assigned to the emergency boat to aid in recovery of persons in the water. Some personnel may jump from the deck of a ship in distress hoping to be picked from the water. Buoyant lifelines can assist men in the water. Swimmers also will stand by to assist during recovery of personnel and recovery of the emergency boat.

(6) Recovery of emergency boat. Safety of life and avoidance of injury shall take precedence over recovery of the boat. Embarkation ladders and cargo nets shall be in position over the side to enable passengers and boat crew to board quickly. Lifelines shall be used to help personnel board. In some cases, the boat may be hooked onto the falls and hauled aboard with all personnel in it. When recovery of the boat would be hazardous, it may be cast adrift as soon as personnel are safely aboard.

c. Ship-to-Helicopter Transfers

(1) Transfer of personnel to helicopters will be accomplished in accordance with Part 2, Chapter 14, Helicopter Launching and Recovery Bill. Personnel will have to be hoisted aboard the helicopters from ships without helicopter landing facilities.

(2) Before transferring personnel to helicopters, they shall be outfitted with appropriate safety gear. Injured personnel will be stopped securely in Stokes litters.

d. Ship-to-Plane Transfers. Even though few seaplanes remain in service, ship-to-seaplane transfers may occur. Before conducting a transfer to or from a seaplane, the Master should meet with all involved personnel and discuss the unique hazards of this operation.

2-13-6 TRAINING

All personnel who may participate in mercy and rescue operations shall be carefully instructed in their duties and responsibilities. Emergency boat and launching crews shall be instructed and drilled in all aspects of day and night mercy and rescue procedures.

a. Ship-to-Ship Transfer. In training, all personnel should refer to the Man Overboard Bill, the Highline Transfer Bill and the Lifeboat Training Guide (COMSCINST 12410.1C). Instructors must describe to all participants how these procedures would be modified for day or night ship-to-ship transfer under all conditions of wind, sea and freezing temperature.

b. Rescue of Personnel from a Sinking Ship

(1) Valuable instruction and preparation for rescuing personnel from a sinking ship can be gained from study and discussion of lessons learned from casualties and MSC casualty reviews.

(2) The Emergency Evacuation Bill, Part 2, Chapter 11, should be reviewed with particular attention given to the offshore boarding of evacuees and patients.

PART 2

EMERGENCY BILLS

CHAPTER 14

HELICOPTER LAUNCHING AND RECOVERY BILL

2-14-1 PURPOSE

a. The Helicopter Launching and Recovery Bill establishes responsibilities and procedures for ensuring safe takeoff and landing of helicopters on ships which are equipped with helicopter facilities. The Bill also assigns duties to personnel and identifies equipment which those personnel use. This Bill identifies hazards, designates preventative measures and provides procedures for helicopter operations. Detailed information on requirements and procedures may be found in the following references:

(1) Air Capable Ship Aviation Facilities Bulletin No. 1G

(2) NWP 14D, Replenishment at Sea

(3) NWP 42D, Shipboard Helicopter Operating Procedures

(4) NAVAIR 00 80R 14, U.S. Navy Aircraft Firefighting and Rescue Manual

b. When a Navy helicopter flight deck crew is assigned to the ship, they will accomplish launching and recovery. The ship's crew will assist as requested.

2-14-2 ORGANIZATION

a. Bridge. Sufficient personnel shall be assigned to hoist signals, man sound powered phones to the flight deck, operate the radiotelephone and perform other duties as directed by the Master.

b. Engineroom. Sufficient personnel shall be assigned to the engineroom for maneuvering the ship.

c. Flight Deck Area. Personnel stationed at the flight deck shall include a Flight Deck Officer (usually the First Officer), a Landing Signal Officer (usually a deck officer), a Landing Signalman Enlisted, tiedown and chock crew, firefighting team and first man.

d. Emergency Boat. The emergency boat shall be lowered to the embarkation deck and shall be ready for immediate launching. A boat crew shall be assigned and ready.

2-14-3 RESPONSIBILITIES

Key personnel shall have the following responsibilities for helicopter launching and recovery.

a. Master. The Master shall ensure that the officers and crew are trained in DC procedures in the event of casualty to the helicopter during launching and recovery. He shall maneuver the ship to provide ideal relative winds, and keep the platform as steady as possible.

b. Chief Engineer. The Chief Engineer shall ensure that sufficient engineering personnel are assigned in the machinery spaces to maneuver the ship during the launching and recovery operations.

c. First Officer. The First Officer, under the Master, is in charge of the ship's crew at the flight deck area. He shall thoroughly train ship's personnel who conduct launching and recovery operations in their duties and responsibilities. He shall ensure that needed gear is at the scene and ready for use.

d. Landing Signal Officer (LSO). Where no Navy flight deck crew is assigned, one of the ship's deck officers shall be assigned as LSO. He is responsible for all flight deck operations. The LSO will supervise launch and recovery of helicopters. The LSO directs the actions of the handling crew, firefighting team and all other personnel required on the flight deck. Except for "waveoff" and "hold" signals, the LSO signals are advisory. The pilot shall have full responsibility for proper and safe operation of the aircraft.

e. Landing Signalman Enlisted (LSE). Where no Navy flight deck crew is provided, one of the ship's deck crew will be assigned as the LSE. He will assist the LSO in giving the proper helicopter launch and recovery signals and directing the handling crew.

f. Bridge Watch Officer. When necessary, the Bridge Watch Officer, or other assigned deck officer, shall act as the Air Control Officer from Helicopter Control Central on the bridge.

g. Helicopter Pilot. The senior pilot should arrange an early conference with the Master and key officers to brief them on the technical aspects of helicopter operations. At regular intervals, he shall conduct the firefighting and rescue crews through the helicopter to ensure that they are aware of the rescue and recovery features of the helicopter in use. He shall survey the helicopter area to ensure that the helicopter can be launched and recovered safely.

h. Firefighting Team. Sufficient personnel shall be assigned to man two foam hoses as required by NAVAIR 00-80R-14. The two foam hoses shall be led from opposite sides of the flight deck. When ships cannot meet NAVAIR requirements, NAVAIR may provide waivers to allow operation of Navy aircraft. Foam stations will be charged up to the nozzles at the beginning of helicopter operations.

i. Crash Rescue Team. Two crewmembers shall be assigned to dress out in proximity suits and report to the LSO before beginning helicopter operations. A set of crash/rescue tools will be available for Crash Rescue Team use. (AEL 2-830024001 applies. See also page 2-14-11.)

j. Helicopter Handling Crew. Sufficient crewmembers shall be assigned to handle the helicopter when it is on deck. This includes crewmembers assigned to place chocks at each wheel of the aircraft and position the aircraft as required. One man shall be assigned to man a 15-lb portable CO_2 extinguisher during starting and fueling operations. This extinguisher shall have an extension to reach the aircraft engine intake (5 foot minimum for H-46 and H-53, 3 foot minimum for H-1, H-2, H-3 and H-60). During engines start up, this man shall be positioned at the side of the helicopter by the engine being started. During fueling he shall be positioned with the extinguisher by the tank being fueled.

2-14-4 CONDITION OF READINESS

In ships preparing for helicopter landings and takeoffs, "Cruising" condition shall be set and maintained throughout the operation. Access openings in the vicinity of the flight deck shall be secured during launching and recovery of helicopters.

2-14-5 PROCEDURES

a. General. Helicopter detachments carried aboard MSC ships normally include two helicopters, four pilots and 26 maintenance and flight deck personnel. Helicopters are extremely vulnerable to deck damage because of their light construction, top heaviness and fragile rotor blades. Care is required in spotting an aircraft, lashing it down and handling it on deck.

b. Launching and Landing Procedures

(1) Launching Procedures

(a) The Master will ensure that helicopter stations are manned in time for all personnel to reach their stations and complete preparations prior to flight.

(b) Phone circuits and talk back circuits between the bridge, Helicopter Control Central and the flight deck shall be tested and ready.

(c) The First Officer shall ensure that the rescue boat is swung out and ready.

(d) Obstructions such as antennas, flag staffs and lifelines shall be lowered, cleared or unrigged as appropriate.

(e) The flight deck shall be cleared of all unnecessary personnel. All flight deck and firefighting personnel shall wear appropriate flight deck clothing and required equipment. Hearing protectors shall be worn by all personnel in the flight deck area and eye protection shall be worn by all personnel who may receive rotor wash. Flight deck cranials with built-in hearing protectors shall be worn by the helicopter crew, passengers and those flight deck personnel handling the helicopter on deck.

(f) The firefighting party shall be on station. Equipment necessary to support the fire team, such as fixed foam stations and fire pumps will be manned and ready.

(g) The Bridge Watch Officer shall display the signal flag HOTEL at the dip and shall display a red signal from the bridge to the Helicopter Control Station.

(h) The helicopter pilot will, when signaled by the LSO, start his engines.

(i) The Bridge Watch Officer will maneuver the ship to obtain optimum relative wind conditions.

(j) The pilot will signal when he is ready to engage rotors.

(k) The LSO shall ensure that the area is clear and upon signal from the Helicopter Control Station. The LSE shall signal the pilot to engage rotors.

(l) The pilot shall complete the final system checks, and test communications. When tests are completed, he will signal that he is ready for takeoff.

(m) The Helicopter Control Station reports to the bridge "READY FOR LAUNCH."

(n) When ready to launch, the Bridge Watch Officer displays HOTEL close up and displays a green signal from the bridge visible to the Helicopter Control Station. On ships not equipped with a ready deck signal system, the Bridge Watch Officer shall pass "GREEN DECK" to the officer in the Helicopter Control Station.

(o) After tiedown removal, a green signal shall be displayed on the flight deck for launch. The LSE shall ensure that all tiedowns are removed from the aircraft and that they are shown to the pilot.

(p) When the helicopter is airborne, the Bridge Watch Officer will dip the HOTEL flag and display the red signal from the bridge to the Helicopter Control Station. On ships not equipped with a ready deck signal system, the Bridge Watch Officer shall pass "RED DECK" to the officer in the Helicopter Control Station.

(q) When appropriate, the Bridge Watch Officer will secure flight operations.

(2) Recovery Procedures

(a) Items (a) through (g) shall be completed as for Launching Procedures.

(b) When all preparations have been made, Helicopter Control Station reports to the Bridge "Ready for Recovery."

(c) The Bridge Watch Officer shall maneuver the ship to obtain optimum relative wind. When the ship is on the proper course and ready to recover the helicopter, the Bridge Watch Officer shall display HOTEL close up and display a green signal from the bridge to the Helicopter Control Station.

(d) When the word is passed to recover helicopters, the LSE shall take a position clearly visible to the pilot.

(e) The Helicopter Control Station shall receive a "Gear Down" report from the pilot before giving clearance to land. In helicopters with side by side seating, if the pilot in the right seat is not in control for landing, he shall make this report to Helicopter Control Station so that the LSE can be repositioned on deck to ensure eye-to-eye contact between the control pilot and LSE during landing.

(f) When the helicopter is aboard, chocks shall be inserted, tiedowns attached, HOTEL shall be hauled down and Helicopter Control Station shall display a red signal.

(g) The Bridge Watch Officer shall maintain a constant relative wind across the deck while the rotors are being disengaged.

c. Vertical Replenishment (VERTREP). Certain MSC ships are fitted with platforms for use in handling cargo by VERTREP. These platforms are not certified for use in landing helicopters. When these ships are conducting VERTREP operations, certain precautions must be taken to ensure the safety of the ship.

(1) The First Officer shall be in charge of the VERTREP deck area and shall act as VERTREP cargo officer. Before beginning operations he shall ensure that the following have been accomplished.

(a) Emergency boat swung out and ready and boat crew standing by.

(b) Firefighting team assigned and ready on station.

(c) Crash rescue team assigned and ready on station.

(d) Hookup man assigned and on station dressed out in hard hat, hearing protector and life vest.

(e) Cargo handlers assigned and ready and dressed out in hard hats, hearing protectors and safety shoes.

(f) LSE assigned and dressed out in hard hat, hearing protector and life vest.

(g) Communications between bridge, Helicopter Control Station and the cargo deck established and checked.

(h) All loose gear and obstructions removed from the hover area.

(2) A ship's deck officer shall be assigned as LSO. He shall use the appropriate signals to direct the helicopter pilot over the drop/pickup area and to assist the pilot in maintaining position during hover.

(3) A crewmember shall be assigned as hookup man. He raises the hookup pendant and hooks the cargo to the helicopter as it hovers overhead. He shall be dressed out in hard hat, life vest, safety shoes, hearing protectors and eye protection.

(4) The firefighting team manned as required by NAVAIR 00-80R-14 shall be ready with a foam hose led at each side of the flight deck. Each foam hose shall be supplied by separate foam stations which are not adjacent to each other. On ships with no foam stations, portable in-line foam proportioners will be used to supply the foam lines.

(5) A crash rescue team shall be assigned. This team shall be dressed out in proximity suits and shall have available a crash rescue tool kit as described in the table in this Bill. This team shall be assigned no other duties.

(6) A team of cargo handlers shall be dressed out and ready. They shall not enter the cargo area at any time that a helicopter is approaching or hovering over the cargo deck. Because loads up to 5000 lbs. can be dropped on the flight deck as often as every 90 seconds, cargo handlers must work quickly to keep the cargo deck cleared.

(7) The Bridge Watch Officer shall act as Helicopter Control Officer where no Helicopter Control Center is separately provided on the ship. The Bridge Watch Officer shall ensure that the optimum relative wind conditions are provided for the VERTREP operation.

(8) Safety shall be the primary concern in all VERTREP operations.

(a) All personnel except the LSO and the hookup man must clear the drop area during delivery and pickup.

(b) The helicopter hookup man must wear a life jacket and helmet with chin strap, goggles and ear protection.

(c) The flight deck drop zone must be cleared of all objects which can be blown around by rotor wash or sucked into jet intakes.

(d) All hatches and covers near the drop zone must be closed and secured.

(e) Cargo handlers must not attempt to steady a load or rush to the load before the helicopter has left the drop zone.

d. Fueling/Defueling Procedures

(1) Fueling shall be conducted in accordance with NWP 42D, NSTMs and applicable type helicopter NATOPS manuals.

(2) A fire party shall be standing by whenever fueling/ defueling operations are in progress.

(3) A 15-lb CO_2 extinguisher shall be at the ready by the helicopter fuel tank being filled. An 18-lb size dry chemical extinguisher shall be ready at the flight deck edge for use in the event the CO_2 extinguisher does not extinguish a fire.

(4) Fuel hoses and helicopters shall be properly grounded to prevent static electricity discharge causing a fire.

e. Safety. Safety precautions shall be observed during all helicopter operations.

(1) Firefighting Safety. Most helicopters have magnesium alloy in large castings such as gear boxes and housings. The entire H-19 body frame is constructed of a magnesium alloy. Before each helicopter operation, firefighters should refer to NAVAIR 00 80R 14, U.S. Navy Aircraft Firefighting and Rescue Manual, for details on hazards and techniques for the particular type of helicopter which will be handled.

(a) Objectives in firefighting are:

1. Rescue the flight crew.

2. Fight the Class B fire.

3. Fight the Class D fire if one exists. Usually, if the Class B fire is extinguished immediately or within a very short period of time, there will be no Class D fire. Most Class D materials require approximately 10 minutes of heating by a Class B fire before the material reaches its ignition temperature.

(b) Clear a rescue path to the helicopter by laying down a foam blanket. Two members of the rescue team outfitted in proximity suits enter the aircraft to remove incapacitated flight crew and passengers. The firefighting team will be dressed out as required by the certifying organization (Navy-flight deck jerseys; inflatable life vests; cranials, USCG-firefighter's ensembles or foul weather gear, rubber boots and gloves).

(c) After rescuing crew and passengers from aircraft:

1. Continue fighting the Class B fire with foam.

2. Extinguish the Class D fire with water fog from 10-foot applicators.

(2) Fueling Safety

(a) The First Officer shall station a fire party at the flight deck during refueling operations. There shall be at least one manned 15-lb portable CO_2 extinguisher located near the tank being fueled. At least one 18-lb dry chemical extinguisher shall be located near the edge of the cargo handling deck/flight deck for use in event the CO_2 extinguisher is ineffective.

(b) Fuel or oil spills shall be washed down and wiped up immediately.

(c) Refueling the helicopter in the hanger is prohibited.

(3) Hazardous Materials (HAZMAT). Modern aircraft contain many materials which are health hazards. All personnel on the flight deck must be aware of what and where these hazards are and the conditions under which they may be affected by them. The flight deck crew must train to respond to HAZMAT situations. Some materials of particular concern are:

(a) Composite Fiber. Composite fibers such as fiberglass and carbon/graphite composites are extensively used in helicopter rotors and body panels. Composite fibers present the greatest hazard when burned because fibers become airborne and can cause respiratory problems. NAVAIR 00 80R 14 outlines precautions to be taken when composite fiber contamination is believed to have occurred after aircraft crashes and fires.

(b) Aircraft Batteries. Aircraft batteries can explode and produce poisonous gas when exposed to fire.

2-14-6 EQUIPMENT

Equipment required to support helicopter operations includes the following.

a. Signaling Equipment. Red and green signal flags and wands. Amber wands must be available for night VERTREP operations.

b. Protective Gear. Appropriately colored helmets with built in hearing protectors and goggles, and flight deck life vests shall be worn by flight deck personnel, helicopter crews and passengers.

c. Crash and Rescue Gear. Two proximity suits and one complete crash/rescue tool kit as required by NAVAIR 00-80R-14 shall be provided at the flight deck.

d. Firefighting Equipment. Firefighting equipment as required by NAVAIR 00-80R-14 shall be provided.

e. Communications Equipment. Sound powered phones shall be provided to the flight deck, Helicopter Control Center and bridge as a minimum. Talk back systems may be installed. Deck edge speakers connected to a PA public announcement system may be required by Air Capable Ship Aviation Facilities Bulletin No. 1G. The Helicopter Control Center and bridge must be provided with ship-to-aircraft two way radio communications.

f. First Aid Equipment. A first aid kit prepared from the ship's medical allowance shall be provided at the flight deck.

2-14-7 TRAINING

All personnel involved in the launching and recovery of helicopters shall be thoroughly instructed and drilled in their duties and responsibilities, as specified in COMSCINST 12410.17A. Firefighting parties and personnel assigned to the emergency boat crew shall be instructed and trained in all aspects of launching, recovery and refueling procedures. The helicopter's crew and ship's crew shall discuss launching and recovery procedures in order to ensure close coordination and full understanding of all operations, including emergency action. Detailed operating procedures, signals and precautions will be found in Shipboard Helicopter Operating Procedures, NWP 42D, and Air Capable Ship Aviation Facilities Bulletin No. 1G.

2-14-8 SIGNALS

The assigned helicopter flight deck crew will handle all signaling and flight deck operations. In ships without flight deck crews, designated ship's personnel will be trained and tested in performing these duties. Helicopter launching and recovery signals used by the LSE and pilot shall be the standard signals shown in NWP 42D.

CRASH/RESCUE TOOLS (SEE NOTE 1)

ITEM	NATIONAL STOCK NUMBER
1. FIRE AX	90 4210-00-142-4949
2. HALLIGAN TOOL (PRY BAR)	90 5120-00-009-5044
3. CANVAS TOOL ROLL	LOCAL DESIGN AND MANUFACTURE
4. SAW, METAL CUTTING	90 5110-00-221-0235
5. WRENCH (VISE GRIP)	90 5120-00-277-4244
6. PLIERS, LINEMANS	9Q 5120-00-239-8251
7. CABLE CUTTER (14-INCH)	9Q 5110-00-224-7053
8. HACKSAW BLADES (6)	9Q 5110-00-142-4928
9. HACKSAW FRAME	9Q 5110-00-289-9657
10. SCREWDRIVER, COMMON 4"	9Q 5120-00-222-8852
11. SCREWDRIVER, COMMON 8"	9Q 5120-00-237-6985
12. SCREWDRIVER, PHILLIPS 4"	9Q 5120-00-234-8913
13. SCREWDRIVER, PHILLIPS 8"	9Q 5120-00-224-7375
14. "V" BLADE RESCUE KNIFE	9Q 5110-00-524-6924
15. BLADE FOR RESCUE KNIFE (6 SETS)	9Q 5110-00-098-4326
16. RIB JOINT PLIERS (WATER PUMP) (10-inch)	9Q 5120-00-059-6711
17. WRENCH, ADJUSTABLE 12"	9Q 5120-00-264-3796
18. FLASHLIGHT, SAFETY, 2-CELL	9Q 6230-00-270-5418
19. DZUS KEY (COWL FASTENER KEY)	9Q 5120-00-604-5007

NOTE 1: Reference - Paragraph 9.3.6 of NAVAIR 00-80R-14, U. S. Navy Aircraft Firefighting and Rescue Manual

PART 2

EMERGENCY BILLS

CHAPTER 15

HAZARDOUS MATERIAL SPILL BILL

Ref: (a) OPNAVINST 5100.19B, Chapter B3; NAVOSH Program Manual for Forces Afloat
(b) OPNAVINST 5090.1A, Chapter 17; Environmental and Natural Resources Program Manual
(c) COMSCINST 5090.1, Environmental Protection Program and Oil/Hazardous Substances (OHS) Spill Reporting Procedures

2-15-1 PURPOSE

To establish effective hazardous material spill response procedures for MSC operated ships as required by references (a) and (b).

2-15-2 ORGANIZATION

a. Discussion. To attain and maintain operational effectiveness, MSC operated ships require specified types and quantities of hazardous material (HM). The crew must be careful in handling, using and storing HM and Used or Excess Hazardous Material (Used/Excess HM) to prevent injury to personnel and the environment. When accidentally released, HM can damage the environment and cause serious health hazards. Aboard ships, large spills of HM present a threat to the ship and may result in the need to implement shipboard damage control. All hands must be familiar with the hazards and emergency procedures for handling HM spills.

b. Definitions

(1) Hazardous Material (HM). Any material that, because of its quantity, concentration, physical or chemical characteristics, may pose a substantial hazard to human health or the environment when purposefully released or accidentally spilled. Categories of HM covered under this program include:

(a) Flammable/combustible materials

(b) Toxic materials

(c) Corrosive materials

(d) Oxidizing materials

(e) Aerosol containers

(f) Compressed gases

Ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, pharmaceutical supplies, medical waste and infectious materials, bulk fuels, nuclear propulsion and radioactive materials are not included in this definition and are addressed by subject matter expert directives dealing with each specific item. Hazardous materials, such as asbestos, mercury and polychlorinated biphenyls (PCBs) are covered under separate directives, as listed in reference (a).

(2) Hazardous waste (HW). Navy policy is that ships do not generate hazardous waste. Ships are required to transfer used or excess HM to a Navy shore activity for determination of suitability for further use. Navy shore activities possess trained personnel who can determine whether Shipboard HM is usable, reusable or should be disposed of as HW. If the shore activity determines that the material has not further use, it will process the material as the HW generator as required by Federal and state laws and regulations.

(3) Used or Excess Hazardous Material (Used/Excess HM). HM for which there is no further, immediate use on board the ship possessing the material. Such material may ultimately be used on another ship, within the shore establishment, for a different purposes other than initially manufactured or by commercial industry.

(4) Material Safety Data Sheet (MSDS). Written or printed data concerning an HM prepared by the manufacturer of the HM in accordance with paragraph (g) of 29 CFR 1910.1200, Hazard Communication, containing information about HM, including precautions for safe use and health and safety hazards. An MSDS is required aboard ship for each HM carried, either as a part of the Hazardous Materials Information System (HMIS) or as a hard copy. The MSDSs shall be readily available to personnel who actually use or handle the material. All personnel using HM must be trained on the hazards associated with the material and personal protective equipment requirements before they may use the material. Hazardous Material Control and Management (HMC&M) Compact Disc-Read Only Memory is the Navy data application which contains the Hazardous

Material Information System (HMIS), Hazardous Material User's Guide (HMUG), Emergency Response Guide and the Afloat Shopper's Guide (ASSG). The HMIS is a compilation of MSDS data available for material provided to the ship for use, the HMIS should be scanned to determine if such data is resident within it. The HMIS shall be maintained at least by the HM coordinator.

(5) Hazardous Material User's Guide (OPNAV Pub P-45-110-91). The Hazardous Material User's Guide is a publication which provides the fleet with easily understandable safety and health information to supplement the technical data found in MSDSs. The information in this guide is designed to assist HM users in protecting themselves and the environment. The contents of the guide include control measures, precautions, health hazards, spill control guidance and disposal guidelines for 20 hazardous material groups. It also provides a personal protective equipment shopping guide. It is intended that the guide be readily available and used in every work center. Applicable sections can be copied and posted in areas where specific HM groups are frequently handled or stored.

2-15-3 RESPONSIBILITIES

a. The Master shall:

(1) Ensure HM/HW spills are handled according to references (a) and (b).

(2) Report all shipboard HM/HW mishaps as required by reference (c).

(3) Ensure all HM/HW spills, contained on board, are reported internally, as required by reference (a). Report format is attached.

(4) Submit an OPREP-3 for any environmentally significant spill defined in references (b) and (c).

(5) Report to the immediate operational commanders and the MSC administrative chain of command, any system or equipment malfunction causing, or which could cause, the discharge of a hazardous substance within restricted waters.

(6) Submit the Hazardous Substance Release Report by message for any hazardous substances spilled in navigable waters, according to references (b) and (c). This includes the Navy On-Scene Commanders Coordinators (NOSCs) and Navy On-Scene Commanders (NOSCDRs). Reference (c) also provides direction for the proper submission of Oil Spill/Release Reports.

(7) Ensure the ship holds at least one spill response drill annually.

b. The HM/HW Coordinator, Chief Mate and Department Heads shall review the list of HM/HW storage locations annually to reduce the number of locations by consolidating compatible materials and eliminating any excessive or unauthorized quantities of HM/HW. Department Heads shall:

(1) Ensure HM stocks do not exceed the quantity needed to satisfy operational requirements.

(2) Ensure their personnel are knowledgeable about MSDS and receive required HM/HW training, including spill response procedures.

(3) Identify and periodically inspect potential HM spill areas.

c. The HM/HW Coordinator shall:

(1) Ensure that shipboard management of HM/HW follows procedures outlined in references (a) and (b).

(2) Together with the ship's Damage Control Officer (DCO), train and supervise the HAZMAT Spill Response Team and fire party personnel on HM spills. Designate spill clean-up personnel and ensure they are medically qualified and fit-tested for spill kit respiratory protection. Ensure that the HAZMAT Spill Response Team is knowledgeable about gas free requirements for spaces.

(3) Inventory, maintain and replenish the HM spill kits.

(4) Provide training to all departments on reporting, initial handling and clean-up of HM/HW spills, as requested.

(5) Ensure supervisors are trained in proper marking, handling, stowage, usage, spill response and disposal procedures relative to HM/HW and in the use of MSDSs.

(6) Ensure the location and quantities of all HM on board are identified and properly marked. Provide the Chief Mate (DCO), the Gas Free Engineer (if not the Chief Mate) and Medical Department Representative (MDR) with a copy of those locations.

(7) Ensure a physical inventory of all HM is conducted annually.

(8) Conduct an annual HM spill response drill using the procedures provided in reference (a) and the HM/HW Spill Response Kit Instruction Manual.

(9) Retain the Hazardous Material Information System (HMIS) which contains MSDS information and MSDSs for locally purchased material, and for materials not covered in HMIS. Ensure copies of MSDSs are available to personnel or their supervisor upon request.

d. The Medical Department Representative shall:

(1) Assist the Department Heads in training assigned personnel on health hazard information and personal protective equipment requirements for HM they are using.

(2) Maintain a CD-ROM or hard copy file of MSDSs for all HM on board.

(3) Provide medical aid in the event of an HM spill or other mishap involving HM.

e. The Supply Officer shall (if not the ship's HM/HW Coordinator. If the HM/HW Coordinator, these tasks are accomplished by him also):

(1) Ensure a CD-ROM or hard copy MSDS is on file for all HM taken on board, including direct turnover (DTO) material ordered through the Supply Department.

(2) For material under the custody of the Supply Department, ensure stocked HM does not exceed the quantity needed to satisfy operational requirements.

f. The Department Heads shall:

(1) Ensure that when HM is transferred into other containers, these containers are properly marked with the material name, hazard and the manufacturer's name and address, according to reference (a).

(2) Ensure approved personal protective clothing and equipment are available for HM/HW operations or incidents, and personnel are trained in its use and maintenance.

(3) Ensure personnel in their departments (before using or handling any HM/HW) are trained in the hazards and precautions of the materials, are aware of MSDS information and they know they may request an MSDS for the materials.

(4) Ensure MSDSs for each HM used are available to the worker and supervisor. This may be either a hard copy or CD-ROM HMIS, if installed.

(5) Ensure all personnel are indoctrinated upon reporting aboard, and then annually; in handling, using, storing, responding to spills and disposing of HM/HW.

(6) Ensure all HM storage locations are marked. Maintain records of stock levels, locations and usage of HM.

g. All hands shall:

(1) Ensure HM removed from stowage for use is returned to the proper stowage upon completion of use or at the end of the work day, whichever is sooner.

(2) Report any spills of HM/HW to their supervisor, Department Head or Mate on Watch, including those topside or on the pier.

(3) Return HM/HW improperly stowed in work or berthing spaces for proper storage.

2-15-4 CONDITION OF READINESS

Condition of readiness is "Cruising."

2-15-5 EMERGENCY PROCEDURES

a. Introduction. Because of the extremely hazardous nature of many materials used aboard ships, only trained personnel shall respond to a HM/HW spill. Personnel shall be trained by Department Heads or supervisory personnel to clean up small spills of HM/HW. Appropriate MSDS shall be used to conduct training. For descriptive purposes, the spill response procedures have been divided into nine phases:

(1) Discovery and Notification

(2) Initiation of Action

(3) Evaluation

(4) Containment and Damage Control

(5) Dispersion of Gases/Vapors

(6) Cleanup and Decontamination

(7) Disposal of Contaminated Materials

(8) Certification for Re-entry

(9) Follow-up Reports

Each response phase is not a separate response action entirely independent of all other phases. Several phases may occur simultaneously and may involve common elements in their operation. For example, containment and damage control may also involve cleanup and disposal techniques.

b. Spill Discovery and Notification

(1) Spills or potential spills of hazardous substances may be discovered by regularly scheduled inspections of storerooms and workshops, by detection devices such as fire alarms and oxygen deficiency detectors and during routine operations. All discoveries of spills or situations that may lead to a spill shall be verbally reported immediately to supervisory personnel and the Mate on Watch. Crewmembers are not to remain in the area to investigate the spill. Whenever possible, however, the discoverer/ initial response team shall report the following information:

(a) Time of spill discovery.

(b) Location of spill.

(c) Identification of spilled material.

(d) Behavior of material (reactions observed).

(e) Source of spill (e.g., tank, container).

(f) Personnel in vicinity of spill (list by name and department).

(g) Volume of spill.

(h) Anticipated movement of spill (e.g., leakage to lower deck passage from midships toward galley).

(i) Labeling or placarding information (copy data from spilled container only after exposure to spill is eliminated).

(2) The Master shall report all overboard spills of hazardous substances as required by references (b) and (c).

c. Initiation of Action. Coordination and direction of spill response efforts at the scene of an HM/HW spill shall be accomplished by the ship's HM/HW Coordinator, Chief Mate or Mate on Watch, as appropriate, who shall initiate the following actions:

(1) Evacuate all personnel from areas that may be exposed to the spilled material, especially to vapors.

(2) Cordon off the affected area.

(3) Arrange first aid for injured personnel.

CAUTION

Do not enter the contaminated area until the necessary protective clothing and equipment have been determined (see paragraph d)

(4) Establish a command post and communications network.

(5) Prevent spills from entering other compartments by any means that do not involve personnel exposure to the spill such as closing drains, ventilation ducts, doors and hatches.

(6) Test atmosphere in spill area for the presence of explosive gases or contaminants.

(7) Disperse gases or vapors to weather through the use of blow-out (forced exhaust) ventilation or by natural ventilation such as opening doors or hatches. If atmosphere is suspected to be flammable or explosive, only explosion-proof fans shall be used for blow-out ventilation.

(8) Eliminate any fire or explosion hazards such as electrical equipment, incompatible materials and open flames.

d. Evaluation. Proper evaluation of a spill can prevent fires, explosions, personal injury or permit steps to lessen their impact. This evaluation consists of the following three steps:

(1) Obtain as much of the following information as possible from container labels and MSDS before commencing further response actions:

(a) Type and concentration of the spilled material.

(b) Hazardous characteristics of the spilled material, such as:

1. Flash Point

2. Toxicity

3. Corrosiveness

4. Potentially incompatible substances

5. Effects resulting from exposure (fainting, dizziness, skin or eye irritation, nausea)

6. First aid measures for exposure

(2) Determine dangerous conditions or potential consequences of the spill, including:

(a) Fire or explosion.

(b) Presence of oxygen deficient atmosphere in compartment.

(c) Presence of toxic or explosive gases.

(d) Possibility of dangerous vapors being drawn into ship's ventilating system.

(e) Other HM/HW in compartment that would play a role in a fire or explosion or is incompatible with the spilled material.

(3) Determine from the MSDS the appropriate spill response equipment and protective clothing necessary for safe and effective response.

e. Containment and Damage Control. Actions taken during this phase are directed toward controlling the immediate spread of the spill and minimizing the impact to the ship and crew. Depending on the type of spill, some or all of the following procedures may be employed:

(1) Fight fire (if any), being careful to use firefighting methods compatible with the material involved.

(2) Shut off or otherwise stem the spill at its source, whenever feasible, by:

(a) Replacing leaking containers.

(b) Plugging leaks in tanks.

(c) Emptying tank of remaining contents.

(d) Encapsulating a leaking container into a larger, liquid-tight container.

(3) Predict spill movement and take further action to prevent the spill from possibly entering other compartments by closing scuppers, drains, ventilation ducts, doors or hatches.

(4) Contain liquid material using barriers, such as sand, upholstery, sorbents or other equipment suitable to dam the flow.

f. Dispersion of Gas/Vapor. If a flammable gas or vapor is released as a result of the spill, the gas/vapor shall be dispersed or diluted as soon as possible. The gas/vapor shall not be allowed to enter other compartments. In some cases, the explosive atmosphere shall be contained and diluted to lower its concentration below the Lower Explosive Limit (LEL). Have the Gas Free Engineer check the spill area for LEL and toxicity. The atmosphere can then be dispersed by one of the following methods.

(1) Normal exhaust ventilation (explosion-proof only).

(2) Blow-out ventilation (powerful exhaust ventilation provided in some HM storerooms explosion-proof only).

(3) Doors and hatches open to the weather.

(4) Portable fans (explosion-proof only).

g. Clean up and Decontamination. During this response phase, personnel, as directed by the person in charge, shall employ the spill clean-up methods recommended on the MSDS. All surfaces shall be thoroughly cleaned of the spilled material. After the spill clean-up, thoroughly ventilate the compartment. Thoroughly decontaminate reusable protective clothing and otherwise maintain it before returning it to its proper storage location.

h. Disposal of Contaminated Materials. All non-reusable cleanup materials are to be placed in impermeable containers, stored and disposed of as HW according to Appendix B3DC of reference (a). These materials include unrecoverable protective clothing, sorbents, rags, brooms and containers.

i. Certification for Safe Re-Entry. The spaces affected by the spill shall be certified safe by the Chief Mate or Mate on Watch before normal shipboard operations are resumed in that space. The Chief Mate shall ascertain the following before allowing re-entry.

(1) All surfaces -- deck, counters, bulkheads, overheads -- have been thoroughly cleaned of the spilled material.

(2) All compartments have been adequately ventilated as determined from analysis by the Gas Free Engineer.

(3) All contaminated clean-up materials, including protective clothing, have been packaged, marked and handled as HMTID.

j. Follow-up Reports. The Chief Mate shall ensure a spill report for all on board spills is submitted to the HM/HW Coordinator. A copy of this report shall also be filed in the ship's safety files and shall contain the following information.

(1) Date spill occurred.

(2) Spill location.

(3) Identity of spilled material.

(4) Cause(s) of spill.

(5) Damage or injuries resulting from the spill.

(6) Response and clean-up measures taken.

(7) Any problems encountered.

(8) Method of disposing of contaminated material.

(9) Action taken to prevent the repeat of a similar spill.

SHIPBOARD HAZARDOUS SPILL RESPONSE REPORT

1. DATE AND LOCATION OF SPILL

2. SUBSTANCE SPILL (BY NAME)

3. SPILL CAUSE

4. DAMAGE AND/OR INJURIES

5. RESPONSE AND CLEANUP ACTION

6. PROBLEMS ENCOUNTERED

7. DISPOSAL METHOD

8. ACTION TAKEN TO PREVENT SPILL RECURRENCE

9. SHIP'S ON-SCENE COMMANDER

*Submit to HM/HW Coordinator.
**Copy to Ship's Safety File.

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 1

COMPARTMENTATION AND WATERTIGHT INTEGRITY

3-1-1 REFERENCES

a. Damage Controlman 3 & 2 NAVEDTRA 10572

b. Naval Ships Technical Manual Chapter 079, Volume 2, Practical Damage Control

3-1-2 INTRODUCTION

A ship's ability to resist sinking after sustaining damage depends largely on the ship's compartmentation and watertight integrity. When these are maintained, fires and flooding can be isolated within limited areas. If compartmentation and watertight integrity are not maintained, a severely damaged ship will almost certainly be lost because fires and flooding will spread from area to area.

3-1-3 COMPARTMENTATION

The compartmentation of a ship is a major feature of its watertight integrity. Structural and non-structural bulkheads divide the interior of a ship's hull into smaller spaces. Bulkheads can run both transversely and longitudinally. Most bulkheads are non-structural partitions. Transverse watertight bulkheads spaced at appropriate intervals extend from the keel to the main deck and from side to side. These bulkheads provide transverse stiffening and partition the hull into independent watertight sections. The number of penetrations of watertight bulkheads are minimized to limit the potential for progressive flooding or fire spread.

3-1-4 WATERTIGHT INTEGRITY

The watertight integrity of a ship (its capability to keep out water) is established when the ship is built. Watertight joints, connections, doors, hatches, closures and fittings all contribute to watertight integrity. Watertight integrity may be lost as a result of storm damage, collision, grounding, negligence or enemy action. Any loss of integrity must be corrected as soon as possible. The ship's level of watertight integrity is decreased or increased by opening or closing watertight doors, hatches and fittings as required by setting various conditions of readiness. The Damage Control Officer (DCO) (synonymous throughout this manual with the ship's First Officer) is responsible for ensuring that the ship's watertight integrity is maintained at all times.

a. Watertight Features

(1) Boundaries of watertight compartments

(a) Watertight compartments are bounded on top by the bulkhead deck, which is the uppermost deck to which the transverse watertight bulkheads extend. This deck and higher decks are not designed to be watertight because of their height above the waterline.

(b) The hull bottom forms the bottom of each watertight compartment. Most ships have an outer bottom, which is the skin of the ship, and an inner bottom some height above the keel. The space between these bottoms provides protection for the ship, particularly against grounding or wartime damage from of mines and torpedoes.

(c) Ships' sides between the inner bottom and the bulkhead deck are the sides of most watertight compartments. Some ships have a double hull to protect from collision or other damage to the ship's sides.

(d) Watertight bulkheads divide the ship to limit flooding from a single opening in the hull. The collision bulkhead is a watertight bulkhead near the bow which is built with few penetrations to limit flooding caused by damage from a collision at the bow.

(e) Joints and connections between the boundary components of watertight compartments are welded or otherwise made watertight. Doubler plating is used around openings to maintain bulkhead strength.

(2) Openings in watertight boundaries below the bulkhead deck.

(a) Watertight (WT) doors may be hinged or sliding, but all are strongly built and have a sealing system designed to withstand the pressure of water in a compartment flooded to the bulkhead deck.

1. Hinged WT doors are installed only above a deck which is at least 7 feet above the deepest loadline. They may have individually operated dogs or a quick acting hand wheel. The dogs set against a steel wedge to apply pressure to a knife edge and gasket to seal the door.

2. Sliding WT doors, operated by power and hand gear, are installed where sills are below the level of the deepest loadline. These doors have a smooth machined surface on the door and frame so that the door slides shut to make a tight fit. They are operated by a handwheel on either side or by remote control from the bridge.

(b) Manholes are normally a bolted access covers used to provide infrequent access to tanks and voids. They are permitted in bulkheads in machinery spaces for access to tanks and voids extending above the inner bottom. In inner bottoms, manholes are permitted only where necessary for access.

(c) Portholes or portlights below the bulkhead deck may be of the opening or non opening type. The opening type may be opened only with the consent of the Master. Deadlight covers are required on all portholes below the bulkhead deck.

(d) Sideports provide access for loading cargo. Their lowest opening must be above the deepest loadline. They are equipped with manually bolted or power operated dogging mechanisms and are not normally opened outside protected waters.

(e) Overboard discharges are fitted with either a series of at least two check valves or with one check valve and a positive stop valve, remotely operated from above the bulkhead deck. Rubbish chutes must have covers on their inboard openings. Covers must be watertight if chutes are below the bulkhead deck.

(f) Penetrations for piping, vents, wiring and remote operating gear are required to be watertight. Pipe is welded into a sleeve in the bulkhead. Stuffing tubes may be used for small tubing. Vent ducts installed below the load line must have a watertight closure at every watertight bulkhead. Wiring penetrations require stuffing tubes. Remote operating gear (reach rods) penetrations require packing at the bulkhead.

b. Setting Conditions of Readiness

(1) "Emergency" (Buttoned-up) condition is set when all hands are called to emergency stations or any time there is imminent danger to the ship. All closures and systems are secured except those required for operation of vital machinery or health of personnel. Closures include watertight doors, fire screen doors, portholes and other fittings such as hatches, manholes and sideports. Ventilation systems are secured except those necessary for main propulsion and for the health of the engineroom watch. Securing ventilation is simulated during drills, except for the zone in which the casualty is staged. All closures must be properly made and checked by Zone Area Officers.

(2) "Cruising" condition is set before getting underway and while entering or departing port. Setting "Cruising" condition is particularly important in confined or inland waters, heavy traffic, heavy weather, low visibility and combat or danger zones. In "Cruising" condition, fittings including manhole covers, sounding tubes, bilge and ballast drain systems, fueling stations, hatches and WT doors below the bulkhead deck are secured except when actually in use.

(3) Modification of Conditions: "Emergency" or "Cruising" condition may be changed or modified only by direction of the Master. Modification of "Cruising" condition may include opening WT doors for ventilation and passage or opening shaft alley WT doors if remote controls are installed.

c. Closure Responsibilities

(1) In "Emergency" Condition:

(a) The Senior Deck Watch Officer will sound the appropriate emergency signal and close WT doors equipped with remote control devices.

(b) Zone personnel make assigned closures upon sounding of the emergency signal and then inspect and maintain assigned closures while patrolling their stations.

(c) Zone Area Officers direct the securing of their zones, inspect their zones to ensure that all closures are properly made and maintained and report to the Repair Locker Leader by sound powered phone or other means.

(2) In "Cruising" condition, closures will be made as directed by the Master. Crewmembers will make closures, as instructed. The DCO will check to ensure that closures are properly made.

(3) Under all conditions, the entire crew must assist in making and maintaining closures. Each crewmember will properly make and check all required closures when moving about the ship. All hands must report when closures cannot be made properly because the opening cannot be closed securely.

d. Inspections. All fittings must be maintained in good operating condition. To ensure readiness for use and proper closures, the following inspections will be made weekly at sea. The following will be checked for proper operation:

(1) WT doors and their mechanisms, remote controls and indicators.

(2) Remote controls and indicators for valves and closures.

(3) Side ports.

(4) Portholes, portlights and deadlights near the waterline, particularly those not accessible during navigation.

e. Tests. Fittings will be tested for proper operation and tightness as follows:

(1) Before Leaving Port:

(a) WT doors will be operated.

(b) Valves and closures will be operated including:

1. Portlights and deadlights. Those near the waterline will be secured as directed by the Master.

2. Scupper closures.

3. Rubbish chutes.

(2) Weekly, while at sea, valves and closures will be operated.

(3) Daily, all WT doors will be operated.

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 2

DAMAGE CONTROL MARKINGS

3-2-1 REFERENCES

a. COMSCINST 9280.3D, Designation and Marking of Hull Structure on MSC Ships in Service (USNS)

b. COMSCINST 4750.2C, Preservation Instructions for MSC Ships

3-2-2 INTRODUCTION

The MSC system of marking enables personnel to find their way about the ship quickly and to locate DC fittings and equipment readily. This increases the crew's capability to isolate and control fire and other damage without delay. Standardization in marking assists in rapidly locating compartments and equipment. This is particularly useful to new personnel and personnel from other ships assisting during casualties.

3-2-3 DAMAGE CONTROL MARKINGS

A uniform system of marking, identifying and locating decks, compartments, equipment and fittings is essential to effective DC. Therefore, MSC has adopted a standard marking system patterned after the Navy system but adapted to merchant ships and Coast Guard requirements.

a. Label plates are installed which clearly identify the location relative to a deck, a frame and the centerline, indicate the purpose of each compartment and provide a permanent marking which does not require painting. These labels also are placed on heating and ventilation equipment, piping systems, fire systems, firehose stations and similar items. Abbreviations used on label plates and placement of the label plates are found in COMSCINST 9280.3D. Additional marking requirements for fire, countermeasure washdown clips, hazards, DC lockers and decontamination stations are in COMSCINST 4750.2C.

b. Various operating instructions, safety precautions and instructional label plates are used. These include Station Bills, emergency signal notices, equipment operating instructions, safety precautions and notices required for compliance with USCG regulations. These are further described in COMSCINST 9280.3D.

c. Repair Lockers (DC Lockers) and equipment are marked as required by COMSCINST 9280.3D.

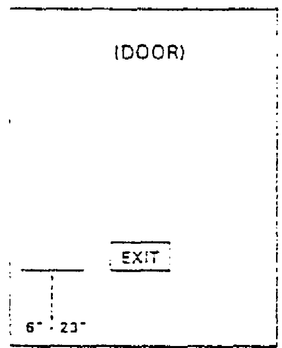
d. Lifeboats and boat stations are marked in accordance with USCG regulations. Specific instructions to meet these requirements are found in COMSCINST 9280.3D and COMSCINST 4750.2C.

e. Shipboard egress routes shall be marked as required by COMSCINST 5100.17B, Afloat Safety Manual, Chapter 23. Photoluminescent exit signs are required on doors and hatches which open directly to weather decks. Exit signs with arrows (EXIT-->) pointing to a door or hatch to weather shall be provided within 5 feet of that door or hatch, with subsequent signs a maximum of 15 feet apart (10 feet recommended) and at the foot of each ladder. All signs are to be no higher than 23 inches (30 inches if more than one sign is required at one location) or lower than 6 inches above the deck. Exit signs and arrows are to be located on the same side of each compartment or passageway and will be located in areas that receive direct lighting. Double arrow EXIT signs (<--EXIT-->) are used in athwartship passageways that provide egress in either direction. "NO EXIT" signs are required in blind or dead end passageways. Examples of the marking are found in Figure 3-2-1.

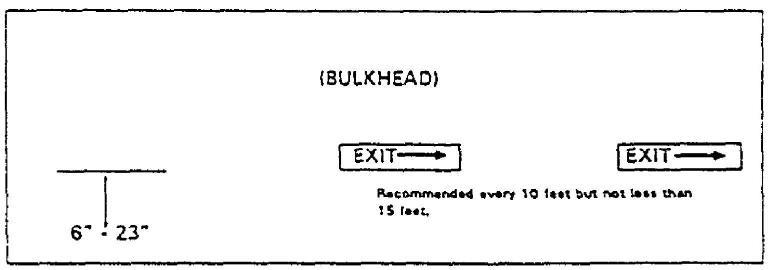
3-2-4 STANDARDIZATION

The MSC marking system is standard on all ships. It permits locating any fitting, compartment or location in the ship, and moving from one place to another. Using the present marking system, a crewman can board any MSC civil service manned ship and find his way to any location by observing deck, frame and side numbers.

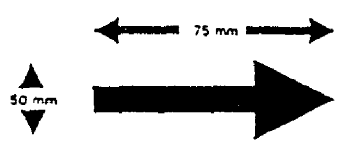
MARKING FOR DOORS, HATCHES LEADING DIRECTLY TO WEATHER DECKS



MARKING INTERIOR PASSAGE WAYS LEADING TO WEATHER DECK EXITS



EXIT SIGN LETTERING



ARROW DIMENSIONS
MINIMUM

SHIPBOARD EGRESS ROUTE MARKING

FIGURE 3-2-1

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 3

FIRE

3-3-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 555, Shipboard Firefighting

b. NAVAIR 00-80-R-14, NATOPS, U.S. Navy Aircraft Firefighting and Rescue Manual

c. Marine Fire Prention, Firefighting and Fire Safety, U.S. Maritime Administration

d. U.S. Navy Ship Salvage Manual, Vol 3 (Firefighting and Damage Control) S0300-A6-MAN-030

3-3-2 INTRODUCTION

Fleet loss experience indicates that fire has caused more damage than groundings, collisions or flooding. Steel ships can turn into floating furnaces fueled by the combustible materials carried on board. Fire prevention and fighting are essential for the survival of a ship at sea.

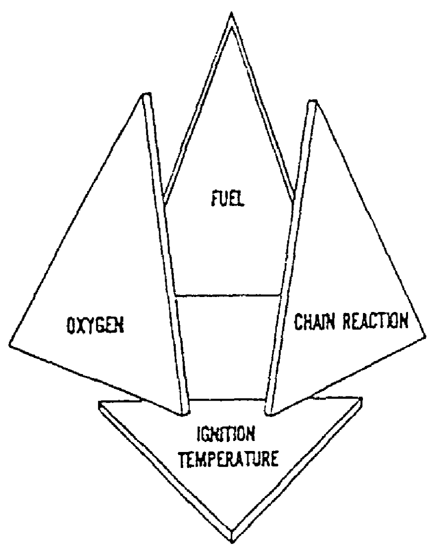
3-3-3 CHEMISTRY OF FIRE

a. Fundamentals of the Chemistry of Fire. The elements of fire are illustrated by the four sides of the fire tetrahedron (pyramid) illustrated in Figure 3-3-1. When the four sides of the fire tetrahedron are combined, fire will result. Removal of any one side will cause the fire to go out.

(1) Fuel is one side of the fire tetrahedron. Fuel is any material that will burn in the presence of oxygen. To eliminate this side of the fire pyramid, remove the fuel or isolate the fuel from the other sides of the tetrahedron.

(2) Oxygen is another side of the fire tetrahedron. Air is a mixture of gases containing approximately 21% oxygen and 79% nitrogen. Most fires will lose flame when oxygen is reduced to 15% although solid fuel such as wood, trash or cotton waste may continue to glow with as little as 6% oxygen. Some materials such as thermite, celluloid and gun powder contain their own oxygen, making it impossible to extinguish them by removing the oxygen side of the fire pyramid. Removing oxygen from fire is accomplished by allowing the oxygen to be consumed or using a smothering agents such as firefighting foams, CO_2 or steam created by vaporization of applied water.

(3) Heat is the third side of the fire tetrahedron. The heat raises the temperature of a material (fuel) to its ignition temperature, the temperature at which a material will ignite and burn on its own. The heat required to raise the fuel to its ignition temperature usually comes from an external source such as a spark from a welder or a burning cigarette. However, some solid fuels such as oily rags can generate heat through slow oxidation. The oil on the rags slowly combines with oxygen and generates heat. The rags insulate the reaction and the heat builds up until ignition temperature is reached. Any material may be cooled below the ignition temperature by application of a cooling agent such as water.



THE FIRE TETRAHEDRON (PYRAMID)

FIGURE 3-3-1

(4) The fourth side of the fire pyramid represents uninhibited chain reactions. When a fuel reaches ignition temperature, its relatively stable molecules break into smaller, highly reactive, particles known as free radicals. If oxygen is present, the free radicals will rapidly oxidize to produce stable end products and heat. The liberated heat is an essential part of combustion because the heat feeds back and raises more fuel to the

ignition temperature, liberating more free radicals which combine with oxygen, continuing the chain reaction. The chain reaction can be interrupted at the stage where free radicals are formed by the application of dry chemical or HALON. Dry chemicals and HALON break down from the heat of combustion and combine with the free radicals from the fuel, forming stable end products but not generating heat. The lack of heat stops the chain reaction at this point and the fire goes out. In addition to interrupting the generation of heat, the dry chemical also forms a screen between the flames and the fuel and reduces the feedback of heat so that both physical and mechanical mechanisms interrupt the chain reaction.

b. Stages of the fire

(1) Incipient stage. No visible smoke, flame or significant heat is developed. However, a condition exists which generates a large amount of combustion particles. They behave according to gas laws and quickly rise. This stage usually develops over an extended period of time - minutes, hours and for spontaneous combustion it can be days.

(2) Smoldering stage. As the fire conditions develop, the quantity of combustion particles increases to the point that it presents itself as smoke. There is still no flame or significant heat. Smoke detectors are intended to detect the fire at this early stage.

(3) Flame stage. As the fire develops, the point of ignition occurs. Flames develop and the level of visible smoke usually decreases and more heat is developed.

(4) Heat stage. Large amounts of heat, flame, smoke and toxic gases are produced. The transition from the third to fourth stage develops very quickly, usually in seconds. The heat stage includes a transition point called "flashover" at which heat transfer reaches a level at which all combustible material in a compartment bursts into flame. Flashover can be rapid enough to be an explosion. A compartment which does not contain enough oxygen for flashover can cause a "backdraft" explosion when oxygen is introduced, such as when firefighters open the door. The temperature in a compartment fully involved in fire can exceed $2400^{o}F$.

c. Heat transmission. Heat is transmitted in three ways.

(1) Radiation, by which heat is transmitted in straight lines through space without any conducting medium. Radiated heat can be stopped or reflected by a solid shield. It will be absorbed by dark colored materials and reflected by light colored materials.

(2) Conduction, by which heat is transmitted through solids by molecular vibration. Radiated heat which strikes a solid body is absorbed and conducted through the body. As an example, heat from a fire which is absorbed by a bulkhead is conducted through and re radiated from the other side. In general, materials which are good conductors of electricity (copper, aluminum and steel) are good conductors of heat. Materials which are poor conductors of electricity like asbestos, and wood are poor heat conductors.

(3) Convection, by which heat is transmitted through liquids or gases by currents in those fluids. Convection works because of difference in weight between warm and cool fluids. It is the only heat transfer method which would not function without gravity. Convection is the mechanism by which a fire is supplied with fresh oxygen. The smoke and hot gases from the fire rise creating a low pressure area at the base of the fire. This low pressure area draws in air to sustain the fire.

3-3-4 CLASSES OF FIRES

Fires are identified by class to aid firefighters to select the proper method for extinguishing them safely and effectively.

a. Class A Fires - Class A fires result from combustion of materials that leave an ash and will support deep seated burning. They are extinguished by using water in straight stream or fog. For deep-seated fires, AFFF is more effective than sea water and can be used as a wetting agent to rapidly penetrate and extinguish the fire. CO_2 and dry chemical are limited in effectiveness due to lack of cooling effects and rapid dissipation. After a Class A fire is extinguished, the material must be overhauled by breaking it up and soaking thoroughly with water. This is done to extinguish any material that may continue to glow after the flames have died down.

b. Class B Fires - Class B fires result from the combustion of flammable liquids such as oil, kerosene or gasoline; paint; or gases such as methane or hydrogen. The primary method for fighting oil fires is to eliminate the oxygen side of the fire pyramid by use of a smothering agent. If firefighting foam is used, a blanket 6 to 8 inches thick completely covering the surface of the oil should be built up after the fire is out to prevent a re-flash. If CO_2 is used in an airtight compartment, 25% by volume is usually sufficient to put out a fire, but in a space such as an engineroom where all ventilation cannot be secured promptly, as much as 100% may be required. HALON flooding systems in enginerooms require 5-7% by volume to extinguish fires. A dry chemical such as PKP is useful to knock down flames so that a man can approach closely enough to lay down a foam blanket. However, because it does not cool the fuel source, dry chemical is not wholly effective by itself against oil fires. Water is effective against oil fires when used as low velocity fog to cool the fire below the ignition temperature. A solid stream of water should never be used against an oil fire because it spreads and intensifies it. Water should never be applied on top of foam because it destroys the foam blanket and the fire may re-flash.

c. Class C Fires - A Class C fire involves or is caused by energized electrical equipment. The most effective tactic is to secure power to the electrical gear and treat the fire as a Class A or B fire. CO_2, HALON or dry chemical may be safely used on live electrical equipment. CO_2 and HALON are preferred because they will not damage the equipment and simplify cleanup. High Velocity or Narrow Angle water spray may be used with the nozzle a minimum distance of 4 feet from the equipment.

d. Class D Fires - Class D Fires involve burning metal. These include magnesium, phosphorus, titanium and sodium. Magnesium and titanium are frequently found in aircraft structures. The recommended agent for combating Class D fires is large quantities of water. This will cool the fuel source below its ignition temperature and reduce damage to the surrounding ship's structure. Dry sand and powdered graphite may also be used to smother the fire. Jettisoning is recommended for small packaged objects such as parachute flares.

3-3-5 EFFECT OF FIRES ON SHIPBOARD STRUCTURE AND SYSTEMS

The performance of materials utilized in ship construction must be considered when they are exposed to the high temperatures reached in shipboard fires (over 2400^{o}F).

a. Steel. The steel structure on ships conducts heat to adjacent compartments, igniting additional fires. This requires additional effort to cool bulkheads surrounding the fire and fight additional fires. Steel melts at approximately 2300^{o}F and loses strength at approximately 900^{o}F. In very large fires, decks and bulkheads may fail resulting in faster spread of fire. Its higher melting point makes steel safer than aluminum for ship structures.

b. Aluminum. Aluminum is used in interior bulkheads and for the superstructure of some ships. Aluminum conducts heat better than steel and looses structural strength at a relatively low temperature. In very hot fires, aluminum will burn, adding more heat to the fire. Aluminum melts between 1100^{o}F and 1700^{o}F, depending on the alloy, this can result in rapid spread of fire in areas with aluminum decks or houses.

c. Wireways. Plastic insulation, particularly PVC, can burn through stuffing tubes and spread fire through watertight bulkheads and decks. The high heat conductivity of copper wire aids this spread by conducting the heat a considerable distance from the fire.

d. Piping. Some piping systems, particularly those joined by silver-brazing, may fail in a large fire due to heat and internal system pressure. Compressed air piping is most likely to fail because air insulates the pipe wall and allows it to heat faster. After a compressed air pipe is ruptured, the compressed air provides large quantities of oxygen to the fire, fanning it to extreme intensity. Although liquid filled pipes are less likely to fail because the fluid acts as a heat sink, failure of fuel or hydraulic piping may have catastrophic effects.

e. Chimney effect. To achieve protection from flooding, ships are divided into vertical zones by watertight bulkheads. This vertical arrangement can result in a chimney effect if fires low in the ship are allowed to vent to weather through accesses higher in the ship. Through convection, heated fire gases rise and draw in air and oxygen to continue combustion. Open hatches and ladderwells, vertical pipe runs and wireways and structural failure due to fire heat provide paths for heat and flame. Eliminating the vent path or providing the lowest possible path to weather is vital to firefighting because this can reduce the intensity and scope of the fire.

3-3-6 FIREFIGHTING AGENTS

Many materials can be used as firefighting agents. The agents described below are the most common aboard ships.

a. Water. Seawater is the most common firefighting agent and is available in an inexhaustible supply. Applied to a fire, water absorbs heat (cooling the fuel source) while turning to steam. The water and steam both exclude oxygen to extinguish the fire. Because water attacks two legs of the fire tetrahedron, it is one of the more effective firefighting agents. Seawater is supplied throughout the ship by the firemain piping system. Using fire hoses from strategically located fire stations, water can be applied to fires anywhere on the ship. Navy All-Purpose nozzles, Vari-nozzles and commercial nozzles control the application of water to the fire. These nozzles provide different solid stream and fog spray patterns. A solid stream of water is used to reach a fire from a distance or to penetrate to the seat of a deep fire in Class A materials. The solid stream conducts electricity and must not be used on electrical fires. Water fog must be applied directly to the area requiring cooling. Water fog also protects the firefighter from the heat of the fire. Because the water is broken up into droplets, water fog can be used on Class C fires. For these fires, the firefighter must remain at least 4 feet from electrical equipment. High velocity fog can be used on Class B material with high flashpoints (above 140^{o}F) such as DFM and JP-5. The water fog cools the liquid below its flashpoint to put the fire out. Water fog should be used only when firefighting foams are not available. There is a hazard of re-flash until all of the fuel is cooled below the flashpoint.

b. Firefighting Foams. Firefighting foams are synthetic compounds similar to soaps and detergents. These foams form a layer of air filled water bubbles on the surface of flammable liquids, preventing the escape of vapors and excluding oxygen while cooling the liquid. Foams are used on all flammable liquid fires. Navy standard AFFF is 6% concentrate and 94% water while USCG approved commercial foam may be 6% or 3% concentrate solution. Instructions for commercial foams recommend the use of air aspirated nozzles to increase the volume of the foam for improved flashback resistance. Firefighting foams are superior to water on Class A fires because of better penetration and wetting characteristics.

c. Carbon Dioxide (CO_2). CO_2 is a dry, non-corrosive gas that is inert in contact with most substances. It will not leave a residue to damage machinery or electrical equipment and does not conduct electricity in the gas or solid (snow) state. CO_2 works by displacing oxygen. Because CO_2 does not provide a cooling effect, there is a re-flash hazard when the gas dissipates. CO_2 is used in fixed flooding systems in high hazard areas such as machinery spaces, flammable liquid storerooms and cargo holds. It should be noted that because CO_2 is a suffocant (displaces oxygen), it is a hazard to personnel. When CO_2 is discharged into closed or confined spaces, personnel should evacuate and should not return until the space is ventilated. Earlier entry can be made with breathing apparatus.

d. HALON. HALON is a manufactured gas which has unsurpassed fire extinguishing characteristics. Although the exact mechanism is not known, HALON is believed to interfere with the uninhibited chain reaction required to sustain a fire. HALON 1301 is used for fixed space flooding systems in machinery spaces and flammable liquid storerooms. HALON is safer than CO_2 because the 5 to 7 per cent required to extinguish fires does not reduce oxygen enough to create a personnel hazard. When a HALON system is actuated, personnel should immediately leave the space or don breathing protection equipment because of the toxic effects of fire gases and decomposition products of HALON, and the depletion of oxygen due to the fire. On ships with single charge HALON extinguishing systems, only the Master or person designated by the Master is authorized to release the HALON system. If another person is designated by the Master, that delegation of authority shall be recorded in the Station Bill and the Main Space Fire Doctrine, and shall be announced to the crew during firefighting drills. If two shot fixed gas extinguishing systems are installed, the senior officer on scene is authorized to release the first charge. Only the Master, a person designated by the Master or, in the Master's absence, the senior officer on board, is authorized to release or order the release of the second charge. The second shot of HALON should be released only after sufficient delay to determine whether the first shot was effective. An inspection of space boundaries should be made to verify sufficient tightness for the HALON to work. HALON is particularly effective against Class B and C fires.

e. Steam. Steam smothers fires by excluding and displacing oxygen. It prevents re-flash as long as the steam blanket is maintained. Because of the hazard of burning personnel, steam is used only to extinguish boiler casing fires.

f. Dry Chemical. Dry chemical extinguishers are filled with potassium bicarbonate (PKP). This chemical extinguishes fires by interfering with the uninhibited chemical reactions. PKP is used in portable extinguishers and in some hoseline systems. PKP is used primarily on Class B fires, although it can be used to extinguish any fire. Because PKP does not cool the fire, re-flash is a hazard. PKP leaves a residue that is corrosive when water is present and is very difficult to remove from equipment.

3-3-7 FIRE PREVENTION

The most effective way to avoid fire damage is to prevent fires. These actions help to prevent fires.

a. Proper Design. General Specifications for T-Ships of the United States Navy, ABS Rules for the Building and Classing of Steel Vessels and the Code of Federal Regulations (Part 46) provide guidance for use of non-combustible and fire retardant materials in construction of ships. Design features include fire zone bulkheads and decks, sprinkler systems, fixed flooding systems (CO_2 or HALON) and use of steel for decks and structural bulkheads.

b. Control of Maintenance. Improper maintenance and careless hot work, cause a higher incidence of fires during yard periods than during normal operation. The Engineering Operations and Maintenance Manual (EOMM), COMSCINST 3540.6, specifies procedures to prevent fires, control hot work, dispose of flammable materials, install of flange shields and observe other fire prevention practices.

c. Performance of Maintenance. Neglect of installed systems increases the incidence of fires. Dust accumulating in electrical equipment, leaks from hydraulic and fuel systems, oil and trash in bilges, gaps opened by missing insulation and flange shields and excess flammable material are places for fires to start. Many systems for firefighting such as foam proportioners and piping require regular maintenance to operate properly. Failure to clean and maintain the ship causes fires and reduces the ability to extinguish them.

d. Control of Flammable and Combustible Materials. Limiting the amount of flammable and combustible materials allowed onboard and properly storing those which are required, minimizes the risk of these materials contributing to a fire. Flammable liquids include gasoline, paints, paint removers and thinners, kerosene, alcohol and fuel oil. Combustible solids include wood, paper, cotton and wool. These and many other combustible materials are carried onboard for use in maintenance or as cargo.

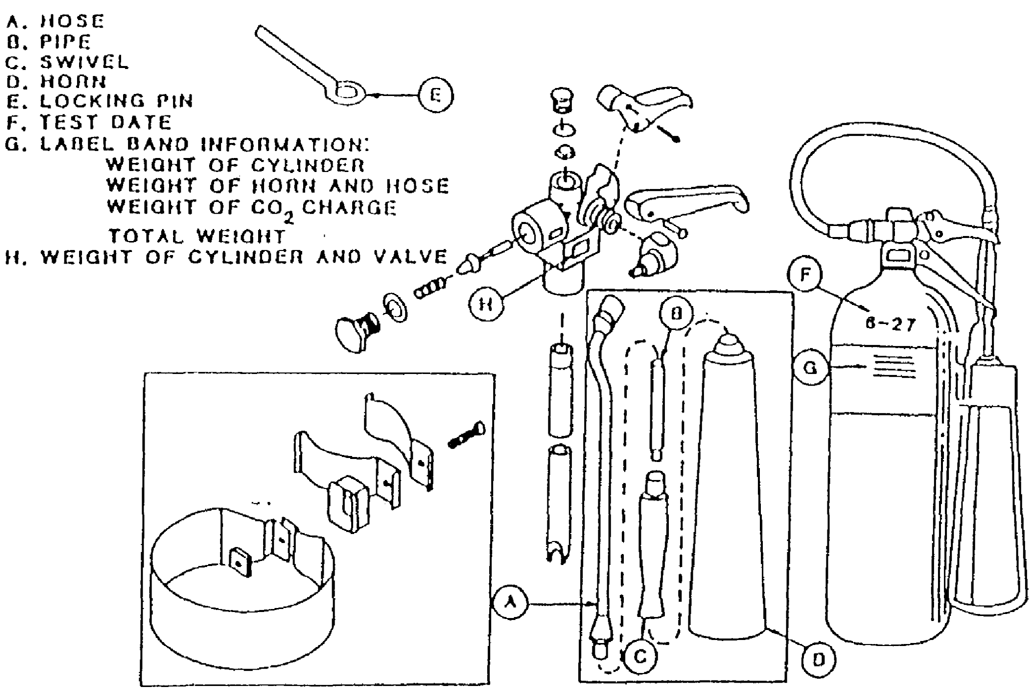
e. Proper Operation of Equipment. Equipment operated improperly can cause damage which increases the possibility of fire. Equipment must be operated in accordance with applicable instructions.

f. Regular Inspections. All personnel, including the Master, must inspect areas of the ship for which they are responsible to identify and correct hazards and conditions which cause fire. Fire prevention is an ALL HANDS responsibility.

3-3-8 FIREFIGHTING EQUIPMENT

a. Portable extinguishers. Carbon dioxide and PKP dry chemical extinguishers are used on MSC ships. For prompt response to fires, each crewmember should know the location of extinguishers in their working and living spaces.

(1) Carbon Dioxide (CO_2) Extinguishers (see Figure 3-3-2)



15 LB. CO_2 EXTINGUISHER

FIGURE 3-3-2

(a) Portable 15 lb. CO_2 extinguishers are located to meet USCG requirements. These locations include:

1. Galleys - within space

2. Radio rooms - vicinity of exit

3. Paint lockers - outside in vicinity of exit

4. Boiler spaces - in space. To prevent overpressure, CO_2 extinguishers in Engine and Boiler Rooms are filled to 90% of capacity or 13.5 lbs.

5. Internal combustion or gas turbine spaces - within space

6. Auxiliary spaces, internal combustion or gas turbine - outside space in vicinity of exit

(b) To use the CO_2 extinguisher:

1. Carry the extinguisher upright and approach the fire as closely as possible.

2. Place the extinguisher on the deck and remove the locking pin from the valve.

3. Grasp the horn handle. This handle is insulated to protect against frostbite from expanding CO_2 and the static electrical charge.

4. Squeeze the operating lever to open the valve and release CO_2. Direct the CO_2 toward the base of the fire. The maximum effective range is 4 to 6 feet from the end of the horn.

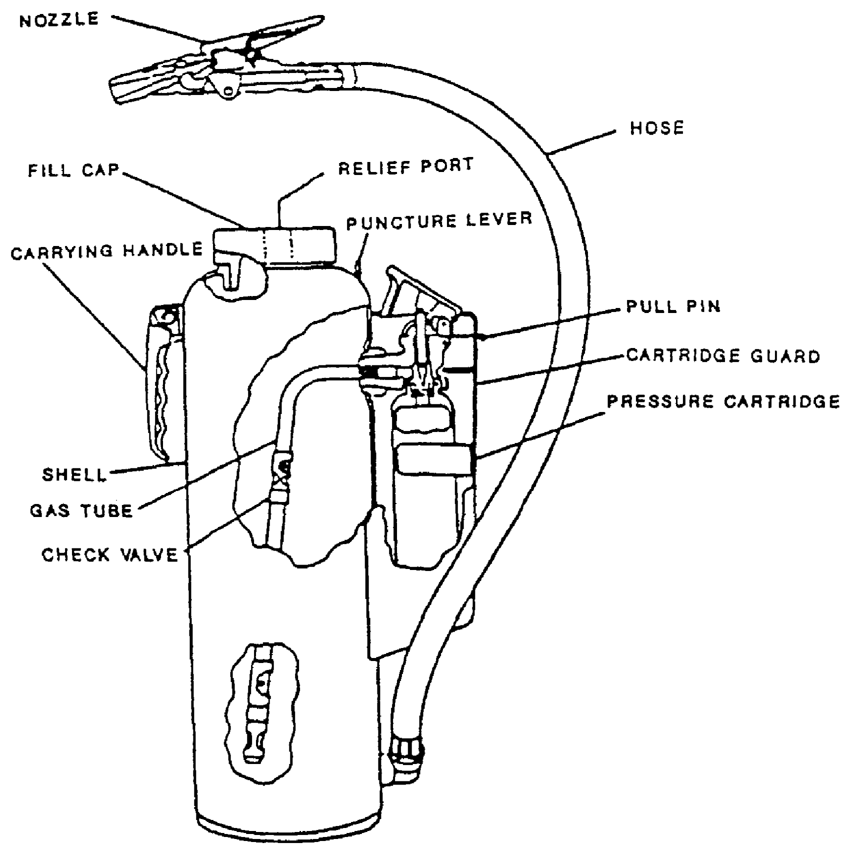
5. Continue to open an close the valve as the situation requires. Note: Since the CO_2 extinguisher functions by displacing oxygen, personnel should not remain in the space or should don Self-Contained Breathing Apparatus when CO_2 is discharged into a confined space.

(2) Dry Chemical Extinguishers (see Figure 3-3-3). The 18 lb. PKP extinguisher contains Potassium Carbonate in dry powder form with an additive to prevent caking and assure free flow. Although the powder is not toxic, it is a lung irritant and combustion products from the fire may require the user to don breathing protection. The powder leaves a residue that makes cleanup difficult. To use the PKP extinguisher:

(a) Remove the hose from the bracket.

(b) Pull pin on actuator lever marked "PUSH" and push lever.

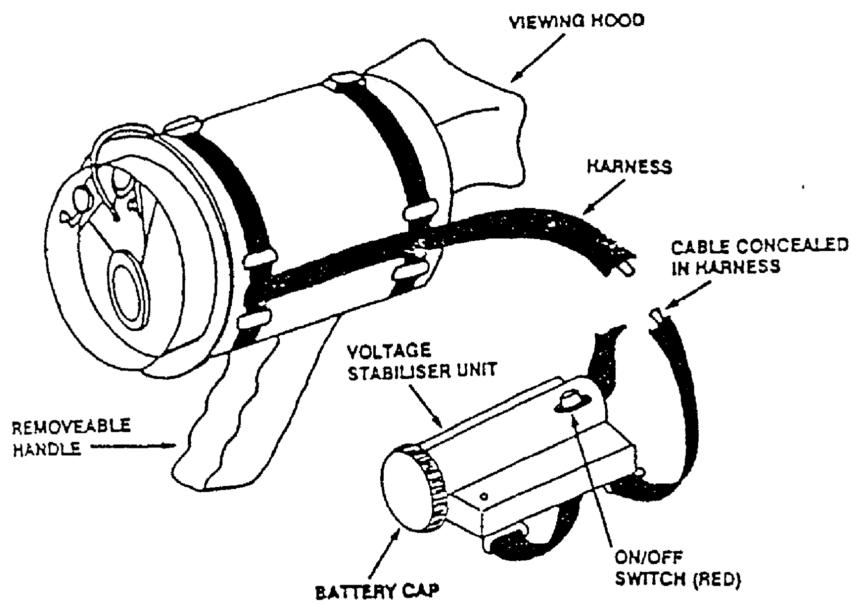
(c) Direct nozzle at base of fire and operate nozzle handle while rapidly sweeping chemical discharge from side to side chasing flames across the surface of the liquid.



18 LB. PKP EXTINGUISHER

FIGURE 3-3-3

b. <u>Naval Firefighters Thermal Imager (NFTI)</u> (see Figure 3-3-4). The NFTI allows the user to see the fire through dense smoke and light steam by sensing the difference in thermal radiation. This temperature difference (as little as $4^{O}F$) is displayed as a black and white TV image on the screen of the NFTI. The NFTI is used to investigate fires, locate the seat of a fire, locate and guide rescuers to injured personnel, set and maintain fire boundaries and locate ignition sources during fire overhaul. The NFTI user should don a Firefighters Ensemble and breathing apparatus and check operation of the NFTI before approaching a fire.



NAVAL FIREFIGHTER THERMAL IMAGER (NFTI)

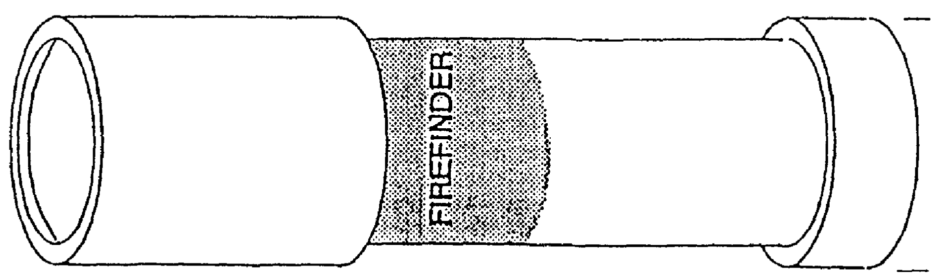
FIGURE 3-3-4

(1) Checking the NFTI before to use. Turn on the NFTI (red button) and check battery status lights. With fresh batteries, five LED lights should be illuminated in the lower left hand corner of the viewing area. As the batteries weaken, lights will go out. It is a good idea to change the battery pack when more than one light is out. Verify that the NFTI is operating in the "chop" and not the "pan" mode by checking the blue button on the front of the NFTI. The "chop" mode is best for firefighting since it allows the user to focus on one area while holding the unit still. The "pan" mode provides a sharper image but the NFTI must be in constant motion or the image will fade out.

(2) Using the NFTI. A slow, steady advance constantly scanning side to side helps the operator to judge distances better during approach to a fire. The side to side scan also provides information on hazards in the area and the best direction in which to proceed. The operator should stay low to avoid hot gases and to maintain a clear image on the NFTI. When pointed directly at a large fire, the sensor may become saturated and the image will fade. The image will return if the NFTI is pointed toward a cooler area. A better image is displayed if the fire is at the edge of the field of view. Fog patterns from a hose nozzle can form a barrier obstructing the view of the fire. Redirecting the spray or spraying in bursts will improve the view of the fire.

(3) Limitations and corrective actions. The NFTI image will degrade if water, dirt or soot is deposited on the lens. Wipe the lens with a clean, soft, dry cloth to restore the image. If the unit's internal temperature goes too high the picture will get lighter. If hot enough, the entire picture will turn gray or white. The NFTI, if not otherwise damaged, will return to normal operation when removed to a cooler area. The battery pack contains 10 "AA" alkaline batteries with a lifetime of 60-90 minutes. To conserve power, turn off the NFTI when not actually in use. The NFTI should be warmed up for 1 minute before approaching a fire. If used topside, electromagnetic interference may distort the NFTI image. The NFTI should NEVER be pointed at the sun. This will saturate the sensor and may destroy it. The NFTI cannot see through glass windows because they block thermal radiation.

c. Portable Infrared Heat Sensors (Fire Finder). To augment the NFTI, commercially available infrared heat sensors (one for each ship) are being provided to the fleet (Figure 3-3-5). These flashlight size devices detect infrared emission (heat) and provide an audible warning tone when temperatures greater than ambient are detected. The audible tone changes as hotter temperatures are detected. The Fire Finder is used by pointing the sensor end at the suspected heat source and listening for the tone. When a tone is heard, scanning the area while listening for a higher frequency tone will locate the seat of the heat source. The Fire Finder can be used by investigators and zone personnel to maintain fire boundaries as well as find fire sources through glass, bulkheads and ventilation ducting.



FIRE FINDER

FIGURE 3-3-5

d. Firefighters' Outfits. Firefighters outfits consists of single piece firefighter's coveralls (Navy Firefighters' Ensemble - FFE) or of commercially available two piece turnout gear, antiflash hood, firefighter's helmet, firefighter's gloves and firemen's boots. The FFE and the turnout gear are designed to protect the firefighter from high temperatures and radiant heat found near large fires. Although designed to keep heat from fire out, the outfit also tends to keep heat in and can cause heat stress for firefighters. While waiting to enter the fire area, firefighters should be dressed only to the waist, fully donning the outfit and breathing apparatus just before entering the fire area.

e. Coolant Vests (Cool Vest). Coolant vests are worn under the firefighters' outfit to alleviate the build-up of heat inside the outfit. These vests incorporate chemical packs which provide a cooling effect when activated. The use of the coolant vest will increase the firefighter's physiological comfort.

f. Fire hoses and nozzles. Most MSC ships are built to commercial standards with commercial equipment, but some have been transferred from the active Navy fleet or were built to Navy standards. Ships are equipped to Navy standards for certain functions, such as flight deck firefighting. For these reasons, MSC ships will have several types of nozzles.

(1) Fire hoses. Navy and commercial 2-1/2" hoses use NFPA standard "NH" 7-1/2 threads per inch couplings. For 1-1/2" hoses, the Navy uses "NPSH" couplings with 11-1/2 threads per inch while the commercial NFPA standard "NH" coupling has 9 threads per inch. While each ship has only one type of hose coupling, the thread difference will affect firefighters assisting other ships.

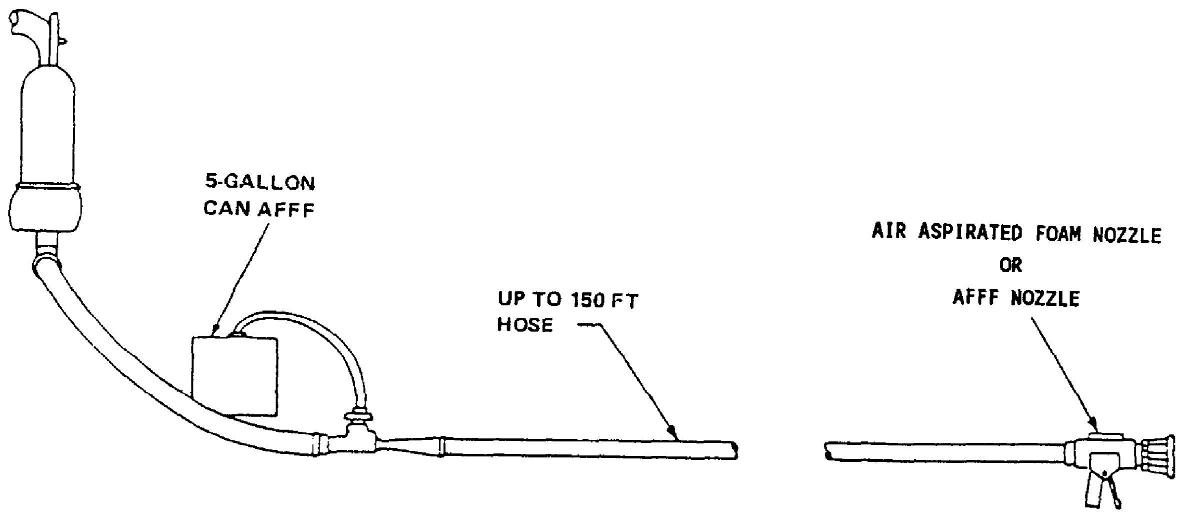
(2) Nozzles. Three different types of nozzles are in use on MSC ships.

(a) The Navy All Purpose Nozzle has a two position bail handle that allows use of a straight stream or fog position. The fog outlet can use either a high velocity spud or a long low velocity fog applicator tip can be inserted into the fog outlet bayonet connection. This nozzle does not form a very effective fog pattern and is mainly used when the low velocity applicator is required.

(b) The Navy Vari-nozzle produces a variety of spray patterns from straight stream to wide angle (90°) fog. It is designed for use with military standard AFFF foam systems and is required for NAVAIR flight deck certification.

(c) Commercial air aspirated foam nozzles produce a thicker foam that lasts longer and is more effective at preventing reflash than other foam nozzles.

g. In-Line Eductor and Foam. The In-Line Eductor is a portable foam system that is placed in the line between the fire plug and nozzle (Figure 3-3-6). The pickup tube is placed in a 5-gallon container of AFFF concentrate which is drawn into the eductor when water flows through to the nozzle. Maximum hose length permitted on the eductor discharge side is 150 feet.



IN LINE FOAM EDUCTOR

FIGURE 3-3-6

h. Foam Systems. Fixed and semi-portable systems are installed on most MSC ships. These vary considerably due to installation date and ship construction to Navy or commercial and USCG standards. Personnel should become familiar with the equipment installed on their ship. Commercial systems on ships built to USCG standards are required to have the entire system and foam concentrate supplied by one manufacturer.

i. Smoke Curtains and Blankets. Smoke curtains and blankets are portable smoke impermeable fabric panels, used to block the migration of smoke through passageways, hatches and scuttles and doorways. These panels can be attached over doorways and hatches with large clothes pin like clamps, close openings which could render vertical, longitudinal and transverse smoke boundaries ineffective. Smoke curtains and blankets, usually constructed in two pieces with Velcro fasteners, allow the movement of firefighters, zone personnel and firefighting equipment through smoke boundaries. This equipment also enhances the effectiveness of portable ventilation devices such as water driven ram fans and electrically powered box fans (air ejectors). These portable blowers are used to assist the ship's installed ventilation systems when de-smoking a compartment after fire extinguishment (see Part 3, Chapter 8). Currently, methods are being evaluated aboard ex-USS SHADWELL which employ portable blowers and smoke curtains and blankets to actively de-smoke adjacent passageways and compartments as a fire is being fought. This "active de-smoking" during firefighting provides a more tenable environment in which firefighters may fight a fire. Extreme care must be taken in employing this technique to ensure the fire is not "fed" fresh air during active de-smoking.

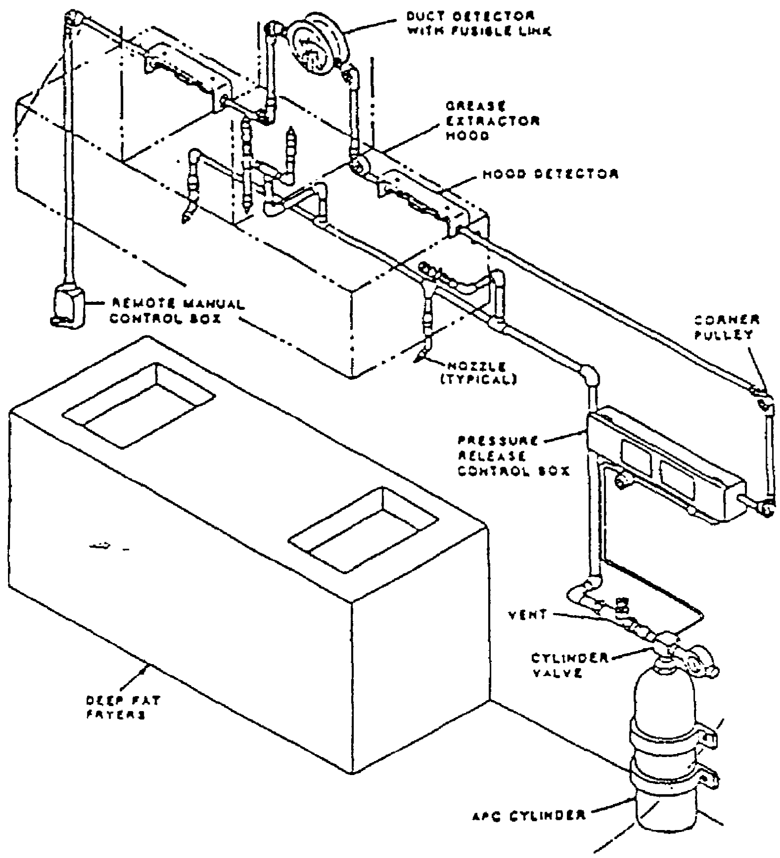
j. Fire and Smoke Detecting Systems

(1) Fire detecting systems use manual and thermostatic sensors to signal a fire the bridge, engineroom and certain other manned stations. Manual fire alarm stations have a pull box that releases a plunger and opens the circuit when the glass is broken. The alarm is sounded at the central panel on the bridge and indicates the location or zone where the fire is reported. Thermostatic sensors are a bimetallic type that open at 135^{O}F at most stations. Higher temperature thermostats are used in the galley. All alarm systems will have back up battery power.

(2) Smoke detecting systems use pipes connecting cargo, storeroom or other spaces to a central detector cabinet. Exhaust fans draw air samples from each space past a sensor that sets off an audible alarm when smoke is present. The cabinet is labeled and has a chart to indicate where the smoke is located.

k. Galley Fire Protection Equipment

(1) Aqueous Potassium Carbonate (APC) fire extinguishing systems (also called Rangeguard systems). Shipboard galley deep fat fryers, doughnut fryers, some ranges and other galley appliances and their exhaust systems are protected by Aqueous Potassium Carbonate (APC) fire extinguishing systems. The basic system consists of a cylinder assembly, discharge piping and nozzles, detector assemblies, a cable release system, a pressure release control box and cartridge and often a remote manual control box (see Figure 3-3-7). The system is designed to be activated automatically by the detector assemblies, or manually at the cylinder assembly pressure release control box or remote manual control box.



APC SYSTEM

FIGURE 3-3-7

(2) Grease Interceptor Hoods. Grease interceptor hoods (also referred to as Gaylord hoods) effectively remove grease and other contaminants from exhaust air flow centrifugally by the use of baffles. The baffles are arranged to drain the waste products into a grease trough. The grease interceptor hood includes a cleaning system and fire dampers to keep fires and prevent fires that do occur from spreading to the exhaust ventilation system.

3-3-9 FIREFIGHTING ORGANIZATION AND TACTICS

a. Organization. The organization for firefighting includes three groups.

(1) Quick Response Team. This team consists of 3 to 5 crewmembers who proceed immediately to the fire location and attack the fire with nearby fire extinguishers and hoses. The objective of Quick Response Team is to put the fire out before full personnel protective gear is required to approach it.

(2) Repair Party. This party proceeds to the repair locker to don firefighting outfits and breathing apparatus and to obtain firefighting equipment to fight any size fire. When equipped, the repair party goes to the fire location and relieves the Quick Response Team.

(3) Zone Personnel. Zone Area Officers and personnel assigned to the zone are responsible for setting "Emergency," isolating any fires in their zone and initiating firefighting efforts. Zone personnel will evacuate personnel from dangerous areas, patrol and investigate conditions in their zone and assist the local repair party.

b. Firefighting Tactics

(1) Fire attack steps. Whether a single hose or multiple hoses attack a fire, the steps are the same. These steps are:

(a) Size up the fire. Determine the location of the fire. Because large fires generate significant smoke, often only a general location can be determined initially. In these cases a thermal imager will be required to investigate and locate the source of the fire. Discolored or blistered paint, smoke from cracks or penetrations and hissing sounds indicate a fire on the far side of a bulkhead. The On-scene Leader must determine what is burning and what combustibles are at risk of igniting to determine whether portable extinguishers, hoselines or fixed systems are required. The Repair Locker Leader determines where smoke and fire boundaries should be set based on reports from the On-scene Leader. The On-scene Leader will select a staging area outside the fire and smoke boundaries and will establish communications with the repair locker. From this staging area the On-scene leader will direct the Fire Team.

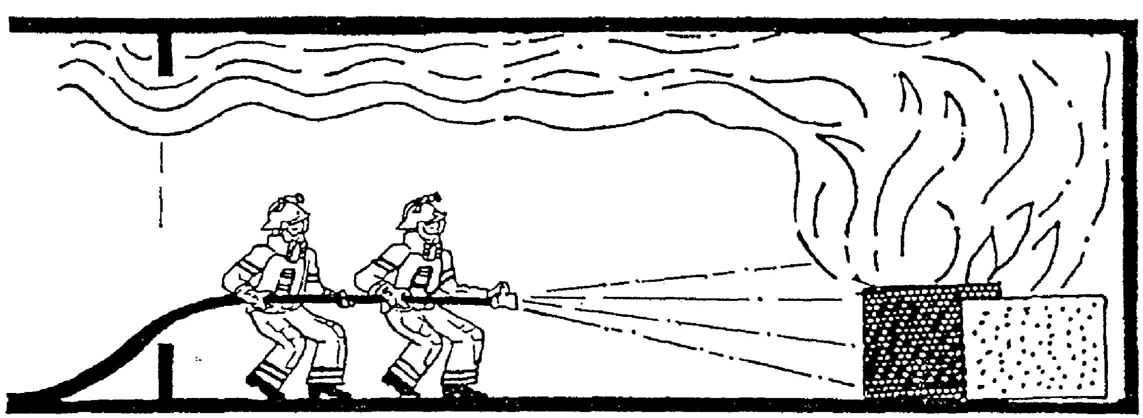
(b) Isolate systems and equipment. Every effort should be made to isolate systems that cause or could feed a fire. Pressurized fuel fires normally cannot be extinguished until the source is secured. Electrical fires will usually not go out until power is secured. Isolating gas fires (O2, Acetylene, Hydrogen, etc.) is especially critical because the collection of gases after the fire is out poses a severe explosive hazard. All systems and equipment in or transiting a space on fire should be secured to the greatest extent possible.

(c) Protect compartments exposed to the fire. Heat spread by conduction through bulkheads and decks can spread fire without a mechanical breach. In the compartment above a fire, combustibles can reach flashover temperature and ignite in as little as 2 minutes. Action to protect compartments includes wetting combustibles in contact with decks or bulkheads, cooling the deck or bulkhead and blocking breaches in decks and bulkheads.

(d) Set fire and smoke boundaries. Fire boundaries are set at fire zone bulkheads or watertight subdivisions and at decks above and below the fire. Setting a boundary means closing openings, monitoring the boundary for heat or smoke and applying cooling water when required. Boundaries above a fire should be set first since fire spreads faster vertically. Combustibles in contact with the deck should be removed and the deck cooled as necessary. Relatively small amounts of water are needed to cool a bulkhead or deck adjacent to a compartment on fire. Cooling should be done by using a 15-second wetdown of the deck every minute. Horizontal smoke boundaries are set at any tight or non-tight bulkhead which reaches from deck to overhead. Vertical boundaries are set at the decks above and below the fire. To set a smoke boundary, close all openings and install smoke curtains and blankets where closure is not provided. Curtains and blankets are used to minimize smoke spread where doors or hatches must be open for personnel or fire hoses to pass.

(3) Attack the fire. The attack should begin as soon as possible to minimize the size of the fire. At the early stages, a fire often can be put out with a single portable extinguisher. Allowed to burn, the fire may require the entire crew to fight and may result in loss of the ship. The attack can be direct or indirect as required by the size of the fire.

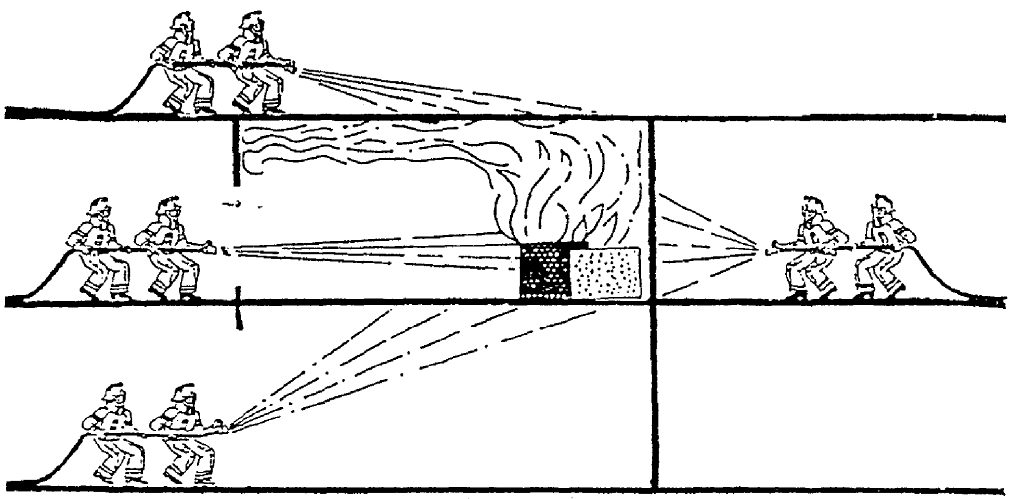
(a) In a direct attack, the firefighters advance into the fire area and apply the extinguishing agent directly onto the seat of the fire (see Figure 3-3-8). Heat, smoke and gases from advanced fires may prevent approach to the fire and make an indirect attack necessary.



DIRECT ATTACK

FIGURE 3-3-8

(b) An indirect attack is used when, the fire team cannot approach a compartment fire close enough to put water directly on the fire (see Figure 3-3-9). Water fog is discharged into the space through a cracked open door or bulkhead or overhead penetration. The opening should be only large enough to admit the nozzle or applicator. An indirect attack should not be used if firefighters also are directly attacking the fire. If both direct and indirect attacks are attempted at the same time, steam and water from the indirect attack will endanger the direct attack firefighters.



INDIRECT ATTACK

FIGURE 3-3-9

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 4

CHEMICAL AND BIOLOGICAL DEFENSE

3-4-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 470, Shipboard BW/CW Defense and Countermeasures

b. Naval Ships Technical Manual, Chapter 077, Personnel Protection Equipment

c. United State Navy Chemical, Biological and Radiological Defense Handbook for Training, S 5080-AA-HBK-010

d. NWP 62-1 (Rev D), Surface Ship Survivability

3-4-2 CHEMICAL AND BIOLOGICAL AGENTS

a. Chemical Agent Effects. Although some chemical agents have corrosive affects on some materials, and others burn most materials, these agents are primarily used against personnel. Chemical agents can enter the body by the eyes, nose, mouth or skin, and be ingested with contaminated food or drink. Agents in liquid or vapor form can penetrate ordinary clothing and attack the skin. Table 3-4-1 lists the most common chemical agents and their characteristics. The various agents are classified according to the following:

(1) Physiological Action. Chemical agents are used to bring about the following harmful physiological reactions when applied to personnel.

(a) Nerve Agents. Nerve agents interfere with nerve pulse, disrupting control of breathing, muscle control and vision. Death can be very rapid. Effects are immediate if inhaled or ingested, slower if absorbed through the skin but may still require less than 30 seconds.

(b) Blister Agents. Blister agents cause inflammation and blistering of the skin and internal tissue such as breathing passages. Effects are immediate although usually incapacitating rather than lethal.

(c) Choking Agents. Choking agents attack the breathing passages and lungs, causing swelling and liquid in the lungs, leading to choking. Speed of effects depend on concentration. Death can occur in minutes for high concentrations.

(d) Blood Agents. Blood agents interfere with use of oxygen by cells in the body. Incapacitation can be immediate followed by death within 15 minutes for high concentrations.

(e) Vomiting Agents. Vomiting agents primarily induce vomiting. The may also cause coughing, sneezing, pain in the nose and throat, nasal discharge and tears.

(f) Tear Agents. Tear agents cause uncontrollable flowing of tears and intense (although temporary) eye pain. Certain tear agents will also cause nasal and mucasal discharge, vomiting, nausea and skin burns.

(g) Others. Many chemical compounds created for industrial, agricultural and other uses have the potential to be used as chemical warfare agents. Although most will fall into the categories listed above, many will create non-specific symptoms which will be difficult to categorize.

(2) Physical State. The physical state of the agents determines the method of dispersal, mode of ingestion and defensive actions required.

(a) Gases, Vapors and Aerosols. Although these physical states differ greatly, behave very similarly during dispersal. They can be dispersed by spraying (typically from aircraft) and exploding munitions. After dispersal they will linger in cloud like form until dissipating or settling to the ground. Agents in these forms are generally absorbed through the respiratory tract.

(b) Liquids. Generally dispersed by spraying, liquids will adhere to surfaces which they come in contact. Liquids may then contaminate personnel who come in direct contact with them or they may evaporate into vapor form and enter a victims system via the respiratory tract.

TABLE 3-4-1 - PROPERTIES OF CHEMICAL AGENTS

AGENTS	CHEMICAL AGENT SYMBOL	STATE AT 20°C	ODOR	RATE OF ACTION	PHYSIOLOGICAL ACTION	USE	PERSISTENCY
NERVE	Tabun GA	Colorless to brown liquid	Faintly fruity; none when pure	Very rapid	Cessation of breathing and death may follow.	Quick-action casualty agent	Depends upon munitions used and weather. Heavy splashed liquid persists 1 to 2 days under average weather conditions.
	Sarin GB	Colorless liquid	Almost none when pure	Very rapid	Cessation of breathing and death may follow.	Quick-action casualty agent	Evaporates at about the same rate as water. Depends upon munitions used and the weather.
	Soman GD	Colorless liquid	Fruity; camphor odor when pure	Very rapid	Cessation of breathing and death may follow.	Quick-action casualty agent	Depends upon munitions used and the weather. Heavily splashed liquid persists 1 to 2 days under average weather conditions.
	VX	Colorless liquid	Odorless	Rapid	Produces casualties when inhaled or absorbed.	Quick-action casualty agent	
BLISTER	Distilled mustard HD	Colorless to pale yellow liquid	Garlic	Delayed; hours to days	Blisters; destroys tissues; injures blood vessels.	Delayed-action casualty agent	Depends upon munition used and the weather. Heavily splashed liquid persists 1 to 2 days in concentrations to provide casualties of military significance under average weather conditions, and 1 week to several months under very cold conditions.
	Nitrogen mustard HN-1	Dark liquid	Fishy or musty	Skin effects delayed 12 hours or longer	Blisters; affects respiratory tract; destroys tissues; injures blood vessels.	Delayed-action casualty agent	Depends on munitions used and the weather. Somewhat shorter than duration of effectiveness for HD.
	Nitrogen mustard HN-2	Dark liquid	Soapy in low concentrations, fruity in high concentrations	Serious effects same for HD; minor effects sooner	Similar to HD. Broncho-pnuemonia may occur after 24 hours.	Delayed-action casualty agent	
	Nitrogen mustard HN-3	Dark liquid	None if pure	Immediate effects on contact	Similar to HN-2.	Delayed-action casualty agent	Considerably longer than for HD.
	Phosgene oxime Dichloro-forcxime CX	Colorless solid or liquid	Sharp; penetrating	Rapid	Violently irritates mucous membranes of eyes and nose; forms welts rapidly.		Somewhat shorter than for HD. Very short duration under humid conditions.
	Lewisite L	Dry oily liquid	Variable may resemble geraniums	Prompt eye stinging; delayed blistering	Similar to HD plus may cause systemic poisoning.	Moderately delayed casualty agent	
	Mustard Lewisite mixture HL	Dark oily liquid	Garlic like	Immediate eye effect; skin effects 1/2 to 1 hour	Similar to HD plus may cause systemic poisoning.	Delayed-action casualty agent	Depends on munition used and the weather. Somewhat shorter than that of HD.
CHOKING	Phosgene CG	Colorless gas	New-mown hay; green corn	Immediate to 3 hours, depending upon concentration	Damages lungs.	Delayed-action casualty agent	Short, however, vapor may persist for some time in low places under calm or light winds and stable atmospheric conditions (inversion).
	Diphosgene DP	Colorless liquid	New-mown hay; green corn	Immediate to 3 hours depending upon concentration	Damages lungs.	Delayed-action casualty agent	
	Chlorine	Yellow gas	Chlorine	Immediate	Damages lungs.	Quick-action casualty agent	
BLOOD	Cyanogen chloride CK	Colorless gas	Somewhat like AC;	Rapid	Interferes with use of oxygen by body tissues.	Quick-action casualty agent	Short, vapor may persist in jungle or forest for some time under suitable weather conditions.
	Hydrogen cyanide AC	Colorless gas or liquid	Bitter almonds	Very rapid	Interferes with use of oxygen by body tissues.	Quick-action casualty agent	Short; the agent is highly volatile and in the gaseous state it dissipates quickly in the air.

(3) Tactical Use. Chemical agents are grouped according to their intended effect.

(a) Casualty Agents. Agents which produce serious injury or death. Recovery from these agents is not expected without medical treatment.

(b) Incapacitating Agents. Agents which produce temporary physiological or mental effects which will render individuals incapable of performing their duties. With these agents, complete recovery is expected without medical treatment.

b. Biological Agent Effects. Biological agents are used in warfare to reduce a target forces ability to wage war through death, disease and famine. This can be accomplished by either directly attacking personnel or by attacking crops, domestic animals and supplies. Biological agents can be transmitted through many of the same methods as chemical agents. In addition, these biological agents may be transmitted through insects and animals which carry disease (vectors). Biological agents are divided into two broad categories:

(1) Pathogens. Pathogens are living organisms which cause disease. Any disease which naturally affects man, animals or crops could be used as a biological warfare pathogen. Pathogens generally enter the body through mucosal membranes or breaks in the skin (bug or animal bites). Once established inside the victim, the disease will grow and reproduce (incubation period) until it overcomes the victim's immune system.

(2) Toxins. Toxins are poisonous substances produced as by-products of microorganisms (pathogens). Some toxins can be chemically synthesized or produced through bioengineering. Unlike pathogens, toxins will produce immediate effects on personnel (no incubation period). Depending on the originating pathogen, toxins will have varying affects on personnel.

3-4-3 CHEMICAL AND BIOLOGICAL DEFENSES

Actions to be taken when a Chemical or Biological attack are likely, imminent or have occurred are described in the CBR-D Bill, Part 2, Chapter 5. These actions are based primarily on the Mission Oriented Protective Posture (MOPP) set by the Master.

a. Mission Oriented Protective Posture (MOPP). MOPP is a management system which coordinates individual tasks, collective activities and shipboard equipment and countermeasures to effectively defend against chemical, biological or radiological warfare. There are four levels of MOPP, each corresponding to a more serious threat. The MOPP levels are described below. It is the Master's responsibility for the implementation of MOPP levels and to raise the MOPP level as threats become more immediate.

(1) MOPP Level 1 (SUSPECTED). Enemy possesses CBR agents and delivery systems in OPAREA. MOPP level 1 requires:

(a) Individual protection. CBR clothing and self aid items issued. Items include:

1. Gas masks - fitted for immediate use.

2. Chemical protective overgarments (CPO) with overboots, glove set.

3. M291 and M295 personnel decontamination kits.

4. Atropine auto-injectors, 2-PAM-Cl auto-injectors, and Pyridostigmine pre-treatment tablets.

(b) Actions to Prepare for Attack. These actions include:

1. Review CBR-D Bill requirements.

2. Inventory detection and monitoring equipment quantity, shelf-life and operability.

3. Inventory decontamination supplies and canteens; replacing expired, missing or consumed equipment and supplies.

4. Set "Cruising" condition.

(c) Preparing Shipboard Systems. These actions include:

1. Test the Collective Protection System (CPS) (if installed).

2. Rig hose and clip countermeasure washdown system if not permanently installed.

3. Test detection and monitoring systems.

(2) MOPP Level 2 (POSSIBLE). Enemy has affirmed, or U.S. authorities estimate that the enemy has the political will to utilize CBR warfare. MOPP level 2 requires:

(a) Individual protection. Gas mask carried in case by all crewmembers.

(b) Actions to prepare for attack. These actions include:

1. Designating primary and secondary personnel decontamination stations with weather and internal access/exit routes, prepositioning decontamination supplies in DECON stations, preposition canteens at staging areas.

2. Set "Emergency" condition.

(c) Preparing Shipboard Systems. Test the countermeasure washdown system and shipboard alarms.

(3) MOPP Level 3 (PROBABLE). An enemy statement of intent to employ CBR warfare, changes in political or military posture or use of CBR warfare in OPAREA requires:

(a) Individual Protection

1. Install new filter canisters in gas mask.

2. Don CPO and overboots. Carry DECON kit, glove set and medical items in CPO jumper pocket. For a nerve agent threat, initiate pyridostigmine pretreatment regimen.

(b) Actions to Prepare for Attack

1. Set "Emergency" condition (or verify condition if previously set at MOPP-2).

2. Fill canteens with potable water.

3. Man DECON stations and assure operability.

4. Man CBR detection and monitoring teams.

5. Strike below flammable and absorbent materials.

6. Limit access to weather decks.

(c) Preparing Shipboard Systems

1. Activate countermeasure washdown system intermittently.

2. Place CPS system in operation.

(4) MOPP Level 4 (IMMINENT). Actual attack or entering a CBR hazards area.

(a) Individual Protection

1. Don gas mask.

2. Secure jumper hood over head and around mask and don glove set.

(b) Actions to Counterattack. These actions include:

1. Actuate countermeasure washdown system continuously.

2. Implement water discipline.

3. Initiate monitoring and detection.

4. Prepare NBC Warning and Reporting System messages.

b. Shipboard Defense. Every ship has at its disposal several means of defending against chemical and biological attack.

(1) Maneuvering. The most important defensive measure that a ship can take when faced with chemical or biological attack is to plot a course to avoid the contaminated area or, if already involved in the contamination, to steam as quickly as possible out of the area. When an attack occurs, the position of the attack should be plotted, wind direction and speed should be noted and an area of contamination should be plotted. Based on this, the Navigator should make recommendations to move the ship out of the danger area as quickly as possible.

(2) Countermeasure Washdown System. The countermeasure washdown system, whether fixed, hose and clip or temporary make-do type, is intended to wet down all exterior deck and bulk-head areas and to provide a continual "wash" of water to carry contamination over the side. This reduces the amount of contamination that adheres to the surface and consequently the amount which must be removed by personnel after the attack. The spray also acts as a filter, removing gasses and particulate from the air. After the attack, leave the washdown system in operation until clear of the hazard area to wash away as much of the contamination as possible.

(3) Buttoning-up. Buttoning-up the ship and securing ventilation before, during and after an attack prevents most agents from entering the ship. Ships designed with Collective Protections Systems ventilation, which is filtered, will remain in operation. Once the ship is buttoned-up, it is imperative that no contamination be carried inside the ship by monitoring or decontamination teams. To prevent this, decontamination stations are established and all personnel entering the ship must be decontaminated.

c. Personnel Protection. To protect personnel from the effects of chemical agents personnel will wear the Chemical Protective Overgarment (CPO), Chemical Protective Overboots, Chemical Protective Gloves and gas mask.

(1) The Chemical Protective Overgarment (CPO). The CPO suit is a two piece (smock w/hood and trousers) garment which will protect the wearer from all known chemical agents. The CPO is stored in a sealed bag until entering a threat environment. After being removed from this bag, the suit will be good for 14 days in an uncontaminated environment. When contamination is encountered, the suit will provide protection for at least 6 hours. Water repellent clothing (foul weather gear) may be worn over the CPO to provide a water/liquid proof layer of protection during periods of rain or heavy seas. It should be noted that the CPO, although providing good skin coverage, provides no special protection against biological contamination.

(2) The Chemical Protective Glove Set. The glove set provides chemical protection to the hands for at least 6 hours. The glove set contains two pair of gloves; an inner set of white cotton and an outer pair of black butyl rubber.

(3) The Chemical Protective Overboots. The overboots provide chemical protection to the feet for at least 6 hours. The black butyl rubber overboots are worn over the normal work boot.

(4) The Gas Mask. There are two gas masks currently in use by the Navy. These are the MCU-2P and the MK V. The MK V mask is being phased out and should be out of service by CY 94. Both masks will provide the wearer protection from chemical agents. Each mask provides protection by filtering air through replaceable air filtration canisters. The filter canisters are good for 60 days after having been removed from their sealed can. The canisters should be replaced after every attack with blood agent, which breaks down the filtering compounds, and within 30 days of exposure to any other chemical agents. These masks, due to the fact that they filter out all particulate, will provide protection against inhaling biological and radiological contamination. Refer to the Chemical, Biological and Radiological Handbook for Training for more specifics on these masks.

d. Detecting Contamination

(1) MSC ships are equipped with the M256A1 Chemical Agent Detector Kit and M9A1 Detector Paper as required by this instruction.

(a) M9A1 Detector Paper. M9A1 detector paper uses an agent sensitive dye impregnated into paper. It is issued as a single 30-foot long roll in a cardboard dispenser similar to most tape dispensers. A resealable bag is provided to store the dispenser after removal from the original package. It will detect all known nerve agents (V and G) and blister agents (H and L) in the liquid state. It detects droplets as small as 100 microns in 10 seconds or less and it is non-specific, turning red for all agents. The M9A1 paper should be strategically placed at several unshielded weather deck locations prior to an attack. Ideally these locations will be visible through portholes so that the paper can be monitored without exposing personnel to contamination.

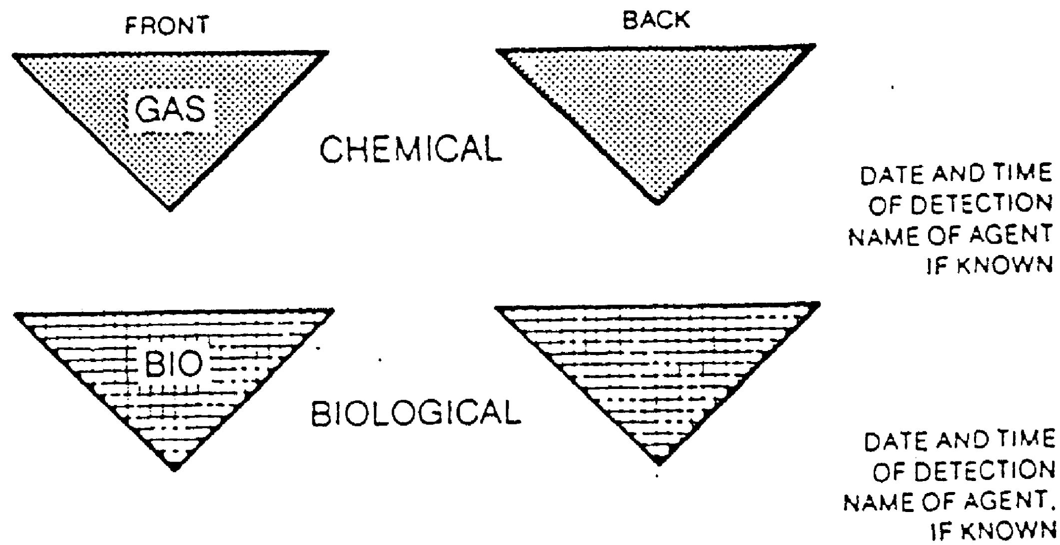
(b) The M256A1 Chemical Agent Detector Kit consists of test spots and reagents for detection of nerve, blister and blood agents, (V, G, H, GD, AC, CK and L). The sampler/detector responds with specific color changes to differentiate between class of agents and to determine when it is safe to unmask following an attack. The M256A1 kits are carried by monitoring teams.

(2) Biological Agents. Due to difficulty in detecting biological agents, these require medical personnel and laboratory equipment to detect and identify.

e. Monitoring

(1) A team of two to three men, a monitor, a recorder and messenger, if necessary, perform monitoring. They should be dressed in full CPO with gas masks, gloves and boots. Chemical surveys are performed by use of M9A1 Detector Paper and the M256A1 Chemical Agent Detector Kit. Areas with contamination are marked on a plan of the ship for later decontamination.

(2) "Hot spots," localized areas with contamination should be marked with line to keep personnel out and a sign (Figure 3-4-1) indicating intensity, time and date. When the area is decontaminated, change to a "safe" sign or remove all markers.



CONTAMINATED AREA SIGNS

FIGURE 3-4-1

3-4-4 DECONTAMINATION

a. Structural Decontamination

(1) The first step in decontamination is use of the countermeasure washdown system. The system should be operated before, during and after an attack to wash contamination over the side without exposing personnel.

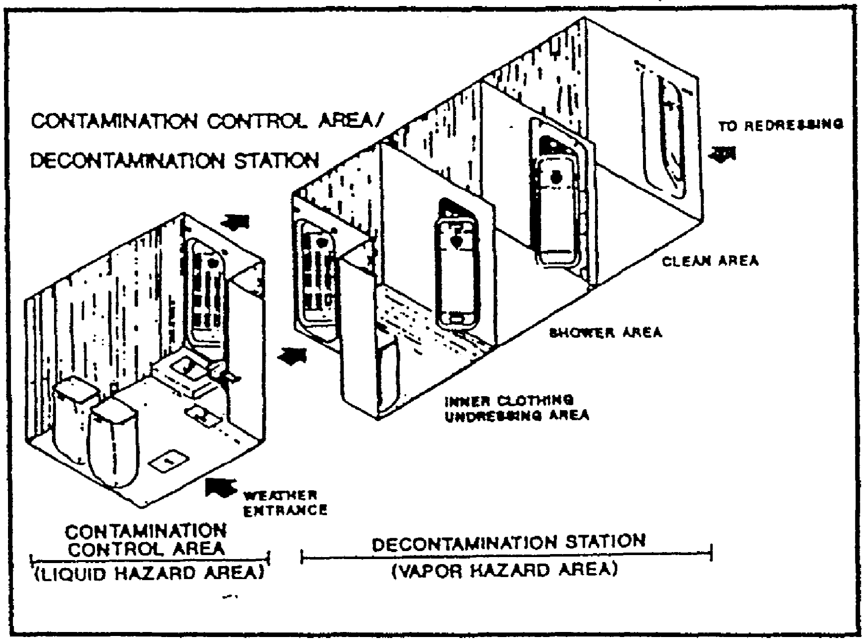
(2) Based on survey results, personnel are sent top-side in protective clothing, gas masks to hose down areas not effectively covered by the countermeasure washdown and all contaminated areas. On completion of hose down, the areas are re-surveyed to determine further decontamination required.

(3) As required after re-survey, locally decontaminate areas by scrubbing with calcium hypochlorite solution. After decontamination, re-survey to determine further efforts required.

(4) Further decontamination by ship's force can include steam cleaning, sealing with paint and isolating the area for shipyard decontamination.

b. Personnel Decontamination. Chemical and biological personnel decontamination is performed at DECON stations. At these stations, the individual will remove all protective clothing and will be decontaminated using the M291 skin decontamination kit, the M295 CBR decontamination kit, HTH and detergent solutions and showering.

(1) The Contamination Control Area (CCA)/DECON Station. Ships should be provided with CCA/DECON stations in accordance with MSC Standard Plan 804-4844759 Rev. A. If not, a DECON station should be set up similar to Figure 3-4-2. The CCA/DECON station has an outer area, the Contamination Control Area (CCA) and inner area, the actual DECON station.



CCA/DECON STATION
FIGURE 3-4-2

(a) Contamination Control Area (CCA). In order to prevent contamination from being carried inside the skin of the ship, an area needs to be set aside to conduct preliminary decontamination of personnel. This area, known as the CCA will be located in a compartment with access to the weather deck. At this location exposed personnel will be cut out of their CPO suit, boots and gloves, and the gas mask will be decontaminated. The CCA is manned by a crewmember, known as the Cutter, whose responsibility it is to assist the contaminated person in preliminary decontamination, and to cut the CPO suit gloves and boots. Because CCA is a liquid hazard area, the Cutter must be in full CPO suit, gloves and boots.

(b) DECON Station. The DECON station purpose is to complete the decontamination process. This includes removing all clothing, showering and scrubbing, monitoring and dressing in clean clothes. To carry these out, the DECON station consists of three distinct areas which should be located in adjoining compartments, when possible. These are the Inner Clothing Undressing Area, the Shower Area and the Clean Area. The DECON station is manned by a monitor, a Medical Department Representative. These individuals will assist the exposed personnel and will monitor for signs of chemical agent poisoning. Because outer contaminated clothing (CPO suit gloves and boots) are removed at the CA, the DECON station is considered a vapor hazard area, requiring only the use of the gas mask.

(2) Decontamination Procedure. Exposed personnel follow designated routes to DECON stations.

(a) Personnel to be decontaminated (doffee) discard all battle dress, equipment and webbing outside the CCA. The exposed person then performs gross decontamination of the gas mask, boots and gloves with M295 by wiping mask and gloves with DECON 1 wipe and then with DECON 2 wipe. Lenses of mask are then wiped with 1% HTH solution taking care not to allow drips.

(b) Step into bootwash containing 9% HTH solution and scrub boots. When CCA Cutter is ready, he opens door and doffee steps onto deck scrubbed with HTH in Position 1. Cutter closes door.

(c) Cutting Out

1. Cutter releases Velcro at waist of smock, wrists, and bottom of trousers. Cutter instructs doffee to "about face," then Cutter pulls smock away from doffee and cuts up back of smock to neck area, then completely through left side of hood to face opening. Cutter again instructs doffee to "about face" and cuts up trouser leg to top of boot. Cutter instructs doffee to make a fist to prevent removal of gloves. Grasping top of hood with the left hand, Cutter pulls smock away from doffee in one smooth motion, over gloves and deposits it in trash can. Cutter instructs doffee to loosen rubber gloves, Cutter then pulls off doffee's gloves leaving cotton liners on and drops them in a second trash can. Doffee then moves to Position 2 facing Cutter.

2. Cutter cuts suspenders on each side of knot, decons his own gloves and leaves scissors in HTH solution. Cutter grasps trousers firmly at hips and pulls them to doffee's knees. Holding trousers firmly, Cutter instructs doffee to sit down carefully on bench or stool. Starting with doffee's leg closest to CCA exit door, Cutter raises leg and cuts all boot laces, ensuring that uppermost lace is cut. Grasping heel of footwear cover with

one hand and the top of trouser leg with the other, Cutter pulls off trousers and boots together. Once leg is free, doffee must place the foot on Position 3. Process is repeated with the other leg.

(d) Doffee then proceeds into DECON station wearing only regular clothing, glove liners and mask. Corpsman or medically trained personnel examines doffee for signs of agent exposure (dilated pupils, nausea, difficulty breathing, etc.) or heat stress and recommends action (send healthy personnel to DECON station, or treat symptoms and send to sick bay).

(e) In the Inner Clothing Undressing Area, the doffee removes all clothing except mask and places them in a plastic bag. The doffee then enters the Shower Area.

(f) The doffee showers with water. The mask remains on until the all clear is sounded. Mask canisters must not be exposed to direct water spray to avoid clogging. The Medical Department Representative ensures clothing is sealed in bags and looks for delayed signs of personnel exposure to agent.

(g) Doffee proceeds to the Clean Area to don clean clothing and await assignment.

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 5

RADIOLOGICAL DEFENSE

3-5-1 REFERENCES

a. Nuclear Attack Instructions for MSC Operated Ships in Port, MSC Form 3541-4

b. Naval Ships Technical Manual, Chapter 070, Radiological Recovery of Ships after Nuclear Weapons Explosions

c. United States Navy Chemical, Biological, and Radiological Defense Handbook for Training, S 5080-AA-HBK-010

3-5-2 EFFECTS OF NUCLEAR ATTACK

When detonated, nuclear weapons release a large amount of energy which results in blast, heat, direct and fallout radiation and an electromagnetic pulse.

a. Blast. Blast damage is due to the shock of the explosion followed by its sudden reversal. After the shock wave traveled outward, it will reverse and air is sucked in toward ground zero. When the primary shock wave strikes the ground, it is reflected and increases (possibly by as much as three times) the force of the direct pressure. This combination of the reflected shock wave with the direct shock wave is called the "Mach" effect. In a 20 kt bomb, it creates wind velocities of about 180 mph. Ships are resistant to blast damage as a result of the design requirements to withstand load and wave stresses. Further, a ship floating on water can yield to the blast effect by rolling or heaving with less damage due to this motion. In contrast, a fixed building on land at the same distance would be severely damaged by the blast effect which may merely toss a ship around. The severity of the shock depends on the proximity of the blast, whether air, surface or underwater burst, the depth of water and bottom, as these determine the intensity of the shock and reflected shock waves. Water waves also result from the blast and shock and can reach 90-100 feet within several hundred yards of the blast.

b. Heat. Heat radiates from the fire ball for about 3 seconds at the speed of light. Therefore, the surface of exposed objects will be burned. Burns will be caused on exposed skin at distances up to 2 miles. The extreme heat will start many fires but the air blast arriving a few seconds later will blow some of them out. The blast also causes secondary fires from short circuits, damage to hot machinery, galley equipment, etc. There is also an intense light pulse which can damage the eyes of exposed personnel.

c. Radiation. Radiation from a nuclear weapons explosion can be direct from the explosion or from fallout of radioactive dust resulting from the explosion.

(1) Direct Radiation. Direct radiation is very short in duration, lasting only seconds. It is primarily neutron and gamma radiation which penetrate through all matter. The intensity decreases with the square of the distance from the explosion, so that a ship twice as far as another ship from the explosion will only receive one fourth the amount of radiation. This radiation contributes to the total dose received by personnel.

(2) Indirect Radiation. Indirect radiation from fallout is the most serious problem for ship's crewmembers since it lasts until it is cleaned up. The dust deposited on the ship continues to emit radiation for years and must be removed to allow the ship to continue to function. This radiation includes alpha particles, beta particles and gamma radiation. The effects on personnel depend on the total amount of radiation received.

(3) Radiation Effects on Personnel. The unit of measurement of radiation effects on personnel is the "radiation equivalent man" or "rem." This relates the damage of various types of radiation to a common scale. For gamma radiation, which is the most common type in fallout, the rem is equal to the roentgen (R) which is directly measured by most radiac meters. The effects of various radiation dose levels (assuming no medical care) are as follows.

(a) 0-60 R - No symptomatic effects.

(b) 300-600 R - Deaths occur.

(c) 1000-3000 R - Instant incapacitation.

d. Electromagnetic Pulse (EMP). The EMP results from nuclear weapons explosions high in the atmosphere that cause an intense electrical pulse that damages or destroys electronic equipment. Radio, radar and computer equipment are among those most heavily affected although most electronic gear containing integrated circuits or transistors is susceptible. Preventing EMP damage requires design to shield against transient voltage spikes. Some approaches to hardening against EMP are utilizing metal shields, ensuring proper grounding, installing surge protectors. EMP is not known to directly affect personnel.

3-5-3 NUCLEAR WEAPON CHARACTERISTICS

a. Types of Nuclear Weapons. There are two basic types of nuclear weapons, fission and fusion. Fission weapons use uranium or plutonium which develop a fission chain reaction when a certain minimum amount, the "critical mass" is reached. Fission is the splitting of heavy atoms into smaller fragments initiated by the impact of a neutron. Simpler uranium weapons use a gun type mechanism to slam two masses of less than critical mass together to achieve the critical mass for detonation while remaining safe prior to detonation. Plutonium weapons use a sub-critical mass which is compressed by conventional explosives to achieve a density that causes the nuclear chain reaction to start. Fusion weapons use hydrogen isotopes that fuse into larger atoms under extreme temperatures (over 100 million ^{O}F) and pressures. The only way to achieve the temperatures and pressures to start the fusion reaction is to use a fission weapon as a trigger. The atoms created by fission and fusion do not have the correct balance of neutrons and protons in their nucleus and achieve stability by radioactive decay which emits radiation. Depending on the new atom formed, this decay takes seconds or years.

b. Types of Nuclear Explosions. There are four types of nuclear explosions, underwater, air, surface and high-altitude.

(1) Underwater burst. Characteristics of underwater bursts vary widely based on the size of the weapon, the depth at which it was detonated, the depth of the water and other geologic features.

(a) All explosions will cause a fireball which will vaporize the surrounding water, creating a rapidly expanding bubble which will rise to the surface. When this "bubble" reaches the surface, it will release gasses and water spray, which will rise in a column or plume reaching significant height.

(b) When this plume falls back to earth, it forms the "base surge," a cloud of radioactive mist, moving at approximately a mile a minute. The base surge is highly radioactive. Vapor passing over the ship leaves a transit radiation dose, while droplets of water leave contamination which will emit beta and gamma radiation.

(c) Large waves will be generated by the blast.

(d) The shock wave in water is much more powerful and travels outward more rapidly than in the air. However, pressure falls off rapidly with distance. It will cause:

1. Severe damage to ship's hull at distances up to 800 yards.

2. Moderate damage to hulls at distances up to 1000 yards.

3. Light damage to hulls at distances up to 1500 yards.

4. Damage to machinery, which is most susceptible to underwater shock.

(2) Air burst. An air burst is defined as one in which the weapon is exploded in the air at an altitude less than 100,000 feet, but at such a height that the fireball does not touch the surface of the earth. Characteristics which are associated with an air burst are:

(a) Intense heat from the fireball and thermal pulses.

(b) Large radioactive cloud with significant quantities of radioactive fallout.

(c) A blast wave.

(d) An electromagnetic pulse.

At Hiroshima and Nagasaki, blast and heat caused 85% of the casualties, while radiation caused only 15% of the casualties. The radiation casualties can be reduced with better medical care.

(3) Surface burst. The surface burst has all of the characteristics listed above for the air burst, however, there are some significant differences.

(a) The winds created by the fireball will move large quantities of dirt, dust and debris.

(b) The surface burst radioactive cloud is heavily loaded with contaminated debris, which can include water, which will later be deposited as fallout.

(c) A crater is formed when the fireball touches the earth's surface. For explosions over water this will result in characteristics similar to those describe for underwater bursts.

(4) High Altitude Bursts. High altitude bursts, although producing almost no structural damage or fallout, can cause significant damage through its electromagnetic pulse. The intense fireball created by these bursts can cause significant retinal damage to crewmembers who look in the direction of the burst.

c. Types of Nuclear Radiation

(1) Gamma Rays. Gamma rays are long range high energy rays similar to X-rays (not solid particles). They are very penetrating and lethal and therefore present an external hazard. An unshielded person 4,000 feet from ground zero would receive a lethal dose from a Hiroshima size bomb burst. Of course, the nuclear weapon yield and type of burst will affect the radiation dosage. Gamma rays pass completely through the human body, leaving a path of injured or destroyed body cells behind them. The following shielding cuts penetrating gamma rays in half.

Steel	1 1/2 inches
Concrete	4 1/2 inches
Earth	7 1/2 inches
Water	10 1/2 inches

(2) Beta Particles. Beta particles are very light medium range charged particles. They present internal hazard if taken into the system through contact with the skin or if inhaled or swallowed. Most of these are stopped by 1/8" thickness of metal.

(3) Alpha Particles. Alpha particles are heavy short range charged particles. They present an internal hazard only if inhaled, swallowed or introduced through cuts in the skin. However, they are stopped by clothing and dead outer layers of skin.

3-5-4 RADIOLOGICAL DEFENSE

Actions to be taken when nuclear attack is likely, imminent or has occurred are described in the CBR-D Bill, Part 2, Chapter 5. These actions are based primarily on the Mission Oriented Protective Posture (MOPP) set by the Master.

a. Mission Oriented Protective Posture (MOPP). MOPP is a management system which coordinates individual tasks, collective activities and shipboard equipment and countermeasures to effectively defend against chemical, biological or radiological warfare. There are four levels of MOPP, each corresponding to a more serious threat. The MOPP levels are described in Chapter 4, Chemical and Biological Defense. It is the Master's responsibility to implement MOPP levels and to raise the MOPP level as the radiological threat become more immediate or serious.

b. Countering Attack. The countermeasure washdown system, whether fixed or hose and clip type, is intended to wet down all exterior deck and bulkhead areas. This reduces the amount of contamination that adheres to the surface and consequently the amount which must be removed by personnel after the attack. Buttoning up the ship and securing ventilation during and after an attack prevents radiated material from entering the ship. After the attack, leave the washdown system in operation until clear of the hazard area to wash away as much of the contamination as possible. Personnel can then go topside as necessary to monitor for radiation.

c. Personnel Protection. Wearing protective clothing, including gas masks, reduces the skin-dose and internal contamination hazards to personnel. Clothing should cover as much of the body as possible and have a minimum number of openings. Water repellent clothing (foul weather gear), rubber boots, rubber gloves and gas masks will be worn by personnel assigned to the monitoring and decontamination teams and any other personnel going topside during clean-up operations. It should be noted that the Chemical Protective Overgarment (CPO), although providing good skin coverage, provides no special protection in a radiological environment.

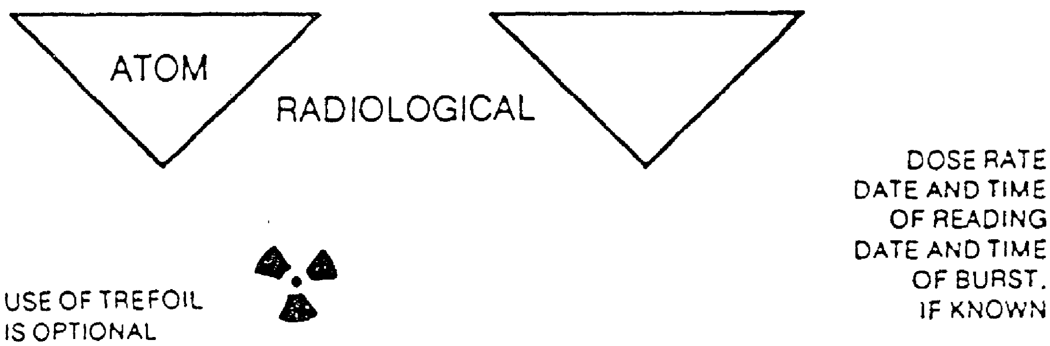
d. Monitoring

(1) A team of two to three men, a monitor, a recorder and messenger if necessary, perform monitoring. They should be dressed in rain gear with gas masks, gloves and boots. They will be provided with DT-60/PD and IM-143/PD dosimeters to record their personal exposure. The senior monitor carries a survey radiac. The recorder plots intensity and type of radiation contamination. He also logs readings of the pocket dosimeters at the start and on completion of the monitoring survey. The messenger marks off "hot spots" with chalk or markers showing details of intensity and time. The team will survey for the allowed "stay time" or until the maximum permissible exposure is reached, or the survey is complete, whichever is less. If the first team is unable to complete the survey, a second team will finish.

(2) A rough or rapid radiation survey is made in operational and weatherdeck areas as soon after the attack as safety and the situation dictate. This survey is always done with a high range radiac with the probe at waist level. The survey should be as rapid as possible and may be made by only one person.

(3) A detailed radiation survey is made for gamma with the probe waist high, with a high or low range meter depending on actual levels. This is followed by a near contact level survey to determine gamma and beta levels in detail. Intensity levels are marked on a plan of the ship to determine priorities for decontamination efforts.

(4) "Hot spots," which are localized areas with a radiation level 10 times the general area level, should be marked with line to keep personnel out and a sign (Figure 3-5-1) indicating intensity, time and date. When the area is decontaminated, change to a "safe" sign or remove all markers.



CONTAMINATED AREA MARKER

FIGURE 3-5-1

e. Structural Decontamination

(1) The first step in decontamination is use of the countermeasure washdown system. The system should be operated before, during and after an attack to wash contamination over the side before it can adhere to the paint, metal and porous material.

(2) Based on survey results, personnel are sent topside in protective clothing, gas masks and dosimeters to hose down areas not effectively covered by the washdown countermeasure and all "hot spots." On completion of hose down, the areas are re-surveyed to determine further decontamination required.

(3) As required after re-survey, locally decontaminate areas by scrubbing with calcium hypochlorite solution. After decontamination, re-survey to determine further efforts required.

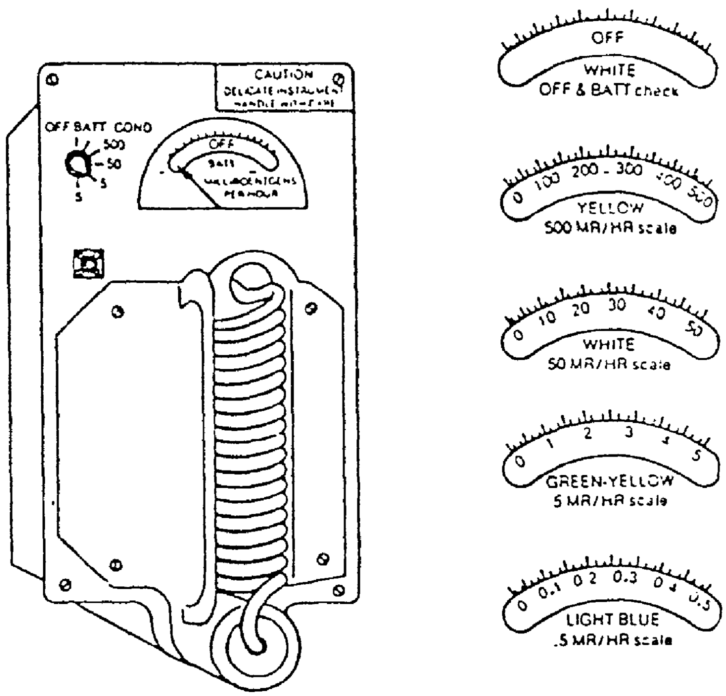
(4) Further decontamination by ship's force can include steam cleaning, sealing with paint and isolating the area for shipyard decontamination.

f. Personnel Decontamination. The person to be decontaminated is monitored over his whole body using the AN/PDR-27 with the beta shield open. The probe is moved slowly over the body, with particular emphasis on the face, hands, feet and other areas that may have come into contact with contaminated surfaces. Clothing found to have contamination is removed using procedures similar to the chemical decon procedure described in Part 3, Chapter 4. Contaminated skin areas are washed with soap and water, scrubbing only the contaminated area and avoiding drips onto non-contaminated skin. For large areas of contamination, the person should take a hot shower, scrubbing with soap and water. The person is again monitored and scrubbing repeated as necessary.

3-5-5 RADIAC INSTRUMENTS

Radiac is a term given to all radiological detection instruments. It stands for Radiological Activity Detection, Identification and Computation. Nuclear radiation cannot be seen or felt. Nor can it be detected by any of the five natural senses. Special instruments are required for its detection and for determination of the dosage rate. Radiation given off by radioactive elements consist of 3 basic types - alpha particles, beta particles and gamma rays. In monitoring for nuclear radiation, it is necessary to determine its presence, location, intensity and the dose rate to which exposed personnel have been or will be subjected.

a. AN/PDR 27 Low Range Beta/Gamma Survey Meter. The AN/PDR 27 series radiac set is a portable, watertight survey instrument consisting of a low range Geiger Mueller tube located in a probe, a higher range Geiger Mueller tube mounted next to the low range probe, an electronic amplifier, a battery power supply, a meter and earphones. This instrument is used for low intensity surveys and all personnel monitoring. It is capable of detecting and measuring beta and gamma radiation together, or gamma radiation alone. The radiac meter is equipped with carrying handle and it may also be carried by its shoulder harness. The detector unit is contained in a probe which is attached to the meter by means of a flexible cable. The probe is normally carried in a bracket on the outside of the meter from which it can easily be removed. Beta radiation can be detected on the two lower ranges only when the beta shield on the large probe is moved aside. When the Geiger Mueller tubes are exposed to gamma and beta radiation, they produce short voltage pulses at an average rate which depends upon the radiation intensity in the vicinity of the tubes. The meter gives a visual indication of the intensity of the radiation; earphones produce a click for each pulse received to give an audible indication. Only the larger Geiger Mueller tube in the probe is used for the two most sensitive ranges, 0 to 0.5 mR/hr and 0 to 5 mR/hr. The smaller Geiger Mueller tube is used for the two least sensitive ranges, 0 to 50 mR/hr and 0 to 500 mR/hr. This set has a six position, rotary sector switch mechanically geared to the meter dial. Ranges scales are color coded. Only gamma radiation field strengths can be measured on the two less sensitive ranges (0 to 50 mR/hr and 0 to 500 mR/hr). The meter can be illuminated by pushing the meter illumination switch in the carrying handle. The following is a general description and operating instructions for the AN/PDR 27 (see Figure 3-5-2):



AN/PDR-27

FIGURE 3-5-2

(1) Procedures for placing instrument into operation:

(a) Turn switch to BATT COND position. The indicator should point to right of line marked BATT on meter dial. This line is the point below which operating voltage is insufficient.

(b) Check operation of the unit.

1. Place range switch on 0.5 mR/hr scale and, with beta probe off, listen for random clicks in the earphones.

2. With the range switch in the 0.5 mR/hr position and the beta probe off, the meter should advance slightly up scale.

3. Place range scale on 5 mR/hr scale and with beta probe cover off, listen for random clicks in the earphones. The clicks should be less frequent than when the previous scale.

4. With the range scale on 5 mR/hr scale and the beta probe cover off, the meter should advance just very slightly up scale.

(c) Prior to use for monitoring:

1. Put on 500 mR/hr scale and allow to warm up for 5 minutes.

2. Put on harness.

3. Connect the headset to its jack.

4. Check BATT condition.

5. Start survey readings on highest scale and work down. Stop at range scale where meter gives indication of radiation.

6. For GAMMA survey, carry instrument at waist level. Maintain meter or its probe at same distance from surface. Turn instrument so tube in use is facing source or highest indication.

7. For BETA indication:

a. Use probe with meter on 5 or 0.5 mR/hr range.

b. Leave BETA shield in place for initial reading.

c. Remove shield, take reading. If reading is higher with shield off than on then beta is present.

8. To illuminate for use at night or in the dark, push meter illumination switch on the carrying handle.

9. To secure instrument:

a. Be sure instrument switch if OFF.

b. Replace instrument in case and secure the fastenings.

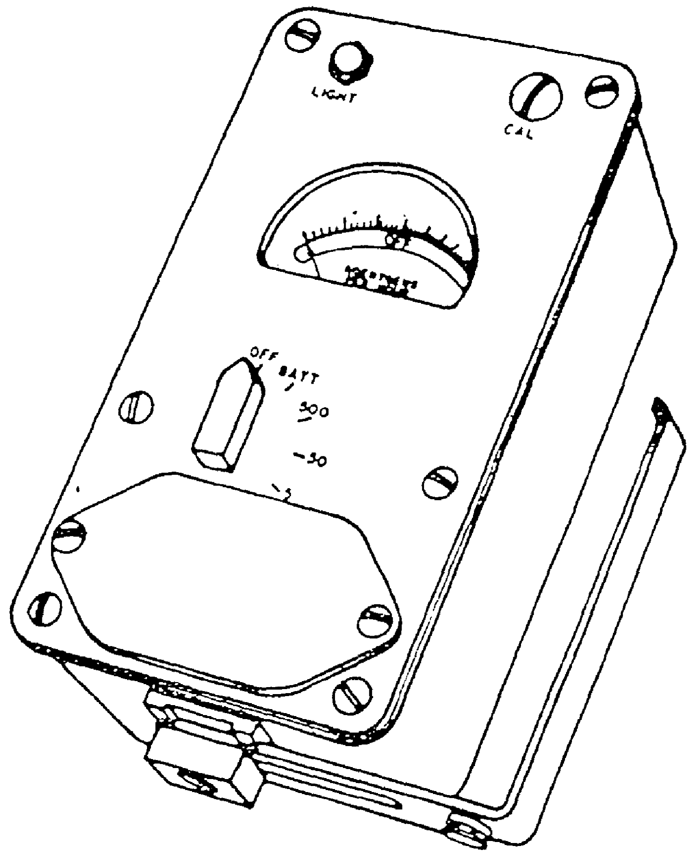
(2) This instrument should be turned in to a Radiac Repair Facility for maintenance and calibration after 6 months' use aboard ship in accordance with the MSC Area Commander's instructions.

b. <u>AN/PDR-43 High Range Gamma Survey Meter</u>. The AN/PDR 43 series radiac set (Figure 3-5-3) is a portable survey instrument using a Geiger Mueller detector, but employs a statistical sampling procedure to overcome the saturation problem associated with the Geiger Mueller detector. The beta gamma (or gamma only) radiation detection capability is available by means of a beta sampling port in the bottom of the instrument. In the earlier models, this port is controlled by manually rotating a round selector disc on the bottom of the instrument to beta, gamma or check as desired. In later models, the round selector disc has been replaced by a spring loaded control in the upper left corner on the face of the instrument. This control is normally in the gamma position and is manually rotated to either the beta or check positions. While in the beta position, this instrument detects both beta and gamma, giving a composite reading. In the gamma position, gamma radiation only is detected and measured. In the check position, an 80 microcurie source of Krypton 85 is placed next to the Geiger Mueller detector as a check to determine if the instrument is operating properly. It is not considered accurate for measurement of beta but gives an approximation of the amount of beta present. The AN/PDR 43 measures radiation over three ranges: 0 to 5 R/hr., 0 to 50 R/hr and 0 to 500 R/hr. The power source is two 1 1/2 volt, D cell batteries. In addition to regular operational checks, the batteries should be checked visually every 60 days. The AN/PDR 43 has three operational controls; the function selector control, the range switch and a small button switch for dial illumination. A fourth control under the screw cap marked CAL is for the use of qualified maintenance personnel only. To operate the set:

(1) Turn the range switch to the BATT position. The needle should move to the right of the line on the dial, indicating that the batteries are in good condition.

(2) Turn the range switch to the 50 and 5 R/hr ranges and move the function selector to CHECK position on each range. The dial reading in the CHECK position should usually be about one to 1 1/2 R/hr. This indicates the instrument is operating properly. It is now ready for survey. Note: The carrying handle can be raised or lowered by loosening the large nut which secures it to the instrument. When the handle is down, the range switch must be in the OFF position.

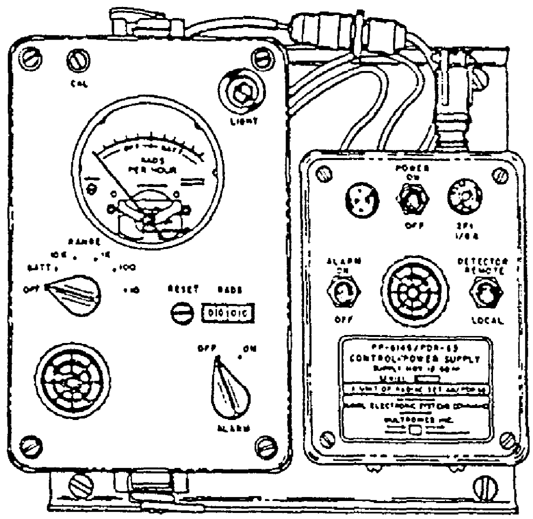
(3) This instrument should be turned in to a Radiac Repair Facility for maintenance and calibration after 6 months' use aboard ship in accordance with MSC Area Commander's instructions.



AN/PDR-43

FIGURE 3-5-3

c. AN/PDR-65 Gamma Rate Meter. The AN/PDR-65 (Figure 3-5-4) detects gamma radiation on a remote detector and computes a dose rate and accumulated dose. It will detect up to 10,000 r/hr using an ionization chamber. Accumulated dose appears on a digital readout. An audible alarm emits a warning tone for each 0.5 mR accumulated doserate less than 10 R/hr. Rates above 10 R/hr result in a steady tone. The radiacmeter is normally fixed mounted and continuously operated. Multiple detectors may be used. Power is 115 VAC with four C cells for backup operation.



AN/PDR-65

FIGURE 3-5-4

d. DT 60/PD Personnel Dosimeter. The DT-60/PD is a small bakelite case slightly larger than an identification tag, containing a specially prepared phosphor glass crystal. Exposure of the glass to gamma radiation produces changes in its internal structure so that when the glass is examined by certain special wave lengths of ultraviolet light, it will glow. The luminescence can be picked up with a photo multiplier tube, and through an amplifier, can be made to indicate the radiation exposure of the glass on a meter calibrated in roentgens. The special light source, photomultiplier tube, meter, etc., required for reading the glass are contained in the CP-95/PD Casualty Dosimeter Reader. The DT 60/PD is a cumulative device indicating up to 600 R. Unissued DT-60/PDs may have very high readings without deliberate exposure to radiation. The two main causes for this are the age of the instrument and handling of its glass surface before issue. Since the DT 60/PD dosimeter is assigned to the individual when issued, it should provide an accurate record of the individual's radiation exposure. To achieve this objective, use the following procedure.

(1) Secure a tag to each unissued detector.

(2) Unissued dosimeters shall be read annually by means of the Casualty Dosimeter Reader CP 95/PD at a room temperature of 77 degrees plus or minus 5 degrees F for maximum accuracy. If the reading is over 75 R, wash the glass with plain water. This may reduce the reading to an acceptable level. Enter the final reading

on the "reference point" line of the tag. DT 60/PDs with readings over 75 R shall be set aside as unfit for issue, and those reading less than 75 R shall be retained for use.

e. CP 95/PD Casualty Dosimeter Reader. This is a portable instrument designed for computing and indicating the total amount of X-ray and/or gamma radiation to which a dosimeter DT 60/PD (and thus the wearer) has been exposed. The reader is operated from a 120 Volt, 60 cycle AC power source. Its function is to read the exposure registered by the DT 60/PD dosimeter. The DT 60/PD is a cumulative recording device and readings indicate "total cumulative exposure." To measure the total accumulated exposure dosage of a DT 60/PD dosimeter, place the dosimeter in the computer indicator. It is exposed to a source of ultra violet light which causes the silver coated phosphor glass to fluoresce, emitting an orange luminescence. A standard crystal that has been exposed to a specified amount of radiation is contained in the skillet of the reader. The reader is calibrated to this standard and it compares the DT 60/PD being read with its standard to compute the reading. The luminescence emitted by the DT 60/PD being read is measured by a photomultiplier tube, fitted with a filter to eliminate passage of blue and green light. The photomultiplier tube employs the principle of secondary emission to amplify the initial electron emission caused by the filtered orange luminescence illumination of the light sensitive cathode. The output of the photomultiplier tube is applied to an indicating circuit to show the accumulated total amount of radiation on a dial.

f. IM 143/PD Self Indicating Dosimeter. This is a high reading dosimeter shaped like a fountain pen and used for brief periods of exposure. Before wearing, the indicator should be set on zero with a PP-4276 Dosimeter Charger. The IM-143/PD has a self-contained direct reading scale and measures total gamma dosage up to 600r. Accuracy is a major deficiency of pocket dosimeters if used for several days without recharging. If charged up to zero and allowed to stand for 24 hours, they should not leak off more than 10% of their total range. If a unit falls below tolerance, send it to the nearest Radiac Repair Facility for testing and survey.

(1) Record the progress of the radiological event.

(2) Permit analysis of the radiological event.

(3) Permit predictions on the future course of the radiological event.

b. Definitions

(1) Time of Arrival (Ta): The H+ time at which fallout is experienced; or the first significant intensity reading above background radiation.

(2) H Time: The time in hours or minutes (must be specified), before or after the nuclear explosion (H Hour). H+ would signify time after the explosion. H- would signify time before the explosion.

(3) Time of Peak Intensity (Tp): The H+ time at which the fallout radiation from fallout cloud and deposited fallout is the greatest or at its peak.

(4) Time of Cessation (Tc): The H+ time at which the fallout ceases to fall on the ship.

(5) Initial Period: Period prior to Ta representing the initial radiation from the burst. If a base surge is present, this period may last for 15 to 30 minutes. It generally cannot be recorded or plotted due to the rapid release and decay of the initial radiation. The ship must usually be very close the burst center, within perhaps 5 miles or less, for it to receive any initial radiation.

(6) Build-up Period: The period of time between Ta and Tp in which fallout is accumulating on the ship.

(7) Transit Period: The period of time between Tp and Tc in which fallout is decreasing but has not stopped.

(8) Decay Period: The period after Tc in which intensities gradually decrease due to the natural decay of the contamination of the ship.

(9) Decay Rate (n): The rate at which the radiation intensity decreases after Tc. Fallout Decay and Total Dose Nomograms are based on a set decay rate (n) and cannot be used without first determining "n." If the decay rate cannot be determined, a standard rate of 1.2 should be utilized.

(10) Dose Rate: The amount of radiation received at a specific location during a given period of time, usually 1 hour. Radiacs read dose rate and the radiac scale is expressed as either milli-roentgens per hour or roentgens per hour. Dose rates will vary widely throughout the ship based upon location and quantity of shielding materials.

(11) Dose: The total amount of radiation received. Dose must not be confused with dose rate. A man may be exposed to a dose rate of 5 r/hr. At the end of 10 hours, he has received a dose of 50r.

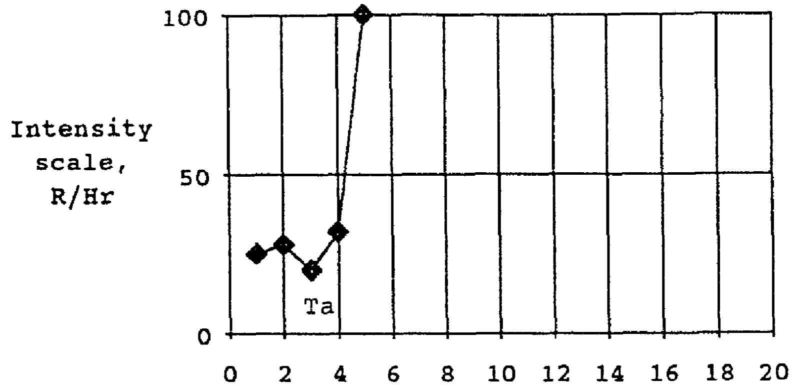
(12) Maximum Permissible Exposure (MPE): The maximum total dose that any man may receive during a nuclear event. The MPE is a flexible figure set by the Master and is usually set with a safety factor in mind. The Master may set an MPE of 10Or knowing that a crewmember may receive a dose of 150r before there is a chance of radiation sickness.

The additional 50r lee-way allows the Master to increase MPE to 15Or later if ship's operations require. If an MPE is set by the at 10Or, then this means that from the beginning of the first indication of radiation until the end of the radiation danger no man involved may receive more than 100 roentgens of radiation exposure. To determine if a crewmember has received this amount, the crewmember's exposure in various locations during the nuclear event must be added up to find the total dose received.

c. Analyzing the build up period

(1) For the purpose of this illustration, the following readings taken from a high range radiac recording outside intensities are utilized:

Intensity, r/Hr	H+ Time, minute
25	H+3/4
28	H+1
20	H+2
32	H+3
100	H+4



(2) Referring to the definition of Ta and to the above graph, it can be observed that Ta occurred at H+2. In this example is that there was a certain amount of initial radiation as demonstrated by the readings at H+3/4 and H+1. At H+2, the lowest reading occurred after this initial period and this is the Ta point after which the rise in intensity readings indicates that residual radioactive contamination began to fall on the ship.

(3) The first item of information which must be predicted is what time will Tp occur and what will be the maximum intensity associated with Tp. The rules of thumb to use for making this determination are:

(a) For close in detonations: Tp = 4Ta

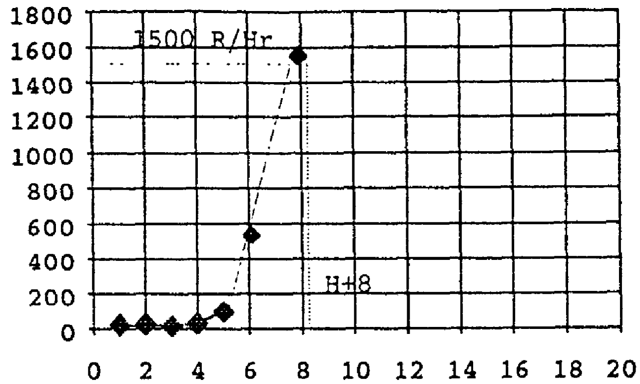
(b) For distant detonations: Tp = 2Ta

(4) For purposes of discussion, we will say that observation of blast shows it to be close in, and our predicted time of Tp is:

Tp = 4Ta = 4(H+2) = H+8 minutes.

To estimate the Ip (peak intensity) associated with our predicted Tp, connect the two most recent intensity readings in the build-up period with a straight line. Extend this straight line until it intersects the predicted Tp. The predicted Ip is then read on the vertical scale at this point of intersection. In our example, therefore, the predicted Ip is 1500 R/hr.

Intensity scale, R/Hr



Time scale, minutes

(5) Revised predictions within the build-up period can be made once additional data becomes available.

(6) The build-up dose can now be calculated from the information recorded. To find build up dose use the following formula:

$$\text{Build-Up Dose} \quad \frac{(I_a + I_p)*(T_p - T_a)}{2}$$

Time in the formula is in hours. If time is given in minutes as in the above example then the difference in time in hours must be divided by 60 as follows:

$$\frac{(T_p \quad T_p)}{60}$$

Using the formula in our example, the build-up dose is calculated to be:

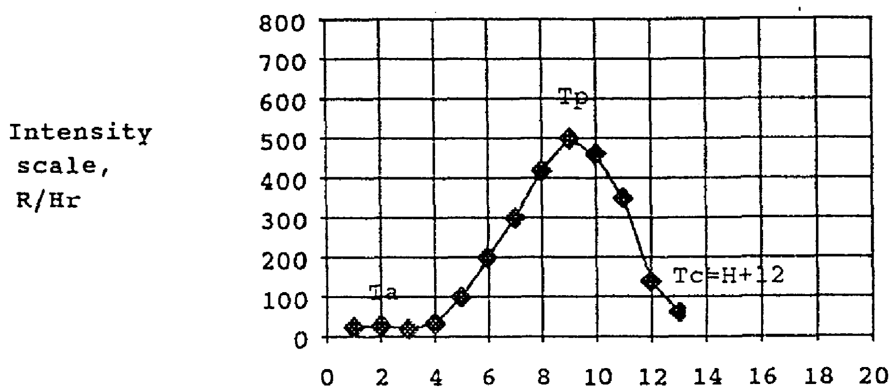
$$\text{Build-Up Dose} = \frac{(20 + 500)}{2} * \frac{(8 - 2)}{60} = 26.0 \text{ R}$$

d. The Transit Period. Recorded data continues as follows:

Intensity, R/hr	H+ Time, minute
350	H+10
140	H+11
60	H+12
54	H+13

(1) Analyzing the transit period. As to the transit period, the results of the nuclear testing which established this log-plot technique indicated that no correlation exists between either Ta or Tp and Tc. This means that NO predictions can be made within the transit period as to time of Tc.

(2) Tc, or time of cessation of fallout, can be determined from inspection of the plot line. Tc is the point in the plot line which indicates a break in continuity between the curve line and the line following Tc which is a straight line of decay.



Time scale, minutes

(3) Once Tc, is determined, the actual transit dose can be calculated utilizing the following formula:

$$\text{Dose Transit Period} = \frac{(I_p + I_c)}{2} * (Tc - Tp)$$

In this formula, time must be in hours. If time is given in minutes, as in the example, then the time difference in the formula must be divided by 60 as follows:

$$\frac{(T_c - T_p)}{60}$$

In our example, T occurs at H+ 12 minutes and the transit dose for outside becomes:

$$\text{Dose Transit Period} = \frac{(500 + 60)}{2} * \frac{(12 - 8)}{60} = 18.7 \text{ R}$$

e. Analyzing the Decay Period. Nuclear weapons testing has indicated that not only did the intensities during this period plot as a straight line, but also that this straight line exhibited a relatively constant slope (decay rate). A slope merely describes the direction a line is taking and is equal to the vertical side of the triangle made by the line divided by the horizontal side. To determine this decay rate, a series of dose rate readings from several locations are required. When these dose rates are plotted on log-log paper, they will yield the decay rate (n). Dose rates will vary from 0.2 to 2.0. The average value of most patterns will be 1.2, which is referred to as the standard decay. The figure "n" forms the most important constant when utilizing the fallout nomograms. As additional data is obtained from radiac measurements, this data should be plotted on the log-log graph paper in order to keep the graph current. These calculations will only be valid if the readings are taken after fallout has ceased falling on the ship.

f. Using the Intensity and Dose Nomograms

(1) The intensity and dose nomogram provide the CBR Officer with a rapid and reasonably accurate method of predicting future intensities during the decay period.

(2) The intensity and dose nomograms may be used only during the decay period of the radiological event from time Tc on.

(3) The Fallout Decay Nomogram (Figure 3-5-5) can be used in several ways.

(a) Enter with time and intensity at that time to find standard intensity. This will be the typical usual of this nomogram since the CBR Officer must first find standard intensity before he can enter the dose nomogram.

(b) Enter with standard intensity and time to find the intensity at any later time.

(c) Enter with standard intensity and intensity to find the time at which that intensity occurred.

(4) The Total Dose Nomogram (Figure 3-5-6) is normally used in conjunction with the Fallout Decay nomogram to find stay time, accumulated dose for a given period of time or entry time.

g. Final Considerations

(1) The objective of all of these calculations is to be able to predict the maximum accumulated dose for crew personnel. Since the dose for each phase of the radiological event has been calculated in the previous example, it is now possible to find the maximum accumulated dose from the beginning of the event until a given time which, for example, is H+60. Maximum Accumulated Dose = Build-Up Dose + Transitional Dose + Decay Dose. For the example above, the Maximum Accumulated Dose is:

Maximum Accumulated Dose = 26 R + 18.7 R + 16 R = 60.7 R

This figure assumes that a crewmember was standing in the area where the readings were being taken. Because the location and tasks of each crewmember will vary, the Maximum Accumulated Dose will not accurately reflect the radiation received by every crewmember. The following rules must be followed in radiological calculations:

(a) Convert readings initially to outside readings if they were not already taken at that location. This means that if the radiac was actually located in the Wheel House, then the readings taken on that radiac should be converted to outside readings before being plotted.

(b) Determine accumulated doses for personnel below decks by applying transmission factors (also known as Residual Numbers) to the readings or calculated doses.

(2) To obtain the transmission factor for any location on the ship, take the inside reading and divide it by the outside reading which was taken at the same time.

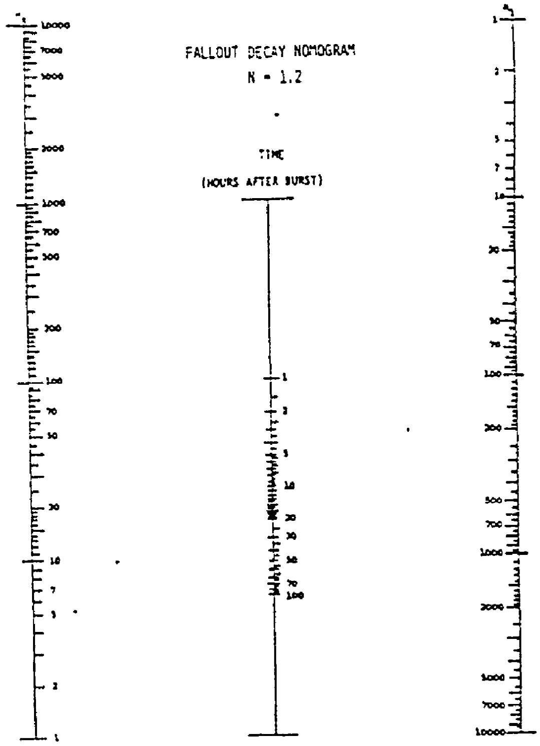
$$T.F. = \frac{I_c}{I_o} \quad \text{or} \quad T.F. = \frac{\text{Dose } i}{\text{Dose } o}$$

(a) For example, at a given time the outside reading was 150 R and the reading taken in the Crew's Mess was 75 R. The transmission factor in this example is:

$$T.F. = \frac{75}{150} = .5$$

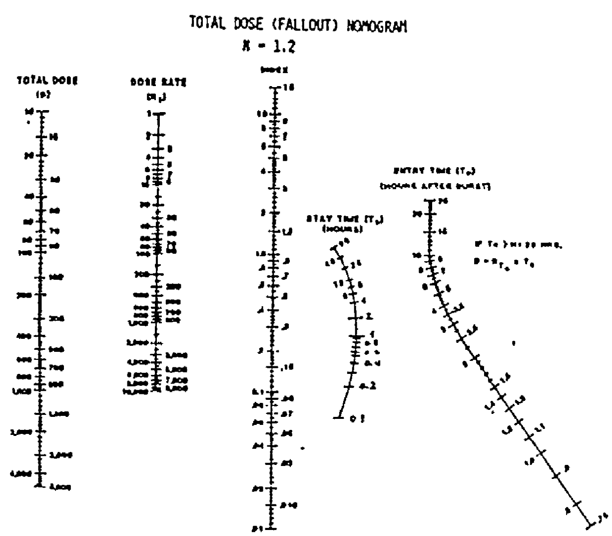
(b) If the transmission factor in deep shelter for a particular ship is .2 and the maximum accumulated dose outside to a given time is 220 R, the accumulated dose personnel in deep shelter received is 44 R.

$$.2 = \frac{\text{Dose } i}{220} \text{ so Dose } i = 44R$$



FALLOUT DECAY NOMOGRAM

FIGURE 3-5-5



DOSE NOMOGRAM

FIGURE 3-5-6

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 6

INTERIOR COMMUNICATIONS

3-6-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 430, Interior Communications

b. Naval Ships Technical Manual, Chapter 079 Vol. 2, Practical Damage Control

c. NAVPERS 14005, Telephone Talkers Manual

3-6-2 INTRODUCTION

Interior communication systems are installed for communicating information between various locations within a ship. These systems are necessary for:

a. The safety of ship, passengers, crew and cargo.

b. Exchange of orders and reports between control stations and action stations.

c. Drills and emergencies.

d. Timely of automatic warning of dangerous conditions.

3-6-3 INTERIOR COMMUNICATIONS SYSTEMS

a. Types of Systems. Interior communication systems are electrical, mechanical, electronic and other devices for communicating information or orders between locations within the ship rather than between ships, or ship to shore. Interior communications systems and equipment vary with the size, type and mission of the ship. The more common systems are:

(1) Ship's service dial telephone system

(2) Installed sound-powered telephone system

(3) Emergency sound-powered telephone system

(4) Engine Order Telegraph system

(5) General announcing system

(6) Ship's intercommunicating system (talk-back)

(7) Engineroom - Bridge intercommunicating system

(8) General alarm and ship's whistle

(9) Speaking tubes

(10) Hand-held radios (walkie-talkies)

b. Descriptions of Systems

(1) Ship's Service Dial Telephone System. This system includes of an automatic telephone switchboard located in the Interior Communication (IC) Room and the necessary number of dial telephones located throughout the ship. Each phone is assigned a number and dialing this number from any other station makes the connection automatically and rings the dialed station. A directory of station numbers should be posted at each station.

(2) Installed Sound-Powered Telephone System. These are permanently installed wire phone circuits with handset phone stations, either desk type or bulkhead mounted. The sound-powered phone system typically connects vital stations throughout the ship. Specific circuits will connect stations which require communications capability for various ship evolutions. Each station is fitted with a selector switch and a ringer crank. Plates or lists of the location and calling number of each phone station in the circuit must be installed at each station. These directory plates or lists must be posted for ready reference and must be protected from wear and kept clean and legible. To use:

(a) Lift the handset from its hook or cradle.

(b) Set the selector switch on the desired station.

(c) Turn the magneto ringer crank. The bell will ring at the selected station only while ringer crank is being turned.

(d) Lifting the receiver at the station called completes the connection.

(e) All stations listening in are connected and can join the conversation. To talk, you must press the button on the handset and hold it down while talking. To listen, the button must be released. To allow hands free communication and constant monitoring of communication on a circuit, sound-powered phone headsets are provide. These headsets consist of two identical ear pieces and a mouth piece. The headset operates like the handset except that the ear pieces allow for constant listening.

(3) Emergency Sound-Powered Telephone System. The emergency sound-powered phone system consists of:

(a) An installed wire phone circuit with jack boxes at selected locations and a number of portable phone headsets which can be plugged in at any jack box in the circuit. All stations plugged in are connected together and can talk to all others in the circuit, two-way. Only one person should talk at a time or messages will be garbled.

(b) Where permanently installed sound-powered telephone systems are not installed or have been damaged, repair parties have a portable sound-powered outfit (salt and pepper lines). These lines can be strung from the scene of a casualty to a repair locker or DC Central to allow immediate communication from the On-Scene Leader to the Repair Locker Leader or DC Officer. When installed, sound-power systems are damaged, the salt and pepper lines can serve as jumpers around a damaged area. The wire is a two-strand cable with jack plugs at either end. No electric power is needed for either the installed or the emergency sound-powered systems.

(4) Engine Order Telegraph System. This system includes pedestals with control dials and indicators at all conning stations (Bridge, flying bridge, after steering station) and in the Engineroom. It is used to send engine speed and direction (ahead-astern) orders from the conning station to the Engineroom control station and for acknowledgment. The engine order telegraph also provides a way for the Engineering Watch Officer to quickly notify the Bridge of the speed that can be maintained when there is an engineering casualty. In this event, the engine telegraph signal must be followed immediately by detailed information sent by telephone or by messenger.

(5) General Announcing/Public Address System. This system includes of a central microphone station on the Bridge and loudspeakers in selected locations throughout the ship. There may be additional microphone stations in other locations from which announcements can be made (such as OIC MILDEPT office or gangway). At the broadcasting microphone station, there are a number of selector switches where by specific areas of the ship may be cut in or out.

(6) Ship's Intercommunicating System (Talk-back). This system consists of a control microphone station on the Bridge and loudspeakers located strategically about the open decks. The control station has a set of selector switches for connecting any one or more of the speakers and a (press-to talk) switch. Each loudspeaker station has a switch for "talk-back" use.

(7) Engineroom - Bridge Intercommunication System. This is a separate talk-back system connecting the Bridge and the Engineroom. Other ship control stations may also be on the circuit (including the Master's and Chief Engineer's offices). A selector switch on the Bridge connects the desired station. As in the ship's main talk-back system, it is necessary to use the "press-to-talk" switch to talk back from any station other than the Bridge.

(8) General Alarm and Ship's Whistle. These are both used in emergencies, though they are not interconnected. The general alarm is sounded by rapid ringing of bells located throughout the interior of the ship. The general alarm bells are rung for fire and collision, CBR defense, abandon ship, steering casualty and for man-overboard. The ship's whistle (in addition to sounding all Rules of the Road signals) is used to alert the ship's crew to most drill and emergency situations.

(9) Speaking Tubes. Speaking tubes are pipes run for short distances, such as from the Bridge to the Master's Stateroom or Radio Room, for passing urgent information or calls by direct voice. They may be installed anywhere in the ship, but may not penetrate a watertight bulkhead below the bulkhead deck.

(10) Hand-held radios (walkie-talkies). Walkie talkies provide the primary communication from the On-Scene Leader to the repair locker. Radio communication increases flexibility by allowing the On-Scene Leader to move around and also maintain communications. Backup systems are the installed or emergency sound-powered phone systems. Frequency (channel) control must be established on each ship since hand held radios are used for functions other than DC such as command and engineering. Encrypted hand held radios are used in secure areas.

(11) Other Special Systems and Alarms. In addition to the above systems of communication, there are many automatic alarm systems which give warning of danger or failure. Some of these are:

(a) Circuit "F," Fire and Smoke Alarm - Thermostatic switches (105, 125 and 150 degrees Fahrenheit) and smoke detectors installed in designated spaces are connected to a Circuit "F" alarm switchboard in the Pilot House with summary audible and visual alarm signals in the Pilot House and each Quarterdeck Station. Manual alarm fire pulls located throughout the ship are connected to this system.

NOTE: {Thermostatic fuses are used in fire extinguishing systems not alarm systems.}

(b) Circuit "FD," Flooding Alarm - Adjustable liquid level sensors are installed in spaces that are subject to flooding and are connected to the Circuit "F" alarm switchboard incorporating a summary audible and visual alarm signal in the Pilot House and each Quarterdeck Station separate from the "F" alarm.

(c) Circuit "FH," Sprinkling System Alarm - Water switches, flow switches or pressure switches are installed in dry or wet sprinkling systems and are connected to one contact to energize the alarm signals on the Circuit "F" switchboard and connected to another contact to start the associated motor driven fire pump.

(d) Circuit "1FR," Carbon Dioxide Release Alarm System - When carbon dioxide is released, a pressure switch actuates a visual and audible alarm in the protected space and actuates a red light and bell outside each access to the protected space and in the Pilot House and Quarterdeck Stations. Silencing switches for the audible alarm are provided.

(e) Circuit "2FR," Halon 1301 Release Alarm - When actuated, a pressure switch initiates audible alarms and amber lights outside all accesses and inside the protected space and another pressure switch shuts down the space ventilation. After a time delay, another pressure switch initiates the release alarm and red lights inside the protected space, outside all accesses to the protected space and in the Pilot House and Quarterdeck Stations. Silencing switches for the audible alarm are provided.

(f) Circuit "3FR," Aqueous Potassium Carbonate (APC) Release and Low Pressure Alarm - The system is actuated by melting of any fusible link above the deep fat fryer(s) or manually at the cylinder valve control head or pull box inside the space access. When actuated, pressure switches de energize the deep fat fryer heating elements, shut down the ventilation, close the fire damper in the ventilator hood and sound an alarm bell locally, in the Pilot House and Quarterdeck Stations when the pressure drops below 120 psig.

(g) Circuit "G," General Alarm - The general alarm is actuated manually in the Pilot house, Quarterdeck Stations and DC Feeder Panel (if location not in Pilot House) to ring bells that warn all personnel in an emergency situation. The system is energized from a 24 volt emergency battery bank.

(12) Messengers. When all other communication systems fail, messengers are used. Because of the time delay in receiving messages and danger to the messenger, hand carried messages are generally a last resort. Messages should be written to ensure accurate delivery.

3-6-4 EXTERNAL COMMUNICATION SYSTEMS

a. External Communications Equipment. External communications equipment will vary from ship to ship. Current Maritime Radio Services requirements for Global Maritime Distress and Safety System (GMDSS) including ship radio equipment requirements and the satellite Emergency Position Indicating Radio Beacon (EPIRB) are included in the Federal Register dated March 16, 1992, approved April 15, 1992.

b. Emergency Communication Links. MSC ships have various types of emergency communication links to other MSC ships, U.S. Navy ships, merchant ships and short stations.

(1) MSC Ship to Shore Links

(a) INMARSAT A. The primary means of emergency communication with the international rescue network is via the INMARSAT A terminal. This terminal is usually located in the Radio Room. The INMARSAT terminal can automatically send a digital formatted distress message, identifying the ship and the ship's location, to the INMARSAT network. This network is monitored 24 hours a day for distress messages. All distress messages received are passed to the nearest national rescue service such as a U.S. Coast Guard Rescue Coordination Center.

(b) High/Medium Frequency (HF/MF) Radios). The HF/MF radios located in the Radio Room require trained personnel to monitor a distress frequency. Thus unless the HF/MF radios are preset to the international distress frequency, any voice or teletype HF/MF transmissions will be transmitted on the frequency previously set.

(c) Cellular Phone. If the ship has a cellular phone on the Bridge and is within 30 miles of the U.S. or Canadian shore, the ship can use the cellular phone to establish a voice land line link to communicate with the nearest Coast Guard station.

(2) MSC Ship to MSC, USN or Merchant Ship

(a) Bridge to Bridge. The primary bridge-to-bridge voice communication to all other ships (MSC, USN, merchant) is VHF radiotelephone. The typical VHF radio range is 25 miles. All ships and the Coast Guard monitor and use VHF Channel 16 for marine operations. U.S. military and commercial aircraft also monitor VHF 121.5 MHz for emergency transmissions.

(b) MSC Ship to USN Ship. Radio voice communications with MSC or USN ships may be conducted on the UHF radios located in the Radio Room. The primary distress frequency is 243.0 KHz and normal fleet communications is on 277.8 KHz, Navy Common. This is also the primary ship to military aircraft method of voice communication.

(c) HF/MF Distress Frequency. All ships at sea monitor HF/MF 2182 MHz for distress signal beacons or voice. Transmissions may be made on the HF/MF radios located in the Radio Room.

(d) Secure Radiotelephone Network. Some communications from MSC ships to USN ships and shore stations are made over secure radio communications networks. The radios and the encryption devices are located in the Radio Room. Remote handsets are also located in the Pilot House. The frequencies are set by the NAVY Type Commander.

(3) Emergency Communication Devices. Located in an open area topside near the signal shelter is an orange buoy called an EPIRB. This device is designed to float free of the ship in the event of ship sinking and transmit a distress signal to a satellite network. This network notifies the proper authorities for rescue. The distress signal can also be manually activated by means of a switch on the unit.

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 7

BREATHING APPARATUS

3-7-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 077, Personnel Protection Equipment

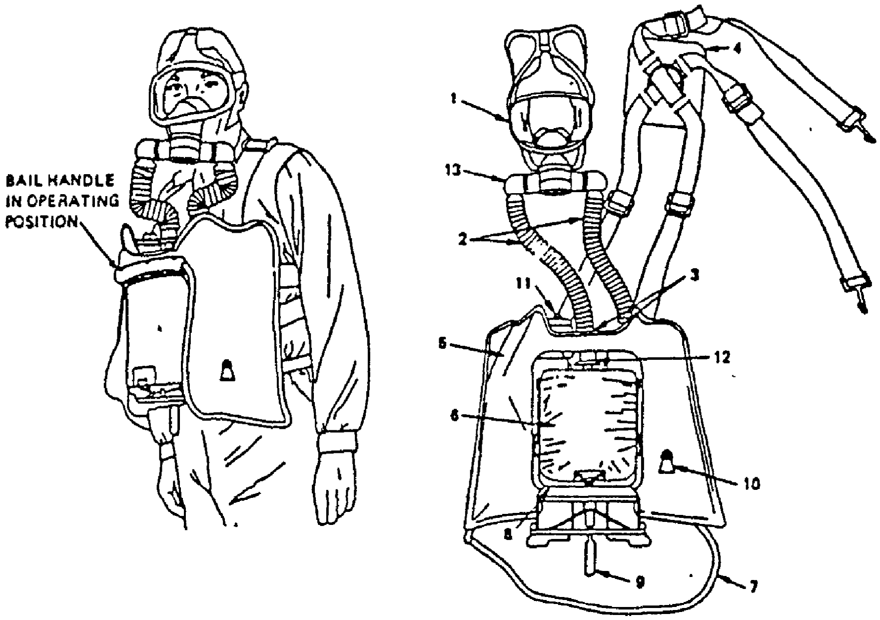
b. Technical Manual for Oxygen Breathing Apparatus, Type A-4, NAVSEA SS600-AA-MMA-010

3-7-2 INTRODUCTION

Because of the nature of the construction of ships and the cargoes and fuels that they carry, there are many situations that can result in a compartment's atmosphere becoming contaminated to the point where it would be hazardous to breath. Fire, leakage of toxic materials and the decay of vegetable matter are a few causes of unbreathable atmospheres. This chapter provides information on the breathing apparatuses carried aboard MSC ships which allow crewmembers to safely enter compartments with contaminated and hazardous atmospheres.

3-7-3 TYPE A-4 OXYGEN BREATHING APPARATUS (OBA)

a. Oxygen Breathing Apparatus (OBA). The OBA is a self-contained, closed circuit devise which generates oxygen and allows the wearer to breathe independent of the surrounding atmosphere. The effective time limit of the oxygen supply is in excess of 45 minutes; however, to account for variation in each individual wearer's consumption rate, and to allow the wearer sufficient time to exit the hazard area and reach fresh air, the timer on the OBA should be set for 30 minutes. The major components which make up the OBA, illustrated in Figure 3-7-1, are listed below:



1. FACEPIECE
2. BREATHING TUBES
3. BREATHING TUBE COUPLINGS
4. BODY HARNESS AND PAD
5. BREATHING BAG
6. BREASTPLATE ASSEMBLY
7. WAIST STRAP
8. BAIL ASSEMBLY HANDLE
9. CANISTER RELEASE STRAP
10. CANISTER RELIEF VALVE AND PULL TAB
11. TIMER
12. PLUNGER ASSEMBLY
13. VALVE ASSEMBLY

NAVY A-4 OXYGEN BREATHING APPARATUS

FIGURE 3-7-1

(1) Quick Start Canister. A replaceable quick starting canister is the oxygen source of the OBA. This canister contains chemicals which generate oxygen for breathing and remove CO_2 and water vapor from exhaled air. To provide an immediate oxygen source and allow quick starting, an oxygen generating chlorate candle is incorporated into the canister. The canister is curved so that it fits into the OBA only one way.

(2) Face Piece. A rubber face piece with adjustable harness and breathing tubes provides protection to the wearer's face and provides the oxygen generated in the canister to the nose and mouth for breathing. The face piece has a single wide angle lens of scratch resistant plastic. There is a speaking diaphragm which allows the wearer to communicate orally. On some OBAs, a microphone and amplified speaker augments this speaking diaphragm and provide better communication.

(3) Breathing Bags. To contain conditioned air, the OBA is provided with two breathing bags. These bags act as a reservoir to hold excess oxygen and to cool the air after its passage through the canister. To prevent the bags from bursting from over pressurization, a relief valve is provided on the left bag. This valve can be operated manually by pull tab.

(4) Timer. A timing device is provided to alert the wearer to leave the hazard area and replace the canister. The timer is spring wound and rings a bell when the set time is reached. To completely wind the timer, rotate the face piece to the 60-minute mark and then turn it back to the 30-minute setting. When wound correctly, the alarm bell should ring for 10 seconds.

b. Donning and Adjusting the OBA. The OBA can be donned solo by the wearer, although using a second person can speed donning. The second person assists the wearer with making strap connections, checking for proper face piece seal and adjusting the fit. The following are procedures for donning the OBA.

(1) Verify that the bail assembly is down and locked in the standby position.

(2) Ensure breathing tube quick disconnect couplings are securely fitted to the nipples on the OBA.

(3) Fully extend and straighten all body harness straps. Extend head straps and place the head strap assembly in front of the face piece lens.

(4) With one hand, grasp the face piece by the inlet valve assembly and the apparatus by the bail handle. With the other hand, grasp the body straps of the harness. Bring the harness over the head and position the OBA on the chest.

(5) Run the underarm straps under the arms and attach snap hooks to the rings on the top corners of the breastplate assembly.

(6) Position the OBA so that the breathing tubes are slightly below the shoulders. While the OBA is held in position, adjust the shoulder straps until the apparatus fits correctly and comfortably.

(7) Place the face piece over and behind the head so that it is out of the way.

(8) Run waist strap around body and snap to bracket on lower side of breastplate.

(9) Install canister as follows:

****WARNING****

Pulling lanyard and cotter pin fires the candle and oxygen is generated. If the canister is fired while the foil is in place, pressure will build up causing the copper foil to rupture.

(a) Remove the canister tear-off cap and aluminum protective disk by pulling tab backward and downward. Newer caps are one piece. Discard cap and disk. Do not puncture copper foil seal.

(b) To remove candle cover, which acts as a grip for candle starting lanyard, hold the canister upside down and rotate swivel plate 180o. Pull swivel plate up and toward center of canister. Leave cover dangling from lanyard. Do not pull lanyard.

****WARNING****

Do not use an OBA which pierces the foil seal in the standby position. If this occurs, adjust the OBA per the technical manual.

(c) Insert canister upward into the guard, with the neck up and the concave or ribbed side toward the body. The canister is correctly inserted when it is firmly retained by the bail. This is the standby position.

(10) Don the face piece as follows:

****WARNING****

Ensure hair does not penetrate the seal between head and face piece or leakage will result.

(a) Insert chin into the face piece chin stop.

(b) Pull headbands from front of face piece over head. Ensure straps are flat against the head.

(c) Tighten lower straps first, side straps next. Do not tighten the forehead strap at this time.

(d) Place both hands on head harness pad and push it down toward neck.

(e) Re-tighten the lower and then the upper side straps.

(f) Tighten the forehead strap if needed.

(g) Test face piece sealing by squeezing the corrugated breathing tubes together tightly with one hand and inhale gently. The face piece should collapse inward while breath is held to indicate a gas tight seal. Hold breath for 5 seconds. Readjust straps if leakage is detected and retest face piece seal.

(h) If going to ready or standby, loosen lower face piece straps, remove face piece and place over the head until needed.

c. Placing OBA in Operation

(1) Don mask and tighten straps.

(2) Using both hands, depress tabs on bail handle and swing handle upward until it snaps into position.

(3) Pull canister lanyard out, away from the body to fire the oxygen candle. Visually inspect the lanyard to ensure the cotter pin has been removed. If the cotter pin does not come out, have another person extract the pin with pliers or get another canister.

(4) While the candle is filling the breathing bags, depress the left breathing bag at the pull tab with the left hand while grasping and sealing both breathing tubes with the right hand and pressing against the right breathing bag with the right elbow to test the canister, tube connectors and breathing bags for tightness. If bags do not remain inflated, determine and correct problem prior to use.

****WARNING****

Do not pull breathing bag tab during normal operation. This will cause a loss of oxygen from the bag.

(5) Breathe normally. Exhaled breath will cause a chemical reaction to generate new oxygen in the canister. Excess oxygen will vent automatically through the relief valve in the left bag. If the relief valve sticks, use the pull tab to manually activate the relief valve. Check to ensure the bag does not deflate completely.

(6) Once the apparatus is inflated, working and has been leak tested, set the timer. Rotate pointer clockwise to 60, then set back to 30 minutes.

d. Removing the canister

****WARNING****

Do not touch the canister during removal. It is hot and will burn unprotected skin. Handle the canister with extreme caution. Do not allow foreign material, particularly water, oil or grease, to enter the neck of the canister or the canister may explode.

(1) Remove face piece and put over head if not immediately inserting a new canister.

(2) Depress tabs on the bail handle and push down from operating to standby position. Spread legs apart, lean upper body forward slightly and pull canister release strap. The canister will drop out of the OBA. If canister fails to drop, shake the OBA. This should free the canister.

(3) If the canister still fails to drop out, insert a thin metal rod between the inhalation and exhalation tubes and attempt to force canister out. If this does not free canister, remove the OBA and set aside to cool and remove canister with gloves.

e. Removing the OBA. The buddy system can be used to remove the OBA. The assisting person can help by loosening and unhooking straps, supporting the OBA during removal, holding the face piece out of the way and checking the condition of an OBA wearer emerging from a fire or other contaminated atmosphere.

(1) Remove face piece by releasing head straps at the buckles and pulling it off.

(2) If canister is still in OBA, place face piece over head and remove canister. If canister is out, let face piece hang down in from of the OBA.

(3) Loosen waist strap then unhook waist strap.

(4) Loosen shoulder straps and unhook at upper corners of breastplate assembly. Grasp face piece and bail handle with one hand. Grasp shoulder harness, preferable at D-ring connector with other hand and lift harness over head.

(5) If wet or moist, wipe down OBA, clean and disinfect according to maintenance requirement.

f. Canister disposal

(1) Ensure copper foil seal has been punctured and jettison overboard when the ship is more than 25 nautical miles offshore. Do not puncture canister, but do ensure tear-off caps are removed. Do not allow foreign substances, particularly water, oil, oily water or grease to enter canister prior to disposal.

(2) If within 25 miles of shore or impossible to dispose of canisters by jettisoning, do the following:

(a) After canister has cooled, recap canister and wrap in double poly bags. Stow in a dry, oil free environment until proper at sea or shore disposal is possible.

(b) If (a) cannot be achieved, stow canisters in sealed clean, dry and oil free metal containers until proper disposal is possible.

3-7-4 SELF-CONTAINED BREATHING APPARATUS (SCBA)

a. Like the OBA, the SCBA is intended to provide complete breathing protection in unbreathable atmospheres. The apparatus may be used in any atmosphere except those that contain contaminants that poison through the skin. MSC has obtained SCBAs from various commercial sources, so the type and manufacture may vary from ship to ship. Each crewmember should become familiar with the SCBA on their ship.

b. Although specific components differ on various models of SCBA, all have the following components:

(1) <u>Compressed air tank</u>. Newer cylinders are fiber wound composite construction or aluminum. Older cylinders are steel. Ships may be equipped with high pressure 4500 psi models which last 60 minutes or low pressure (2215 psi) models which will last 30 minutes. The duration of a tank of air varies with the exertion and breathing rate of the wearer. Care must be taken to protect the cylinder valve end during handling since it can be damaged. If dropped and the valve is broken off, the cylinder will become a "missile" hazard.

(2) <u>Regulator</u>. The regulator is a valve assembly which reduces the cylinder pressure to near atmospheric pressure for use in breathing. Most SCBAs use two regulators, one on the tank to reduce to an intermediate pressure (typically 100-150 psi) and one on the mask to reduce to required breathing pressure. The use of two stages allows the hose between the two regulators to be smaller and therefore, less susceptible to damage. The regulator may be a demand type, which supplies air when the wearer inhales, or the pressure demand type, which provides air at slightly above atmospheric to provide extra protection from toxic atmospheres. Some SCBAs allow the wearer to select between the two modes to conserve air in the demand mode and provide extra protection in the pressure demand mode for very toxic atmospheres.

(3) Backpack unit. The backpack has shoulder and waist straps for holding the SCBA to the wearer. A strap with a quick release mechanism secures the tank in place and allows for quick changeout.

(4) Mask. A rubber mask of neoprene or silicone rubber seals out the toxic atmosphere. There is single wide angle lens and a speaking diaphragm. The mask has the exhalation valve to vent exhaled air.

(5) Low pressure alarm. The alarm lets the wearer know when the cylinder pressure is down to 500 - 600 psi. This allows enough time to return to a breathable atmosphere before the air supply is completely exhausted.

c. Operation of the SCBA. (These procedures are typical of most SCBAs, check the manufacturer's manual for the SCBA on your ship.) The SCBA, like the OBA, can be donned solo by the wearer. Use of two persons in a buddy system can speed donning the SCBA, particularly for inexperienced personnel. The following procedures should be observed when donning the SCBA.

(1) If cylinder pressure is less than fully charged, replace the cylinder before use.

(2) Ensure the high pressure hose is attached to the tank valve hand tight and is securely fastened to the regulator.

(3) Check the cam-lock on the cylinder band and make sure the cylinder is secure on the back pack.

(4) Don the unit by lifting the cylinder, valve pointing up, over the wearer's head and resting the unit on the back while slipping the arms into the shoulder straps. Then grasp the harness tightening straps. As the back pack slips down the back of the wearer, tighten the shoulder harness until comfortable.

(5) Fasten the waist strap and chest strap.

(6) Open the mainline valve on the regulator.

(7) Close the bypass valve on the regulator.

(8) Open the cylinder valve.

(9) Loosen the straps on the head harness of the face mask.

(10) Place the face mask to the face and pull the head harness over the back of the head.

(11) Tighten the head straps in the proper sequence.

(12) Check for a proper seal around the face mask by placing the end of the breathing tube against the flat of the hand and then inhaling. If the face mask collapses against the face then the face mask has a good seal.

(13) Attach the breathing tube to the regulator and screw in place.

(14) Breath easily to check the operation of the regulator. In the demand mode, the regulator will meter air to the mask as the wearer inhales. In the pressure mode, the regulator will immediately maintain a slight pressure on the face mask at all times.

d. Removing the SCBA. The buddy system can be used to remove the SCBA. The assisting person can help by loosening straps, holding the face mask out of the way, supporting the cylinder and checking the condition of the SCBA wearer emerging from a fire or other contaminated atmosphere.

(1) Disconnect regulator from face mask.

(2) Close cylinder valve by turning fully clockwise.

(3) Release air pressure in system by opening the bypass valve on regulator.

(4) Loosen head harness straps and remove face mask.

(5) Unfasten waist strap and loosen shoulder straps.

(6) Remove the SCBA.

(7) Remove cylinder from SCBA and tag for refilling.

e. Emergency operation of the unit

(1) If difficulty is experienced with the regulator while in a compartment, immediately crack open the red by-pass valve until a comfortable flow of fresh air is being received in the face mask.

(2) Close the main line valve.

(3) Proceed immediately to a safe atmosphere so the apparatus can be checked out.

f. Cleaning the unit

(1) Use mild soap and warm water and a soft brush to clean the face mask inside and out.

(2) Disinfect the face mask using one cup of ammonia to 1 gallon of water.

(3) Wipe the rest of the apparatus with damp sponge.

(4) Let the apparatus dry before stowing.

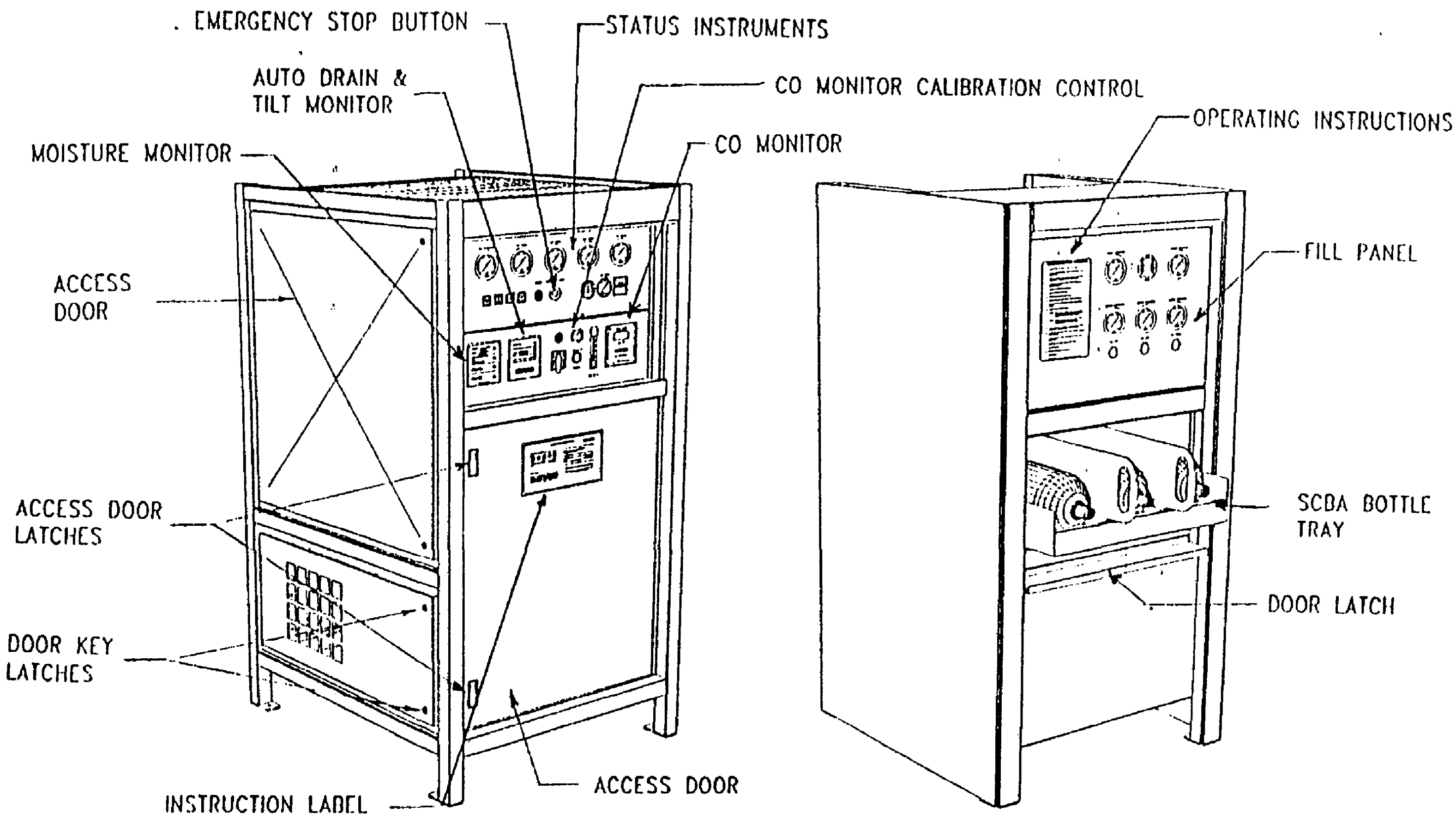
3-7-5 SCBA RECHARGE COMPRESSOR AND REFILL STATION

a. SCBA Compressor and Refill Station. SCBA Compressor and Refill Stations have been installed on the T-AO 187 Class ships to recharge high pressure (4500 psi) SCBA cylinders. These systems will be considered for installation on other ship classes on a case-by-case basis. Where SCBA recharge systems are installed onboard ship or where SCBAs can be readily recharged at a suitable recharge facility ashore, shipboard firefighting training evaluations should emphasize the actual donning and use of SCBAs, consumption of SCBA air and recharging of the SCBA cylinders. To prevent exhausting all readily accessible and fully charged breathing apparatuses during training, thereby reducing a ship's actual firefighting readiness, a ship shall maintain least 25% of the ship's total units in a fully charged and ready state. Priority shall be placed on returning the ship to a 100% breathing apparatus capability.

b. Components. The main components of the SCBA refill system are the prime mover and compressor, purification module, air monitoring module, air control panel and refill station. Air storage systems are also used in some systems to augment air demands during peak periods, but increased air capacity, cost, space and other factors are to be evaluated when considering actual installation.

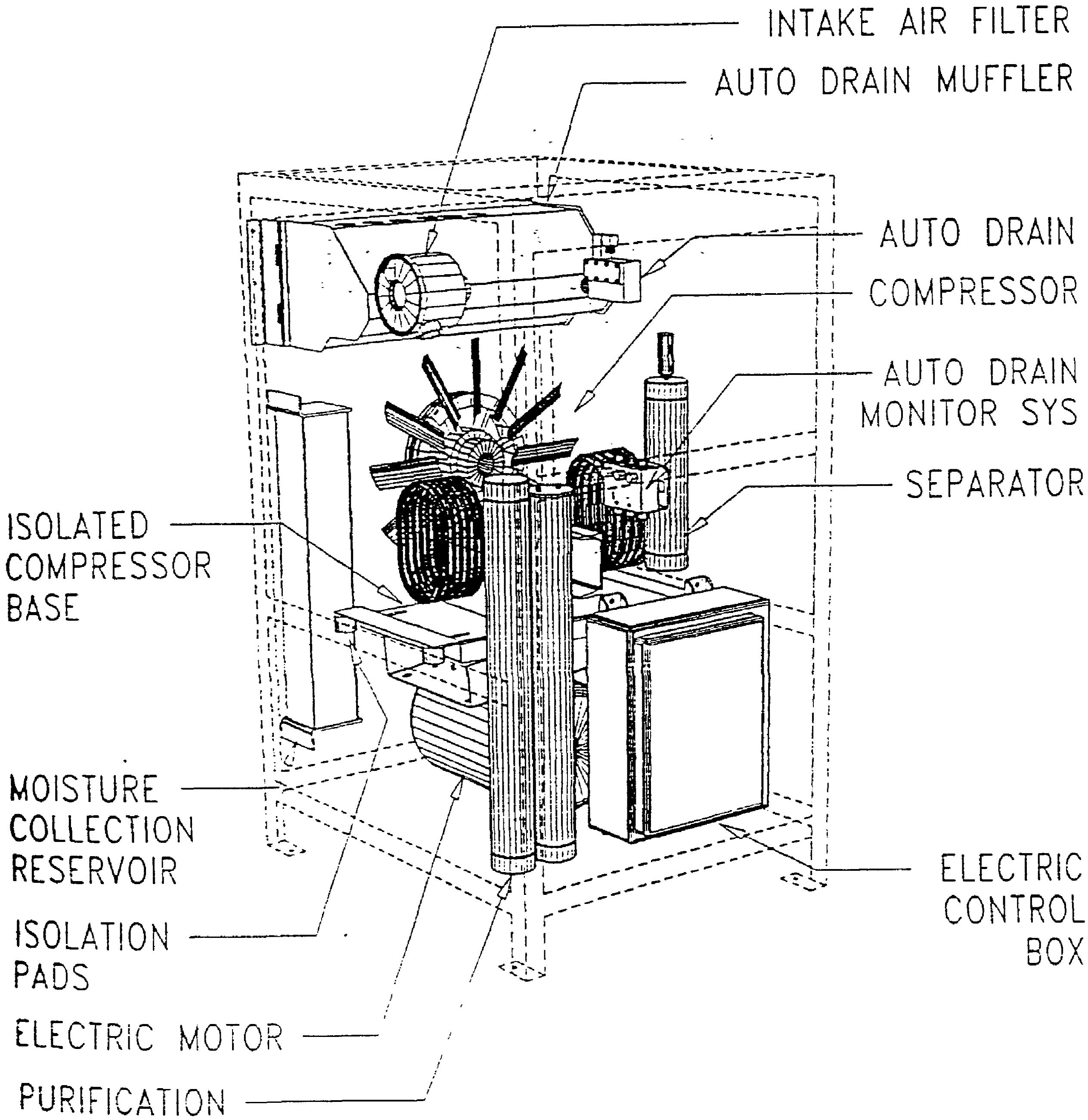
c. Maintenance. Routine maintenance of the SCBA compressor recharge system is essential to ensure proper operation of the equipment and to ensure proper air quality is maintained. Special attention should be given to the condition, level and type of lubricating oil; purification cartridge shelf/usable life; condition of air quality monitoring equipment and drainage of the condensate reservoir. Only use lubrication oils specifically approved for the compressor by the compressor's manufacturer. Operation of the compressor in high ambient air conditions (excess of 110^{O}F) decreases performance and accelerates wear and should be avoided. Normal operation ambient air temperature should be maintained around 75^{O}F to 85^{O}F and should not exceed 90^{O}F to 95^{O}F. Consult SAMM and the manufacturer's technical manual for maintenance and overhaul practices and periodicity. An active servicing program must be implemented to prevent excessive oil carry-over and CO generation.

d. Air Quality. NFPA, ANSI, OSHA and the Compressed Gas Association (CGA) provide maintenance, sizing, quality standards and air test criteria for breathing air quality recharge equipment. Although the CGA requires a minimum air quality of Grade D for such equipment, MSC SCBA recharge systems will meet at least CGA Grade E air quality with less than 25 ppm water vapor. The water vapor limit is required to eliminate water vapor condensing and freezing in the SCBA regulator when the SCBA is used in cold weather. In accordance with NFPA, compressor air samples should be taken on a quarterly basis in accordance with manufacturer's procedures and provided to a qualified air test laboratory to check for proper air quality. Additional air quality analysis is required following major overhaul modifications or extensive repairs to the breathing air system.



COMPRESSOR MODULE

REFILL STATION


INTAKE AIR FILTER
AUTO DRAIN MUFFLER
AUTO DRAIN
COMPRESSOR
AUTO DRAIN MONITOR SYS
SEPARATOR
ISOLATED COMPRESSOR BASE
MOISTURE COLLECTION RESERVOIR
ISOLATION PADS
ELECTRIC MOTOR
PURIFICATION
ELECTRIC CONTROL BOX

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 8

VENTILATION

3-8-1 REFERENCES

a. COMSCINST 9280.3D, Designation and Marking of Hull Structure on MSC Ships in Service (USNS)

b. Naval Ships Technical Manual, Chapter 510, Ventilation and Heating

c. Naval Ships Technical Manual, Chapter 079 Vol. 2, Practical Damage Control

d. Naval Ships Technical Manual, Chapter 555, Shipboard Firefighting

3-8-2 INTRODUCTION

A ship's ventilation systems supply fresh air, cooling and heating, while exhausting stale air to provide a livable, workable atmosphere in manned spaces. Ventilation systems also prevent equipment and cargo from exceeding design temperature and humidity limits. Exhaust systems can be used to remove toxic gasses resulting from fires or mishaps involving toxic materials. Ventilation systems can also provide a route for fire and flooding to cascade beyond the point of origin.

3-8-3 TYPES OF VENTILATION

a. <u>Types of Ventilation Systems</u>

(1) <u>Natural ventilation</u>. Natural ventilation systems move air without any mechanical aid. These systems use wind or the motion of the ship to drive air through ventilators trimmed for either supply or exhaust.

(2) <u>Mechanical supply and exhaust</u>. These systems use fans or blowers to supply and exhaust air from the ship.

(a) Supply. These systems provide fresh air to compartments within the skin of the ship. Supply systems are usually conditioned (heated, cooled, de-humidified) to increase crew comfort.

(b) Exhaust. Exhaust systems provide general exhaust of stale air from the ship. Special exhaust systems move air from special hazard areas (e.g., welding benches, sewerage pump rooms, refrigeration compressor rooms) directly over the side without mixing with other exhaust.

(3) Heating and cooling. In supply systems, the air may be heated by steam or electricity and cooled by refrigeration or chilled water systems to control temperature and humidity. Air from inside the ship may be recirculated through heaters or cooling coils to adjust the temperature.

b. Control of Ventilation

(1) Blowers and fans in the ventilation systems can be controlled at local controllers or at electrical switchboards or panels. Controllers may include speed and thermostat controls. Shutdown switches are at the following locations:

(a) Bridge control. The emergency ventilation cutout switch secures all vent fans. It is used only for control of fires and for CBR defense.

(b) Engineroom Remote Control Station. This cutout switch secures engine room ventilation only. It is used for controlling engineroom fires to secure ventilation from outside the engine room.

(2) Fire dampers are located throughout the ventilation system in both supply and exhaust ducts. They are used to cut off ventilation automatically or manually to prevent the spread of fire from a section of the ship.

(a) Automatic (fusible link) fire dampers: These dampers have a fusible link which when heated melts, allowing a weighted damper to seal the vent duct. Links that melt at 165^{o} are used in most locations; 212^{o} links are used in galley exhaust ducts.

(b) Manual fire damper: Manual fire dampers are operated by hand. The handle on these dampers aligns with the damper so that when the handle is parallel with the duct, the damper is open and when the handle is perpendicular to the duct, the damper is closed. All zone personnel should know the location of manual fire dampers in their zones and the conditions in which they should be shut.

(3) CO_2 or HALON Cutout. In fixed CO_2 or HALON systems, the pressure of the gas in the actuation piping activates a switch and shuts off the ventilation to the protected space. The CO_2 or HALON must be sealed into the space to smother and extinguish the fire and prevent introduction of oxygen that could cause the fire to reflash.

c. Watertight and Firetight Integrity

(1) Watertight integrity is achieved by designing systems so that ventilation ducts are not routed through watertight bulkheads. Where necessary, ducts are routed above the watertight level and back down into the adjacent watertight compartment.

(2) Firetight integrity is achieved by locating a fire damper wherever a ventilation duct crosses a main vertical zone bulkhead. Ventilation systems serving compartments which contain fire hazards are separate from the general ventilation systems. Because of the hazard of grease fires in galley exhaust ducts, these systems are provided with special vent hoods and filters to trap grease. These vent hoods and filters must be cleaned frequently.

d. Ventilation System Markings. Ventilation systems are marked in accordance with COMSCINST 9280.3D, Designation and Marking of Hull Structure on MSC Ships in Service.

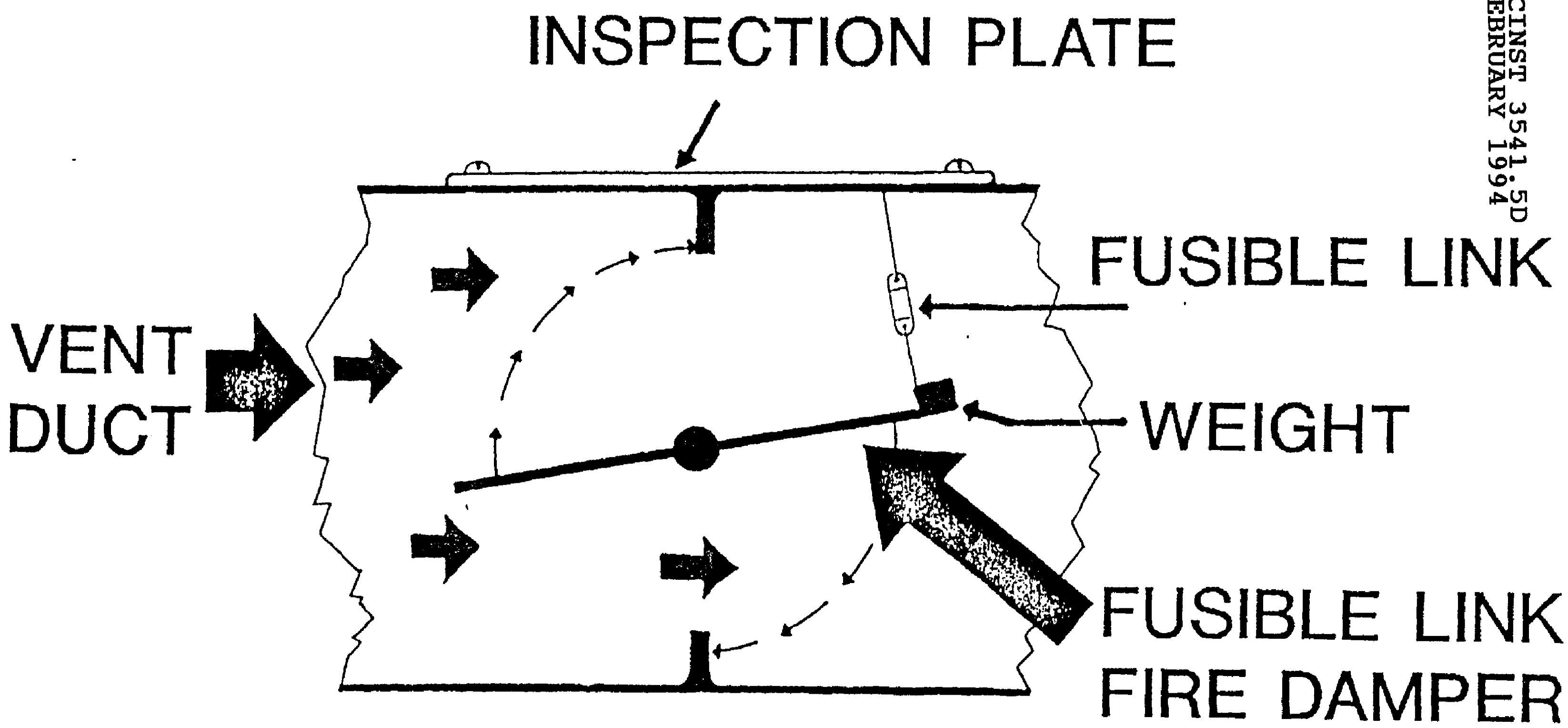
e. Maintenance of Ventilation System and Dampers

(1) Maintenance of all ventilation system components shall be scheduled as required by the Shipboard Automated Maintenance Management (SAMM) system or as directed in COMSCINST 3540.6, Engineering Operations and Maintenance Manual (EOMM) for ships without SAMM.

(2) All manual fire dampers should be tested periodically for smooth operation and proper fit.

(3) All fusible link automatic fire dampers should be tested periodically by removing the link to see if the damper drops freely and fits properly. The indicating arrow must also be checked to show the position of the damper.

(4) Ducting must be kept clean to prevent the spread of fire. A dirt or grease laden duct acts as a path to spread fire.



AUTOMATIC FIRE DAMPER

AUTOMATIC (FUSIBLE LINK) FIRE DAMPER

FIGURE 3-8-1

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 9

FLOODING AND DEWATERING

3-9-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 079, Vol. 2, Practical Damage Control

b. Hull Maintenance Technician 3 & 2, 1 & C, NAVEDTRA 10573 & 10574

3-9-2 FLOODING

a. General. Compartments may become flooded as a result of damage to the skin of the ship, excess water used to fight fire, water from ruptured piping systems and similar causes. This water must be removed to return normal buoyancy and stability as well as to restore the compartment to its normal use. Flooding can happen in port or at sea. Actions to combat flooding require personnel and dewatering equipment. All ships' crews must have a working knowledge of dewatering equipment including its uses and limitations.

b. Actions. In case of flooding, it is important to quickly determine the location of the damage and to secure all watertight subdivisions surrounding the area to prevent progressive flooding. After the threat of further flooding has been eliminated, those spaces already flooded can be patched and dewatered. Because not all pumping facilities can be employed to dewater any single flooded compartment, it is essential that the rate of flooding be reduced by of patching and plugging the ruptures. Dewatering by fixed systems or portable pumps will typically be ineffective until the rate of flooding has been reduced.

c. Gravity Drain Piping. Flooding dangers exist in gravity drain piping systems. Such piping usually discharges through the ship's hull above the waterline and passes through watertight decks. As a damaged ship lists to one side or settles more deeply, water will flow back through drainage piping and flood the ship unless some positive closure is provided.

3-9-3 INSTALLED DEWATERING SYSTEMS

a. Drainage Systems. Each ship has some system provided for removing water from within its hull. Systems of piping with or without pumping facilities installed for this purpose are termed drainage systems. The following are the drainage systems commonly installed on ships.

(1) Main drainage system

(a) The main drainage system runs through the main machinery compartments and in some ships, it may extend forward and aft of these spaces and interconnect with other drainage systems. The main drainage system provides high volume dewatering through the use of pumps and eductors.

(b) In smaller ships, the drainage main consists of a single pipe running fore and aft, usually along the centerline. In larger ships, it is a loop system extending along both sides of the engineering compartments and joined at the ends.

(c) Main drainage piping is normally constructed of 5" galvanized pipe or copper nickel tubing. Branch suction lines leading to valves or manifolds from various bilge wells, tanks or other compartments are of smaller sizes down to about 2".

(2) Secondary drainage systems. Secondary drainage systems drain spaces forward and aft of the main machinery compartments. These systems are independent systems, each with its own pump or eductors.

(3) Plumbing and deck drains

(a) These are provided for draining fixtures and compartments within the ship by gravity. Gravity drainage piping is installed extensively in compartments above the waterline.

(b) Some compartments near or below the waterline may be drained to compartments or tanks lower in the ship from which the fluid can be pumped overboard.

(c) Although gravity drain piping systems are usually provided with check valves to prevent backflow, there is danger of flooding unless some positive closure has been shut (i.e., closed isolation valves, gagged scuppers).

1. Each separate overboard discharge led through the ship's side from spaces below the freeboard deck must have an automatic non return valve fitted with a positive means of closing it from above the freeboard deck (gagged scupper).

2. An alternative way to provide required overboard discharge closures is by installing two automatic non-return valves without positive means of closure, provided the upper valve is so located above the deepest loadline so as to be accessible for examination under service conditions, and is of a type which is normally closed.

(4) Weather deck drains. Weather deck drains are provided to drain exposed levels and main decks. These drain overboard above the waterline by gravity.

(5) Feed drains in machinery spaces. Steam condensate, which is being retained as potential boiler feed water, is drained by gravity to tanks lower in the ship. Because drain piping penetrates decks and bulkheads, it creates a potential danger of flooding.

b. Drainage System Pumps and Eductors. Fixed pumping equipment associated with drainage systems include:

(1) Steam-driven double-acting reciprocating pumps (older ships only). These usually are used for ballast and general services and are permanently connected into the bilge manifold.

(2) Electrically or steam driven centrifugal pumps (bilge, ballast and general service). These are cross-connected into the bilge manifold. Their usual capacity is about 400 GPM although they may be larger.

(3) Fixed electric submersible pump for the main bilge system, capacity up to 600 GPM.

(4) Main circulating pump. A large propeller pump used to provide cooling water to the main condenser on steam ships. It can be used for emergency dewatering of the main space by aligning it to emergency bilge suction and closing the sea chest valve. Flooding water is discharged through the main condenser and overboard. The main circulating pump cannot be connected to any other compartment.

(5) Jet-type eductors. Jet-type eductors provide high volume dewatering capability to engineering spaces and cargo holds. These eductors use firemain to provide suction.

c. Drainage System Valves. Because of the debris often contained in drainage systems, several special valve are used in these systems.

(1) Valves

(a) Gagged scupper valves have a flap which can be positively closed (gagged) by a screw down stem or other device.

(b) Plug cock valves have a simple rotating plug closure which is resistant to fouling and plugging. Plug cock valves are used exclusively in plumbing systems.

(c) Gate valves are often used as sea valves at the skin of the ship.

(2) Operation of Valves

(a) In smaller ships, only the main cutout valves can be remotely operated. In larger ships, the main cutout valves, together with many of the stop check valves, may be operated from distant control stations.

(b) Valves in smaller ships are controlled mechanically; larger ships have hydraulic or pneumatic control.

3-9-4 PORTABLE DEWATERING EQUIPMENT

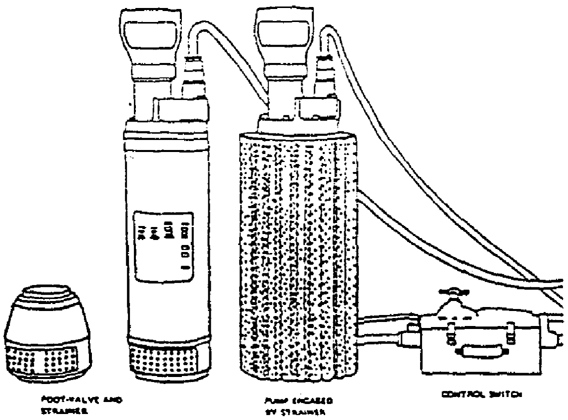
a. Portable Electric Submersible Pump. Portable electric submersible pumps are used for pumping compartments not drained by the installed drainage system. The portable submersible pumps are stowed in or near repair lockers, or other suitable locations. See Figure 3-9-1.

(1) Rigging the pump

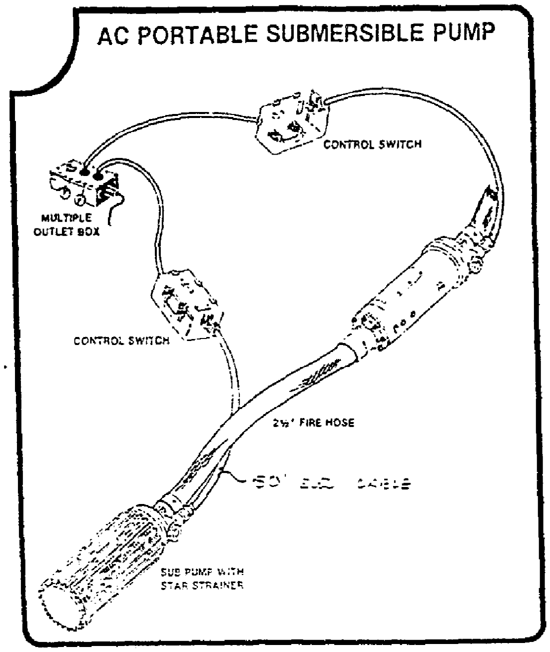
(a) The pump should not be lifted or handled by the electric cable. Each pump is provided with a bridle and a 3" manila rope for manhandling and lowering into the flooded compartment.

(b) The electric cable is taped to the handling line about every 3 feet. Allow a small amount of slack in the cable every 3 feet. This will put the weight of the pump on the handling line instead of on the electric cable.

(c) A cap with a handle is provided for lifting and handling the pump. It should be kept screwed on the 2-1/2" discharge outlet for this purpose, and will also serve to protect the male threads from damage.



ELECTRIC SUBMERSIBLE PUMP



AC PORTABLE SUBMERSIBLE PUMP

FIGURE 3-9-1

(2) Operation

(a) When submerged in water the pump needs no priming.

(b) Use of a suction hose requires a foot valve.

(c) Use standard 2-1/2" fire hose for discharge. The discharge hose from the pump should be led to the nearest available overboard discharge. Some ships are provided with permanent overboard discharge connections for this purpose.

(d) Do not operate the pump unless the suction is submerged and has its strainer attached. The pump should be operated only in a vertical position.

(e) Ensure that the cable is plugged into the proper electrical outlet to operate the pump.

(f) When dewatering against high discharge heads, two submersible pumps can be used in series. The lower pump lifts water into the suction intake of the higher pump, which discharges overboard. Connecting and discharge hose must be kept free of kinks.

(3) Maintenance. The most vulnerable point on these pumps is the packing gland where the electric cable passes through the watertight casing to the motor. The packing gland, the electric cable and connections should be carefully checked. The pump should

be meggered monthly and the ground wiring checked for continuity from the pump casing to the plug by the ship's Electrician. The pump should be tested monthly using a drum full of water. When the pump is used in salt water, it must be flushed with fresh water before stowage.

(4) Pump capacities

(a) The pump is rated to discharge water through a 2-1/2" hose at a rate of 140 GPM against a 70-foot head. Approximately 200 GPM is pumped against a 50-foot head.

(b) Twenty (20) feet is the practical limit of suction lift when primed. If a suction hose is put into the water instead of lowering the pump in the water for priming, a foot valve is necessary to keep the priming water from running out the lower end of the suction hose. The greater the lift from the water to the pump, the less water will be pumped. Power expended pulling water up to the pump inlet reduces volume at the pump discharge. Therefore, it is generally better to lower the pump into the water. Pumps may be connected in series to increase lift height beyond the 70-foot level limit of one pump.

(5) Safety Precautions

(a) Do not use the electric submersible pump without a strainer when the pump is submerged or a strainer foot valve combination when suction piping/hose is used.

(b) Do not run the electric submersible pump without water circulation. The pump utilizes pumped water for cooling.

(c) Never use this pump as a firefighting pump. Back pressure created by the nozzle will cause the seals to leak.

(d) Submersible pumps are not designed for pumping gasoline or oils. Gasoline tends to leak past the seals and oil is too thick to provide adequate cooling for the motor.

(6) Power sources and discharge outlets

(a) The pump can be requisitioned with a motor that matches the voltage and current rating of the ship. They are available for 115 or 230 volts DC and 220 or 440 volts AC.

(b) The power outlets for submersible pumps are located in various parts of the ship. These locations are marked by a label plate reading, SUBMERSIBLE PUMP OUTLET - XXX VOLTS AC (or DC).

b. Eductors. Eductors are a simple and extremely useful device for dewatering compartments. Actuated by fire main or P-250 water pressure, they discharge both the actuating water and an approximately equal amount of suction water. Two types of eductors are in use, the single jet S-type and the Peri-jet.

(1) Use

(a) Eductors perform low head dewatering operations at a greater rate of discharge than can be obtained with available emergency pumps.

(b) They are used for pumping liquids which portable pumps cannot handle.

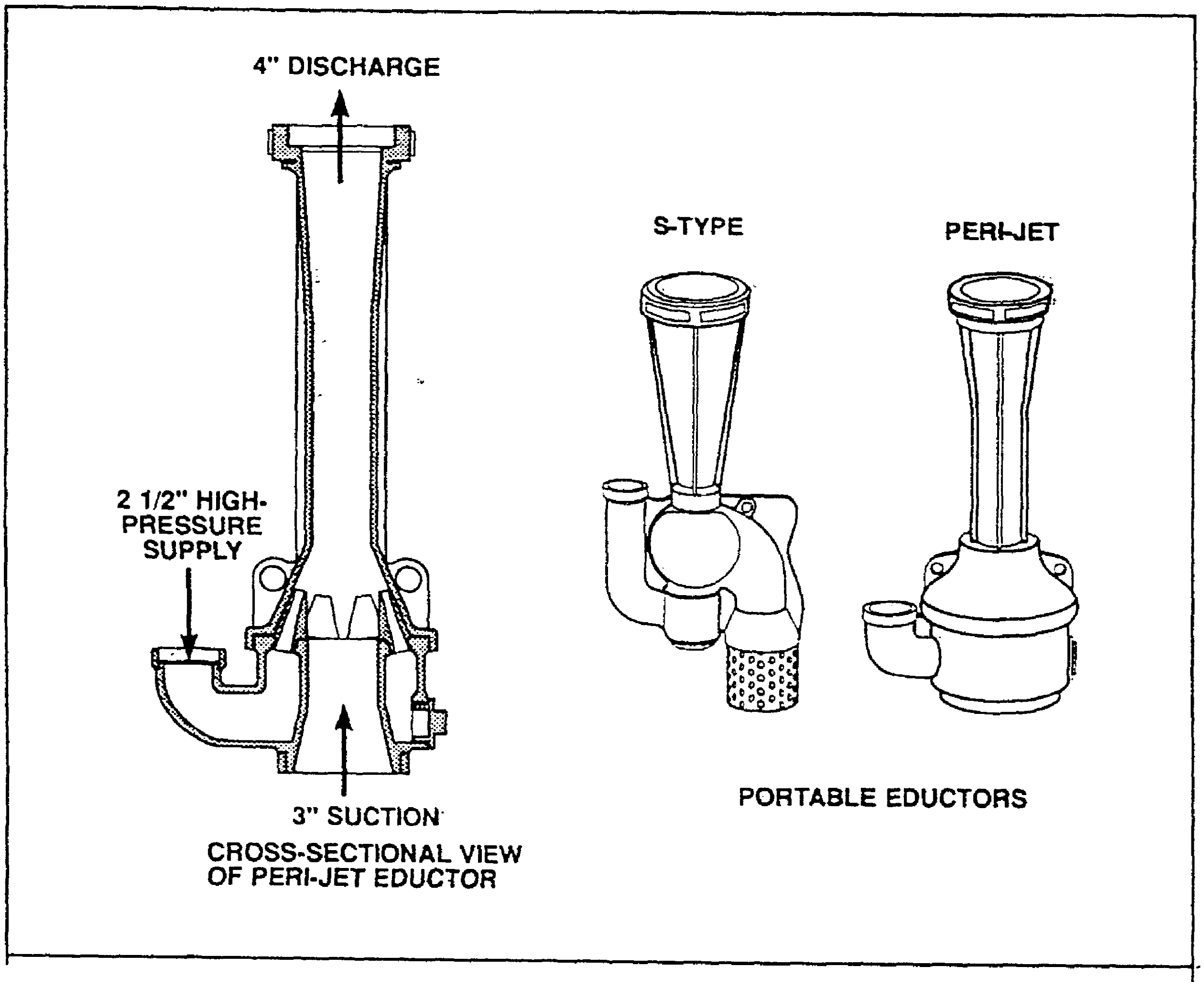
(c) It is imperative that adequate water supply pressure be maintained to the eductor. Insufficient supply pressure results in the space being flooded instead of dewatered. The minimum eductor supply pressure can be determined by multiplying the head height by 0.434 and then multiplying this result by three.

Supply Pressure = height X .434 X 3

(2) Types of Eductors

(a) S-Type Eductor. The single jet S-type eductor has a nozzle inside the suction chamber and has its 1-1/2" intake and 2-1/2" discharge openings offset (not in line). Because any small foreign matter may clog its suction chamber, a strainer with foot valve is built into this pump. See Figure 3-9-2.

(b) Peri-jet Eductor. The peri-jet uses six nozzles in a single venturi suction chamber. It has 2-1/2" supply and 4" discharge and suction connections. The suction chamber is a straight bore capable of passing an obstruction up to 2-1/2" in size. See Figure 3-9-2.



S-TYPE AND PERI-JET EDUCTORS

FIGURE 3-9-2

c. P-250 Mod 1 Pump. The P-250 Mod 1 is a gasoline engine driven portable pump designed for firefighting and dewatering. Refer to Figures 3-9-3 and 3-9-4 for clarification.

(1) Description

(a) Without accessories, the pump weighs 147 pounds. This includes the engine, centrifugal pump, hand priming pump, discharge ball valve, self-winding pull starter, 6-gallon fuel tank, elapsed time meter and pressure gauge.

(b) The engine is a two cylinder, two cycle engine rated at 40 horsepower. The engine is lubricated by oil pumped from the oil tank mixed with fuel in the variable ratio oiler. The engine is water cooled. A small amount of water is diverted from the pump casing and circulated through the engine block before being blown out the engine exhaust port. The engine is equipped with a self-winding pull starter. The engine has a control panel with check, high and low speed needle valve settings, an engine stop button and fuel connection.

(c) This centrifugal pump capable of delivering 250 GPM at 100 PSI with a 16 foot lift. It is self-priming to 16 feet and will pull water to a 20-foot lift with priming. A small priming pump is attached to the motor. This pump cuts out when the discharge pressure reaches 40 PSI. The pump unit has three hose connections:

1. The suction hose is a 3-inch hard rubber hose in 10-foot lengths.

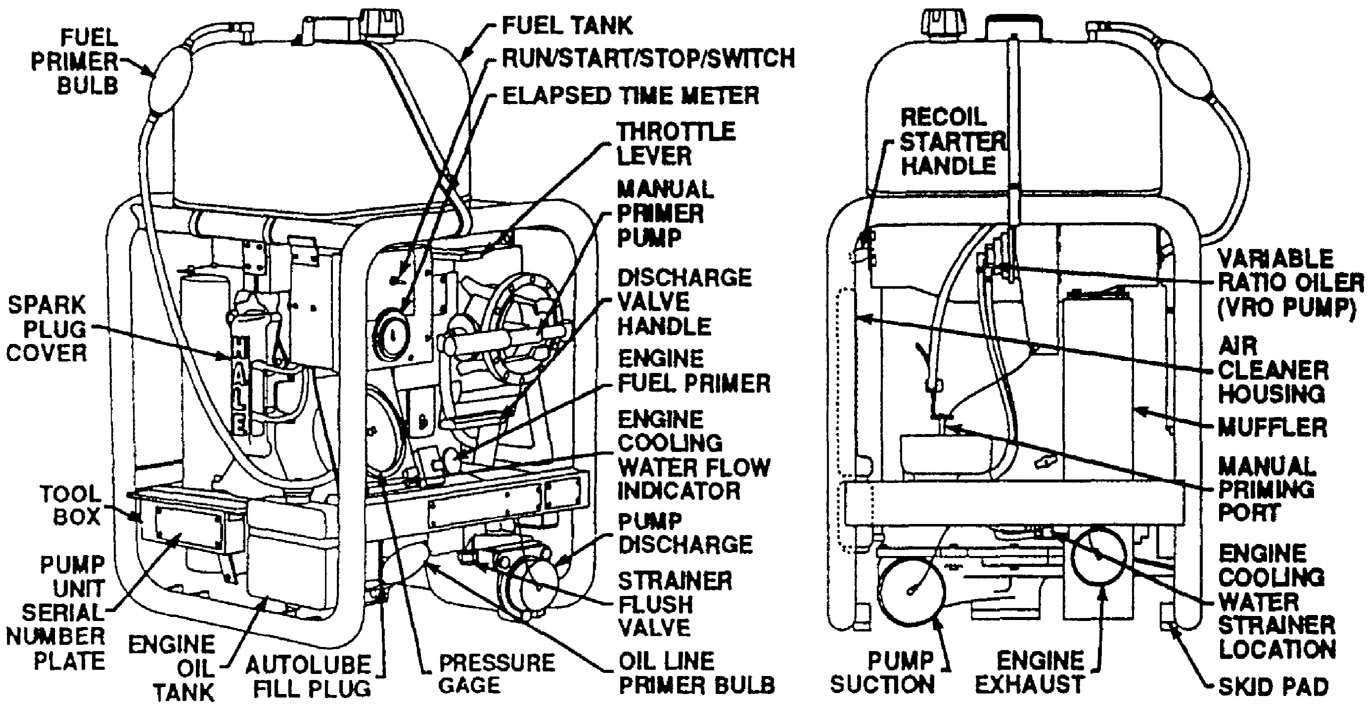
2. A foot valve and strainer assembly maintains the prime on the pump while shut down and prevents debris from clogging the pump.

3. Exhaust hose is a 2-inch diameter hard rubber hose in 20-foot lengths. This hose must never be elevated over 10 feet above the motor.

(2) Operation

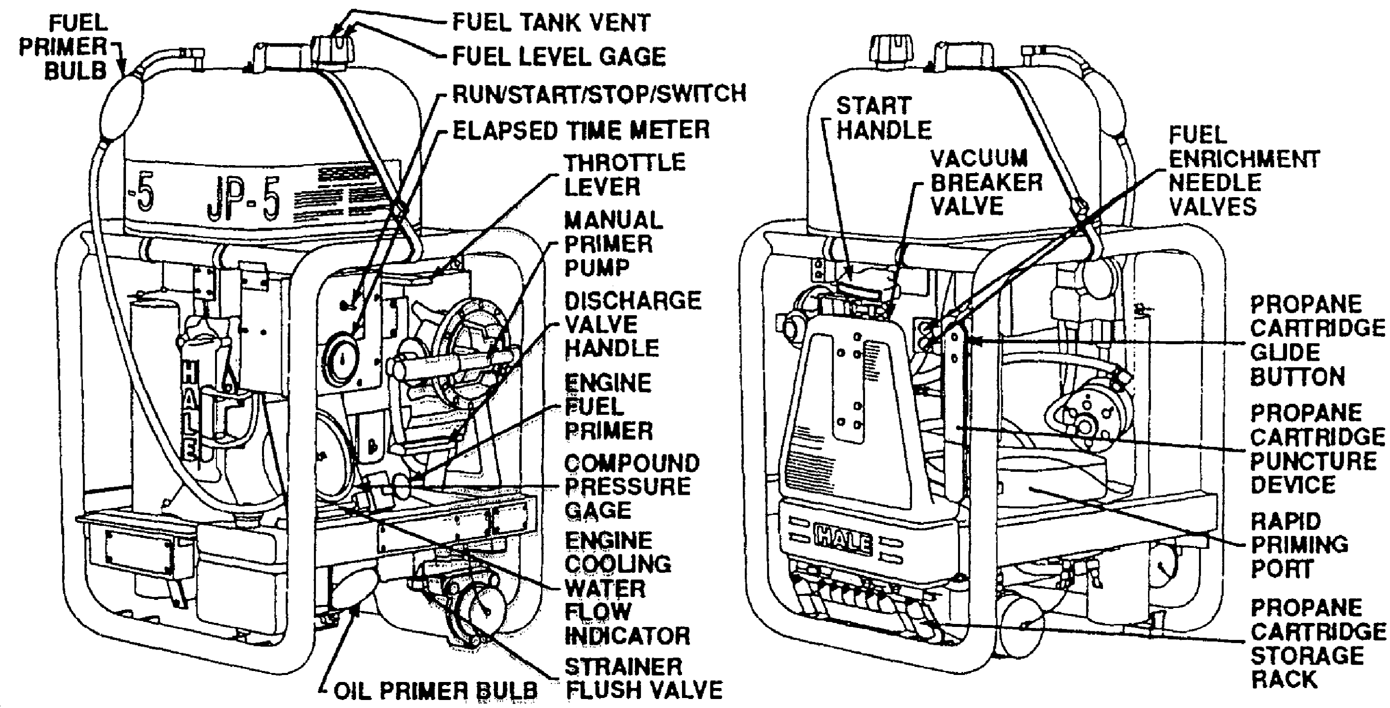
(a) Connect hoses to suction, discharge and exhaust connections. Tighten all suction hose connections between foot valve and hose and the hose and pump. Use a spanner wrench and proper gaskets to ensure a tight connection. Support the hose so that the weight will not be borne by the pump casing. Make certain the foot valve is completely submerged. Do not use in confined spaces unless an exhaust hose is connected to carry the toxic engine exhaust gases to weather.

(b) Close pump discharge valve and make certain that the T-handle screw on the rapid priming port is tight.



SPECIFICATIONS	
MANUFACTURER:	HALE FIRE PUMP CO. CONSHOHOCKEN, PA
MODEL:	P-250 MOD 1
PART NUMBER:	545-2150-00-0
CONTRACT NUMBER:	N00104-84-C-0580
WEIGHT:	155 LBS (71.7 KG)
DIMENSION (L/W/H):	21IN / 20IN / 24IN (53.3CM / 50.8CM / 60.9CM)
HORSEPOWER:	55HP
DISCHARGE OUTPUT:	250GPM @ 125PSIG @ 5000 RPM
SUCTION LIFT:	16 FT (4.9M)
FUEL CAPACITY:	6 U.S. GAL (22.7 LITERS)
FUEL TYPE:	LEAD-FREE GASOLINE (MINIMUM 69 OCTANE)

FIGURE 3-9-3



SPECIFICATIONS

MANUFACTURER:	HALE FIRE PUMP CO. CONSHOHOCKEN, PA
MODEL:	P-250 MOD 2
PART NUMBER:	545-2151-00-0
CONTRACT NUMBER:	N00104-88-G-0203
WEIGHT:	172 LBS (78 KG)
DIMENSION (L/W/H):	21IN / 20IN / 24IN (53.3CM / 50.8CM / 60.9CM)
HORSEPOWER:	40HP
DISCHARGE OUTPUT:	250GPM @ 125PSIG @ 5000 RPM
SUCTION LIFT:	16 FT (4.9M)
FUEL CAPACITY:	6 U.S. GAL (22.7 LITERS)
FUEL TYPE:	JP-5 (NMT: 2MG/L SOLIDS, 5PPM WATER) (LEAD-FREE GASOLINE - 69 OCTANE MAY BE USED IN AN EMERGENCY)

FIGURE 3-9-4

(c) Check fluid levels in the fuel tank and oil tank. Fill as necessary. The oil must be NMMA TCW-II.

(d) Attach fuel tank to the top of the pump frame. Connect fuel hose to fuel tank and open vent on the fuel tank cap.

(e) Check that oil is visible in the clear line attached to the variable ratio oiler (VRO) pump. If oil is not visible all the way to the VRO pump, lightly squeeze the oil primer bulb until it is visible.

(f) Prime fuel line by squeezing fuel line primer bulb until bulb is firm.

(g) Pull the engine carburetor primer 2 to 3 times to prime the carburetor.

(h) Prime the P-250 by operating the hand priming pump until water is discharged from the hand priming pump.

(i) Set throttle lever and START/STOP/RUN switch to the START position.

(j) Pull the manual start handle. Ensure exhaust gases are discharged to outside atmosphere. Do not run pump more than 20 seconds unless pressure shows on gauge. If not, stop pump, check all suction connections, prime and restart pump.

(k) When the pump discharge pressure exceeds 45 PSI and is stable, shift the START/STOP/RUN switch to RUN position.

(l) Adjust engine throttle lever and open the discharge valve slowly to obtain the desired pump discharge pressure.

(m) While the engine is running, occasionally check the discharge pressure. If pump is operated for more than 15-20 seconds with the discharge valve closed, the pump may begin to cavitate and speed up due to accumulation of air in casing. Open the discharge valve momentarily to allow trapped air to escape.

(n) To stop the pump, gradually return the throttle lever to the START position. Pull the fuel primer out for 5 seconds. After the engine has stopped, close the discharge valve.

(3) <u>After operating the P-250</u>. To restart the engine while still warm, shift the START/STOP/RUN switch to the START position and pull the manual starter handle. Priming should not be necessary. If the engine does not start immediately, prime the carburetor and crank until it starts. To store the engine, complete the following steps:

(a) Flush the pump by operating the unit in fresh water for 5 minutes.

(b) Slow the engine speed, move throttle level to the start position.

(c) Shut the discharge valve.

(d) Stop the engine by disconnecting the fuel hose, allowing the engine to run until fuel is burned out of the carburetor.

(e) Remove the fuel tank.

(f) Disconnect the suction, discharge, and exhaust hoses.

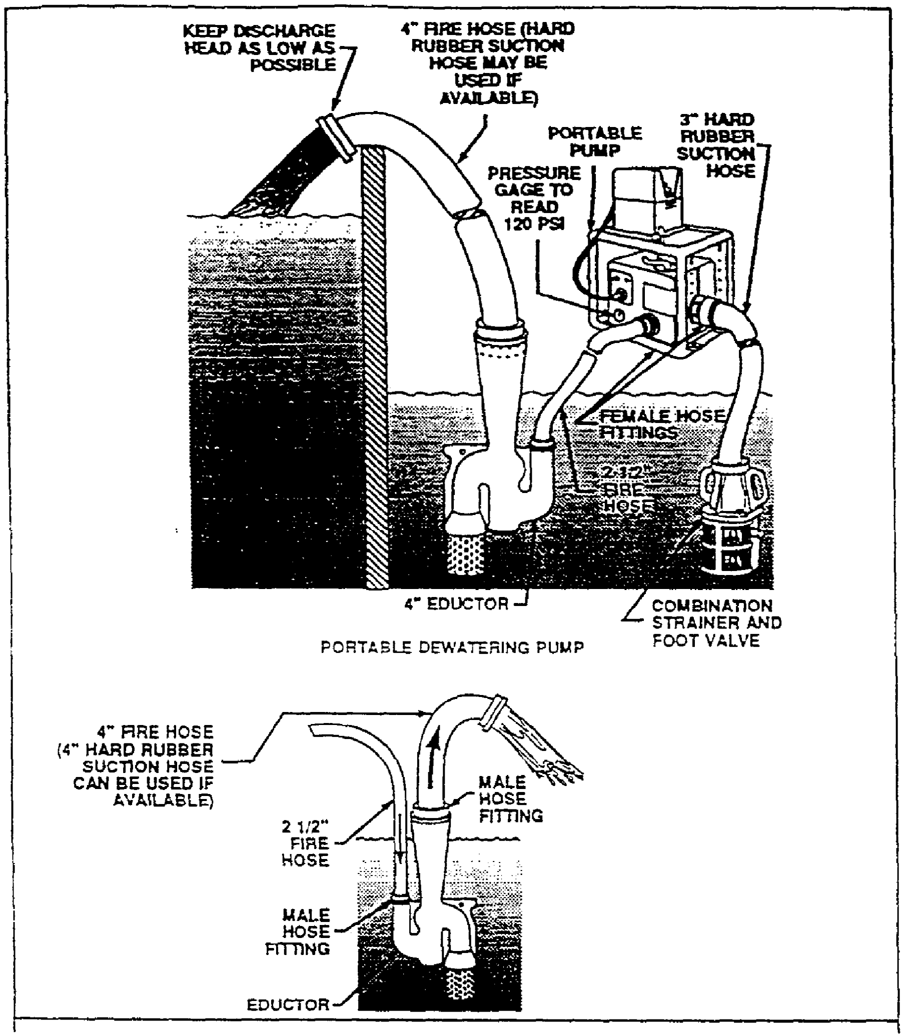
(g) Allow the water to drain from the pump casing.

(h) Spray pump internals with silicone compound.

(i) Replace the thread protectors on all connections and clean and dry entire unit.

(4) P-250 and eductor combinations

(a) Contaminated spaces may be dewatered using a P-250 to supply clean water to an eductor as in Figure 3-9-5. The P-250 is set up to take suction from an uncontaminated source and drive the eductor. The eductor is placed in the contaminated space and ejects contaminated water from that space.



P-250/EDUCTOR COMBINATION

FIGURE 3-9-5

3-9-5 PLASTIC PATCHING KITS

a. Plastic Pipe Patching Kit. Plastic pipe patching is suitable to make emergency repair of any size salt and fresh water piping and fittings or to repair holes, cracks and ruptures. Plastic patching does not require that special sizes or shapes be made up in advance. It adheres to steel, cast or malleable iron, copper, nickel, brass, bronze, galvanized metal and aluminum. Ruptures in pipes and fittings can be repaired and service restored to the systems with minimum loss of time. When properly applied and cured, the plastic patch:

(1) Possesses a high strength weight ratio.

(2) Possesses excellent adhesive qualities and vibration-resistance.

(3) Will repair not only holes and cracks, but also will mend complete breaks by joining the broken ends.

(4) Will seldom leak. If the patch leaks, an additional patch can be applied over the first, extended about 2 inches beyond its end.

b. The Kit. The metallic pipe and general purpose repair kit (plastic) is available in a kit which includes two assemblies. Each contains a synthetic thermosetting resin in paste and liquid forms with hardening agents and glass reinforcement.

(1) Assembly #1 - liquid resin for repair of metallic pipes.

(2) Assembly #2 - paste resin to patch holes in decks, bulkheads, flat surfaces or cracks.

(Note: The next generation plastic patching kits, the Emergency Water Activated Repair Patch (EWARP), will be outfitted aboard new construction MSC ships. Training information on the use of this kit will be provided with each kit.)

c. Chemical Reactions

(1) Stowage. As long as the resins and activators are kept in their individual closed containers, they may be stored for an indefinite period with no noticeable deterioration and without any reaction taking place.

(2) Stirring. Stir the resin as you would stir paint before using.

(3) Mixing. When the activator is added to the resin which has been mixed thoroughly for about 2 minutes and the two are stirred together, a chemical reaction takes place which generates heat. This heat generation occurs gradually at first, until the "kick over" point is reached. At this point, the temperature rises rapidly to its peak and then cools gradually. During the cooling period, the mass sets and hardens into the finished patch or repair. The peak temperature generated at "kick over" is 350°F. The time required for completion of the chemical reaction cycle is governed by the temperature of the materials when mixing, the temperature of the surface to which applied and the free air temperature. However, resin temperature is the most important. At 73°F, mixing time to hardening time will be 12 to 15 minutes. Higher temperatures shorten the time and lower temperatures lengthen the time required to apply a patch. Therefore, all materials must be cut, prepared and laid out ready for use in sequence before mixing the resin and activator.

(4) Curing time. When the patch has been completed and "kick over" has occurred, the time required for curing will depend largely on the mass of the patch.

(a) A thin patch of glass fiber tape and activated resin will take from 2 to 4 hours to cure and harden ready for normal service.

(b) A patch of one-half inch or thicker will generate more heat quickly and cure much faster 20 to 45 minutes.

(5) Setting. During the stage immediately following "kick over," the activated resin emits noxious fumes. It is in a state somewhat similar to liquid and flows freely. The mass of resin and impregnated reinforcing material is soft but, as cooling takes place, it sets as a result of the generated heat (thermosetting) and hardens into a solid homogeneous mass, impervious to water, oils, gasoline, dilute acids and many chemicals.

d. Pipe Preparation and Application of Plastic Patch

(1) Preparation of ruptured piping or fitting.

(a) Remove lagging (follow safety precautions if the lagging is asbestos).

(b) Clean and roughen surfaces removing all paint, grease, oil, scale, dirt or other foreign matter.

(c) Remove irregular projections. Use a hammer and chisel or coarse file to form a smooth fit over the break.

(d) The type and size of patch will depend on the size of pipe or where it is to be applied, and on the size of the rupture or leak.

(2) On a flat surface, a flat patch will consist of fairing compound molded over the rupture, covered by a sheet of glass cloth extending at least 2 inches beyond the fairing material all around and the whole area well brushed with activated resin. The patch may be backed up with a plate of wood, sheet metal or any rigid flat material held in place with suitable bracing.

(3) Liquid or paste resins may be used for flat patches or a combination of both used.

(4) On a pipe, the patch will include a void cover, woven glass roving cloth, activated resin and retaining cover.

(a) Woven roving cloth may be impregnated with activated resin and wrapped 3 or 4 times around the pipe.

(b) The amount of material required can be estimated easily by noting the size of the break. One unit of resin and activator is sufficient for the average rupture in pipes up to 3 inches in diameter. All material should be pre cut to speed application.

(5) <u>Application of materials to form patch</u>

(a) After brushing a coat of activated resin on the area surrounding the break, apply a precut piece of void cover which is at least 1 inch larger than the rupture all around and lash it securely in place with chalk line.

(b) Pour and spread or brush activated resin on woven roving cloth precut 1 inch wider at each end than the void cover and long enough to go completely around the pipe three or four times with overlap at the end. Apply the impregnated cloth over the void cover and smooth it in place.

(c) Apply a wrapping of kraft paper or PVC film extending several inches beyond both ends of the completed patch and going around the pipe and patch twice to retain the liquid activated resin in the patch and prevent its loss by dripping.

(d) Finally, take two turns of string around one end of the retaining cover and then wind the string diagonally around the patch to the opposite end. Take two turns tightly around the end and wind the string diagonally back to the beginning and tie it off. The patch is now complete.

e. <u>Safety Precautions</u>. Personnel handling plastic pipe patching materials must protect themselves from its fumes and from the harmful effects of these materials on the skin. The following precautions must be observed.

(1) Apply petroleum jelly to the exposed skin of hands and wrists before mixing the resin.

(2) Wear goggles to protect the eyes from fumes.

(3) Wear neoprene rubber gloves furnished in the kit when handling glass fiber materials and activated resin.

(4) Personal cleanliness is important. After completing the patch, wash gloves and tools thoroughly in warm soapy water.

(5) When using plastic pipe patching materials in enclosed areas, use a forced air supply and exhaust ventilation to remove noxious fumes.

(6) Avoid breathing noxious fumes given off during the curing period.

(7) Avoid spilling plastic materials. Keep kraft paper under the patch to catch any spilled or dripping materials.

f. Plastic repair kits should be stowed, if possible, in a cool place because of the effect of temperature on working time from mix to "kick over." If kits are kept cool, more time will be available for making an emergency patch before the plastic "kicks over."

3-9-6 OTHER PATCHES

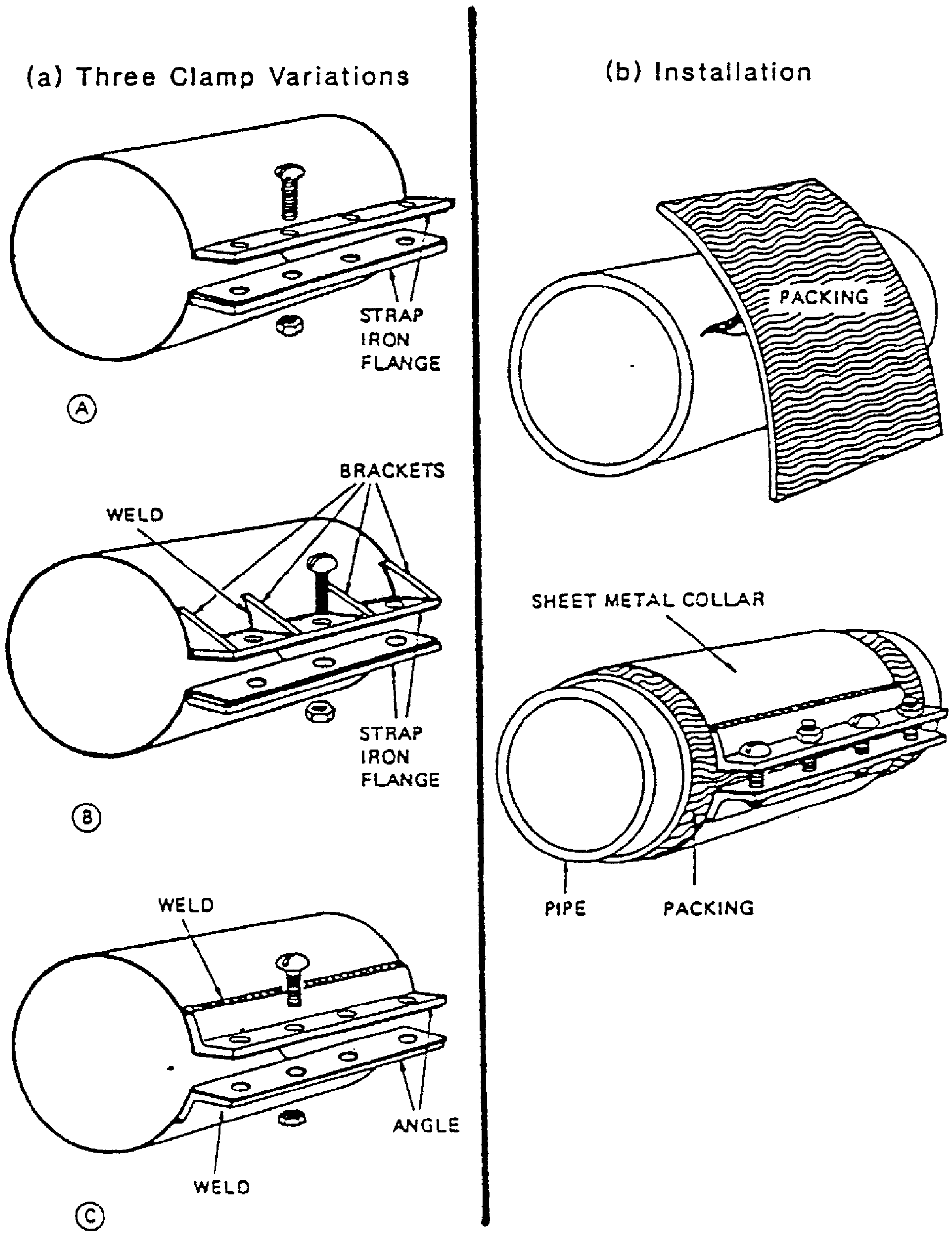
In an emergency, almost anything can be used to patch holes or ruptures. Patches described below are just a few of many possible patching methods. NSTM, Chapter 079, Volume 2, provides detailed information on these and other method of patching.

a. Jubilee Patch. The jubilee pipe patch is made from sheet metal and angle iron, can be used as in Figure 3-9-6.

b. Plate. Large ruptures in flat bulkheads or the ship's plating can be patched with plate.

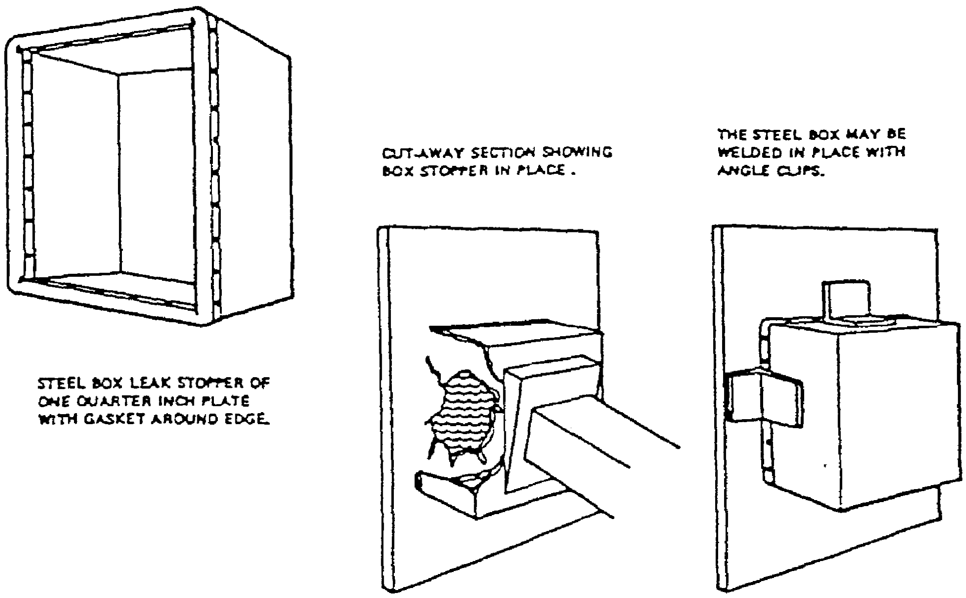
c. Box and Bucket Patches. Smaller ruptures in flat surfaces can be patched using box or bucket patches. These patches have the advantage of fitting over jagged edges which protrude inward. (Figure 3-9-7)

d. Soft Patches. Soft patches made of wood wedges, oakum, sheet rubber and marline, wire or banding may be used to stop leaks from small holes and cracks in low pressure (150 PSI) piping. A common method is to use softwood wedges driven into the pipe. They should not be driven in too far or they will retard the flow of fluid. After they are driven in to reduce the area of the hole, the wedges are trimmed flush with the outside of the pipe and covered with a strip of sheet or rubber packing tightly bound in place by two layers of marline or wire. The packing must extend 2 inches on either side of the hole. A curved plate of light sheet metal can be used between the packing and binding to increase strength. This is illustrated in Figure 3-9-8.



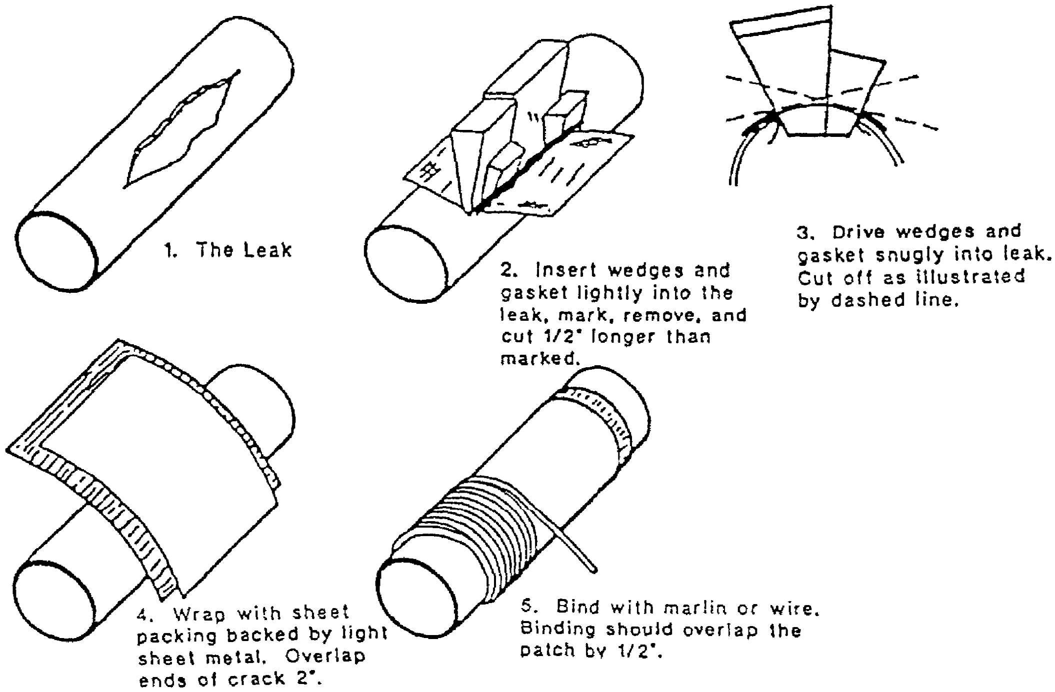
JUBILEE PIPE PATCH

FIGURE 3-9-6



BOX PATCH

FIGURE 3-9-7



SOFT PATCH ON LOW PRESSURE PIPE

FIGURE 3-9-8

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 10

PRINCIPLES OF SHORING

3-10-1 REFERENCES

a. Naval Ships Technical Manual, Chapter 079, Vol. 2, Practical Damage Control

b. Damage Controlman 3 & 2, NAVEDTRA 10572

3-10-2 INTRODUCTION

a. Definition. Shoring is the action of placing supports against the side of, beneath or above a structure to counteract metal fatigue and sagging. Any time a part of the ship's structure has sustained damage and needs support, it should be shored. Shoring, as an emergency temporary measure, is used to:

(1) Strengthen or brace weakened bulkheads.

(2) Support weakened decks.

(3) Seal off sprung watertight doors or hatches.

(4) Support, and apply pressure to, a strongback over a patch.

b. Terminology

(1) Shore - A portable beam. MSC ships use both wooden and steel shores.

(a) Wooden Shores. The best shoring is Douglas fir or yellow pine. All shores are treated with fire resisting chemicals and should never be painted. The length of a wooden shore should never exceed 30 times its minimum thickness. For example, a 4" timber, multiplied by 30 equals 120" or 10 feet. The weight carrying ability of shoring will vary depending on the type of wood utilized and the age and condition of the timbers.

(b) Adjustable Steel Shores. Adjustable telescoping steel shores are available in the following models.

1. Model 3-5 - Adjustable from a minimum of 3 feet to a maximum of 5 feet. These shores can carry a load of 20,000 lbs when adjusted to 3 feet and 12,000 lbs when adjusted to the maximum of 5 feet.

2. Model 6-11 - Adjustable from a minimum of 6 feet to a maximum of 11 feet. These shores can carry a load of 20,000 lbs when adjusted to 6 feet and 6,000 lbs when adjusted to the maximum of 11 feet.

(c) Semi-permanent Steel Shores. Repairs of a more permanent nature may be effected with steel members such as pipes, boxes and angle and "I" shapes. Although these shores usually are welded in place, most principles of shoring still apply.

(2) Wedges - Wedges are triangular on the side and rectangular on the butt end. Length should be six times thickness. Wedges are of straight grained soft wood, unpainted to permit absorbing water.

(3) Plugs - Of hard wood for plugging cracks, small holes and leaking seams.

(4) Shole - A flat plate or section of wide plank placed under the end of a shore to distribute weight or pressure.

(5) Strongback - A bar or beam of wood or metal used to distribute weight or pressure or serve as an anchor for a patch.

3-10-3 RULES FOR APPLYING SHORING

a. Objective. Because shoring is simply bracing ships members to withstand excessive pressure, it is obvious that no two shoring jobs will be handled in exactly the same manner. Available and "make do" equipment and the situation will govern the methods used. However, the following principles will serve as guides.

(1) Pressure must be taken up over a wide area.

(2) Each horizontal shore must be backed up by more shores exerting pressure at right angles to the bulkhead.

(3) Butt ends of shores must rest snugly against undamaged strength members.

(4) The weakened area must be supported from the deck beneath, or all the way down to the tank tops, if necessary.

(5) Shores must form a considerable angle with the bulkhead they are supporting. The larger the angle up to 90 degrees, the greater the shore's effectiveness.

(6) Use sholes under ends of shores. Where they must be placed against riveted joints, chisel pockets to take exposed rivet heads and thus prevent splitting of shore ends.

(7) Methods of applying wedges

(a) Always use two wedges, driven simultaneously from both sides to prevent tilting the shore.

(b) Use a block of wood or a batten between the butt of the wedge and the maul to prevent splitting wedges.

(c) If the deck is slippery, as from fuel oil, use sand or non-skid strips under the wedge to reduce its tendency to slip.

(d) When setting up wedges before driving, insert them with their slanting sides together so they will form a rectangular shape when driven up.

(e) If there is not enough room to swing two mauls, the same effect can be obtained by holding a maul hard against the butt of one wedge and driving on the other.

(f) Cleats may be nailed behind the butts of wedges after driving them up hard to prevent them from slipping.

(8) Never notch the ends of shores as this will cause the shore to split under pressure. Instead, cut a socket or chamber in the strongback into which to set the butt of the inclined shore.

(9) Avoid the use of nails in shores wherever possible. They add no strength and can cause the wood to split.

(10) Set shoring up tight; post a man to take up on wedges as the ship works when underway; re-check frequently and take up any slack that develops.

b. Tools and Equipment for Shoring. MSC ships have standard allowances of shoring, wedges and tools. Shoring is stowed in at least two locations in the ship, forward and aft. Tools and materials include:

(1) Hammers, mauls and sledges

(2) Hatchets, axes, chisels.

(3) Saws (circular electric power, rip and crosscut).

(4) Battens, wooden plugs, clamps.

(5) Turnbuckles, chainfalls, jacks.

(6) Mattresses, pillows, canvas and, rope.

(7) Bolts, nuts and washers.

(8) Portable Exothermic Cutting Unit (PECU) and welding equipment.

(9) Measuring battens, folding ruler, tape measure and carpenter's steel square.

c. Preparation and Stowage of Shoring

(1) Keep full allowance of shoring material on hand. Use dunnage for instruction and drill purposes.

(2) Never attempt to cut or prepare shores in advance of need.

(3) Stow materials where easily accessible in pockets between frames girders secured with lines or metal clips. Shoring must be secured so that it cannot break loose but must be easily removable when needed.

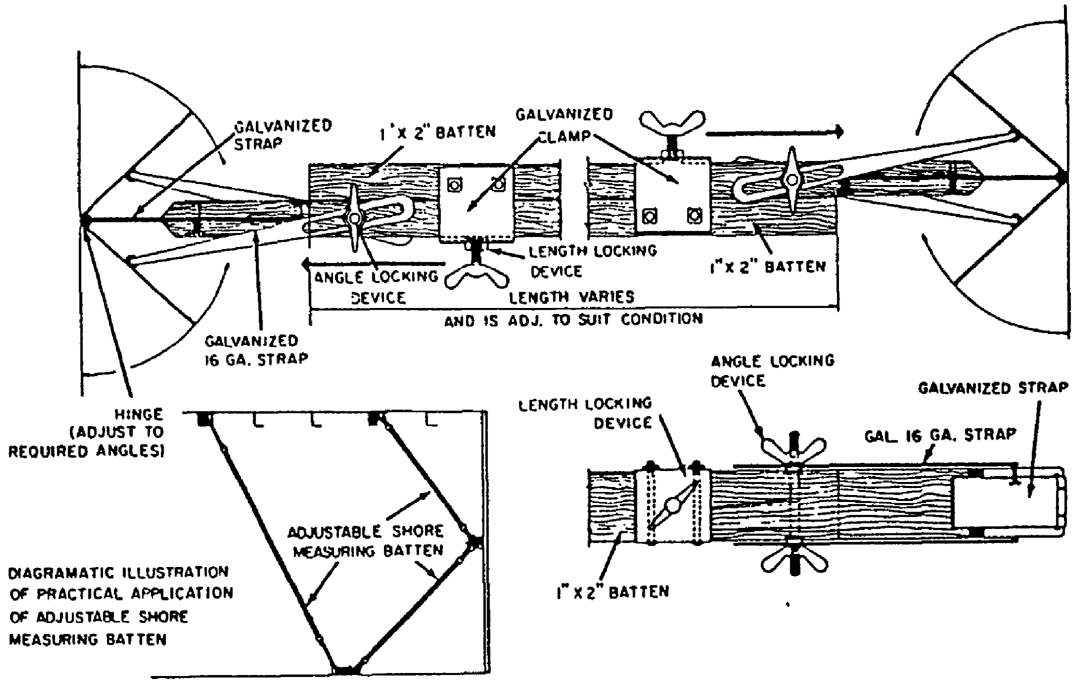
(4) Wooden wedges should be made up into blocks by nailing a batten on their sides.

(5) Plugs should be kept in a canvas bag secured to a beam or stanchion or stowed in metal boxes.

d. Emergency Shoring Material. In an emergency, any equipment aboard ship which will serve the purpose should be used to effect temporary repairs. Metal plates, pipe, bars and I beams can be used for semi permanent shoring when there is time to weld it in place and a repair facility is not available.

3-10-4 USE OF MEASURING BATTEN FOR CUTTING SHORING

The measuring batten, Figure 3-10-2, is put into the desired location for the shore and adjusted to length and required angles. The length and angles are locked in place and the batten removed from the shore position. Mark the length positions if the batten must be shortened to remove it from its position and lock the length to the mark when ready to cut the shore. Shorten the batten by 1/2" to allow space for wedges when putting the shore in place. Lay the measuring batten on the shore stock with the hinges at each end on the centerline and mark each end. Cut each end of the shore.



MEASURING BATTEN

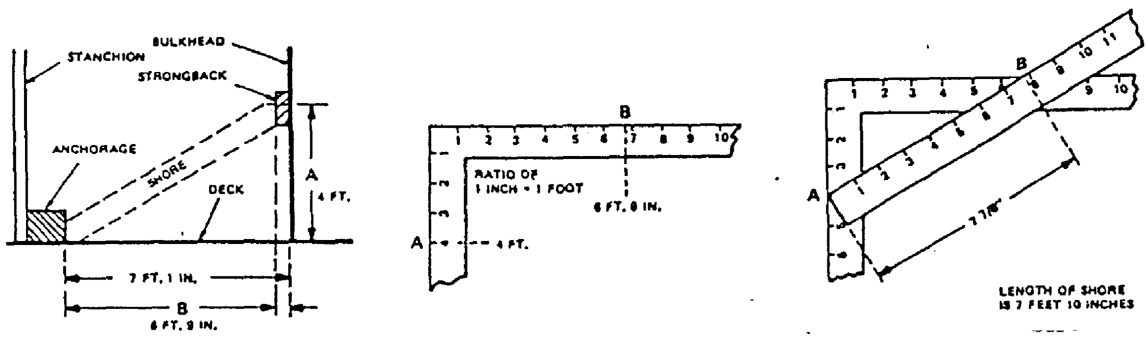
FIGURE 3-10-1

3-10-5 USE OF CARPENTER'S SQUARE FOR CUTTING SHORING

a. Carpenter's Square. When a measuring batten is not available or is too long or too short to measure for shores, carpenter's steel square can be used to make and cut flat snug pressure surfaces.

b. Determining Length of Shore (Figure 3-10-3)

(1) Measure the distance "A" from the center of the strongback to the deck. Then measure the distance "B" from the edge of the anchorage to the bulkhead, minus the thickness of the strongback.



DETERMINING THE LENGTH OF A SHORE

FIGURE 3-10-2

(2) Lay off on a carpenter's square the measurements "A" and "B" using the ratio of 1 inch equals 1 foot.

(3) Measure the diagonal distance between "A" and "B." This is the length of the shore in feet.

c. Cutting the Shore. Angle cuts may be determined as shown in Figure 3-10-4.

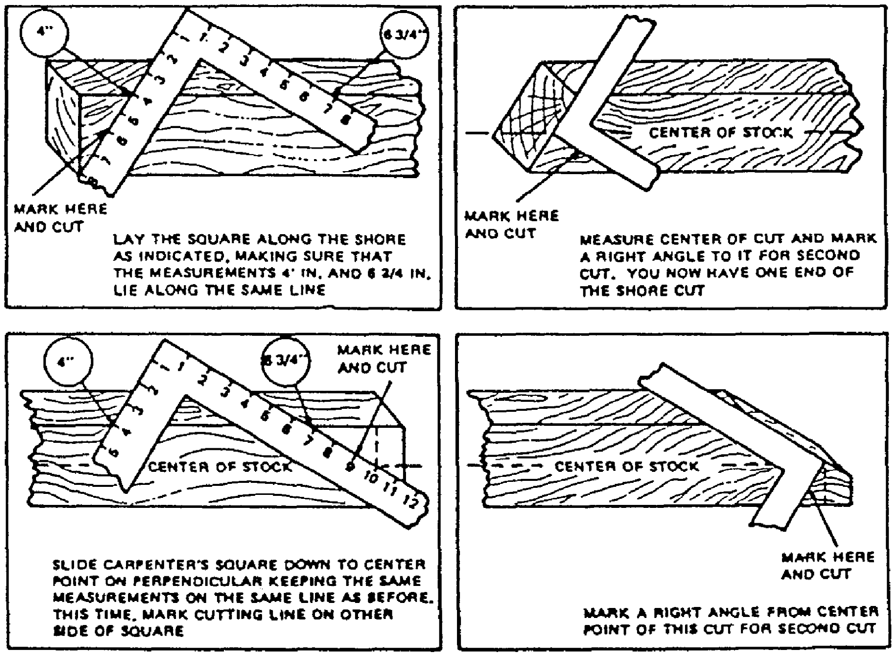
(1) Lay the carpenter's square along the shore as shown in step 1 of Figure 3, making sure that the measurements, 4 inches and 6 3/4 inches lie along the same line. Cut shore to this line.

(2) Measure the center of the cut and mark a right angle to it for the second cut. Work and saw to the line. One end of the shore is now cut.

(3) Along the center of the stock, measure the desired length of the shore, 7 7/8 feet, and mark off a perpendicular line at the other end of the stock.

(4) Slide the carpenter's square to the center point on the perpendicular, keeping the same measurements on the same lines as before. Mark the cutting line on the other side of the square.

(5) Mark a right angle from center point of this cut for the second cut. Make these cuts and the shore will be the proper length with the correct angle cuts.

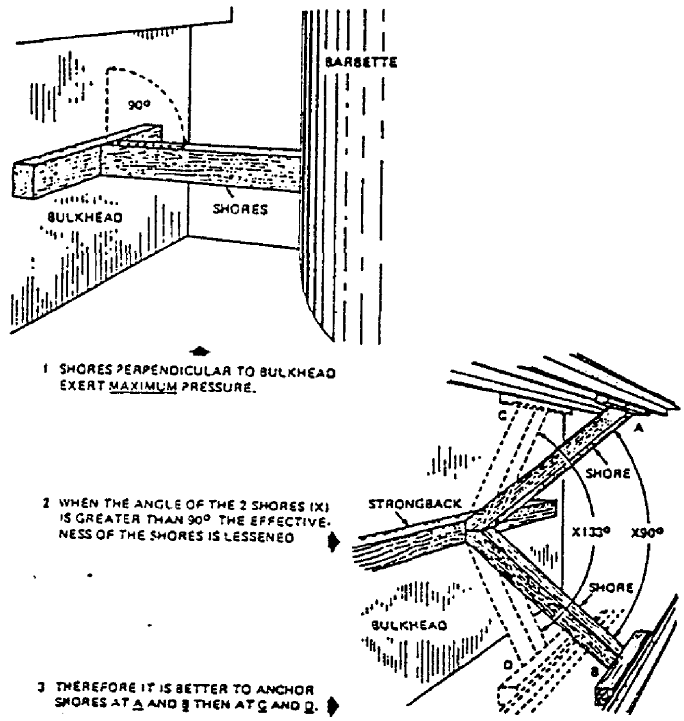


CUTTING THE ANGLES OF A SHORE

FIGURE 3-10-3

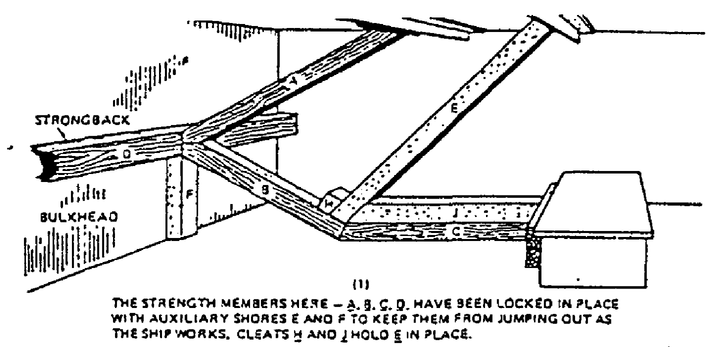
3-10-6 PLACING OF SHORING

a. Placement. The effectiveness of shoring depends on correct placement. The simplest and strongest shoring is at a 90^{o} angle to the bulkhead, overhead or member being shored, as in the top of Figure 3-10-4. Where this is not possible, a "K" structure is used to transfer pressure from the middle of a bulkhead to the deck and overhead. This type of shoring structure should not exceed 90^{o} between the upper and lower shore for maximum strength. This is shown in the lower part of the same figure. For longer shores, additional support may be required to prevent bowing. Several ways to provide this support are shown in Figure 3-10-5.



CORRECT SHORING ANGLES.

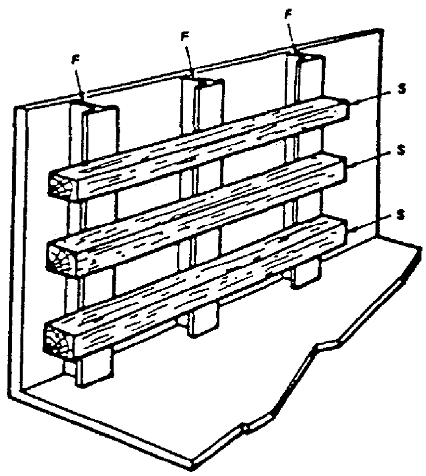
FIGURE 3-10-4



STRENGTHENING SHORES.

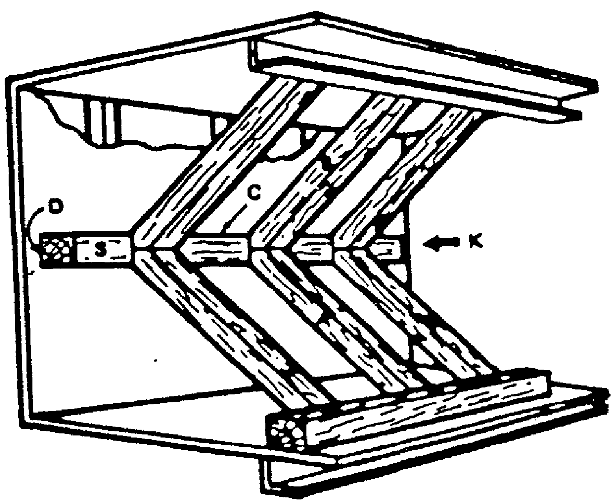
FIGURE 3-10-5

b. <u>Planning</u>. The pressure on a bulkhead must be spread over a wide area to prevent concentration at the end of a shore. Multiple strongbacks (S) (shown in Figure 3-10-6) spread the pressure over several frames (F) to prevent failure that might occur at a single point. Several sets of shores may be required (Figure 3-10-7) to provide adequate support and spread the pressure on the bulkhead. Shores (A) and (B) alone would concentrate pressure at (C) with none at (D). Use of additional shores provides uniform pressure and maximum support for the bulkhead.



SPREADING BULKHEAD PRESSURE

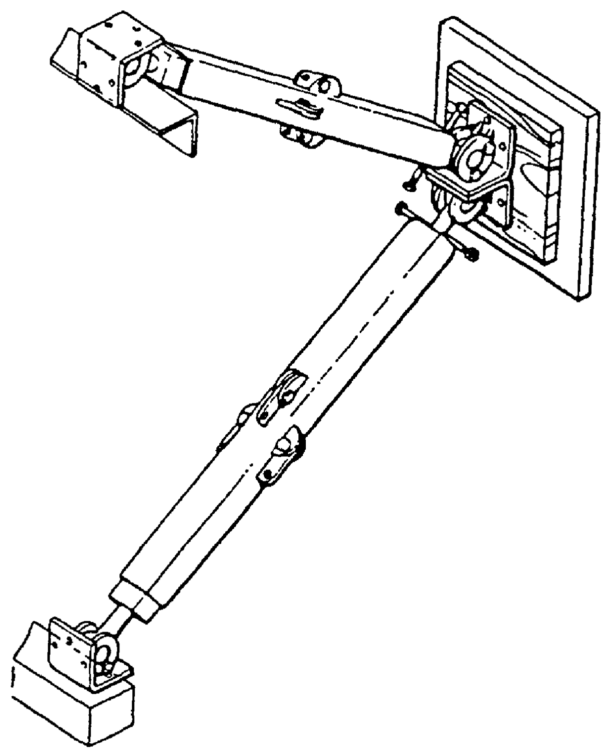
FIGURE 3-10-6



MULTIPLE SUPPORTS

FIGURE 3-10-7

c. Adjustable Steel Shores. Steel shores are used in almost the same way as wood shoring. Steel shores have a rough adjustment using latches and a screw mechanism for final adjustment in place. Holes in each end piece can be used to nail the shore to a shole to prevent slipping or to bolt two shores together when forming "K" shoring. Use of steel shores to support a patch is shown in Figure 3-10-8.



STEEL SHORING

FIGURE 3-10-8

PART 3

DAMAGE CONTROL GENERAL INFORMATION

CHAPTER 11

STABILITY

3-11-1 REFERENCE

Naval Ships Technical Manual, Chapter 079, Vol. 1, Damage Control Stability and Buoyancy

3-11-2 SHIP'S STABILITY

Stability is the ability of a ship to right itself when displaced from its original position of equilibrium. When a ship does not return to this equilibrium point or the equilibrium point changes, the ship is at greater risk of capsizing. Because of this, maintaining ship's stability is a critical component of overall damage control. Although all ships are effected by the same fundamental principles of stability, each ship, based on its hull form, displacement and cargo load out, has its own individual stability characteristics. The chances of survival in a casualty situation, particularly flooding and collision, are greatly increased if the ship's officers are familiar with these characteristics and are able to take corrective action based upon this knowledge.

3-11-3 PRINCIPLES OF STABILITY

a. Basic Principles

(1) Every modern ship has a formal displacement curve plotted by her architects from the lines and dimensions of her hull. This graph is provided to the Master at delivery. The ship's weight or displacement, is determined by taking the average of the bow and stern drafts which are the vertical distances between the water line and the keel. With this information the displacement can be determined. The displacement is the sum of the ship's weight plus everything aboard. Conversely, using the displacement curve the draft under any given load can be determined.

(2) A modern oceangoing ship is basically a floating steel box. Because this box must have the ability to remain afloat under all probable conditions, the hull of a modern steel vessel is compartmented by watertight, transverse divisions, called bulkheads. If, through collision, explosion or other circumstances, one section of the hull is flooded, the other compartments are designed to maintain sufficient buoyancy to keep the vessel from sinking. Highly compartmented ships, such as tankers, have even been sheared in two by collision and the individual parts have remained afloat.

(3) A ship must be designed for buoyancy, stability and strength. Stability - the tendency of a ship rolling from side to side always to return to an upright position like a rocking chair or a weighted doll - is the second vital element which must be part of a vessel's design. Symmetry is an initial condition. The architect plans port and starboard sides of the hull as mirror images of each other. To know in advance the total weight of the ship and the exact distribution, designers tabulate everything that goes into the ship from the huge power plant to the crew's bunks.

(4) Buoyancy and Gravity are the two forces acting on a ship as it floats at rest. The water pushes all around on the submerged hull (small arrows, Figure 3-11-1). The total push acts as a single upward buoyant force, B, exerted at the center of the submerged part of the hull. The downward force of gravity is equal to the weight of the ship and everything in it (small arrows, Figure 3-11-2). The total force, G, is exerted at approximately the center of the ship. These two forces, operating in opposite directions, which affect the stability of every ship. When a ship is at anchor in a placid harbor, its center of gravity is located directly above its center of buoyancy on the vertical center line of the vessel.

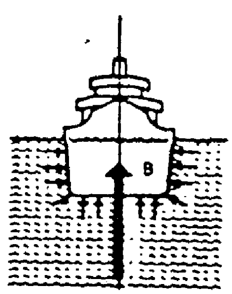


FIGURE 3-11-1

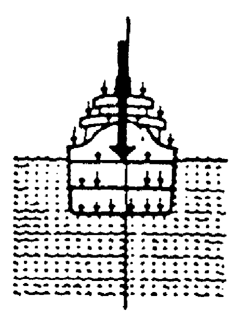


FIGURE 3-11-2

(5) If a wave from a passing vessel causes a ship to heel momentarily, the positioning of B and G changes. If the tilt is to starboard, for example, the center of buoyancy is transferred laterally to the right. The relationship between the centers of buoyancy and gravity now becomes vital. If the center of gravity is sufficiently low, it will be to the left of the center of buoyancy, and the downward force of gravity and the upward force of buoyancy combine to push the vessel back to an upright position.

(6) A stable ship is one that can right itself if it is heeled over. When it is upright, the ship's center of gravity, G, and buoyancy, B, are in line (Figure 3-11-3). When the vessel is tilted, B moves in the direction of the slope so that its upward push combines with G's downward force to right the ship (Figure 3-11-4). This stability is measured by the position of the metacenter, M, a theoretical point when the upward force B meets the ship's vertical midline. The position of M above G here indicates good stability. If the center of gravity is too high, it will be to the right of the center of buoyancy. Now the downward and upward forces are combined to aggravate the heel and the ship may capsize.

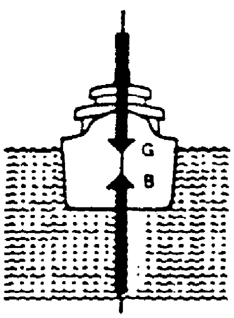


FIGURE 3-11-3

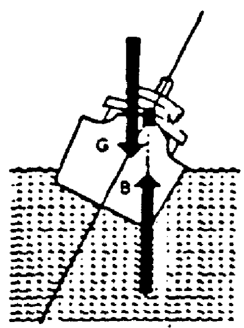


FIGURE 3-11-4

(7) An unstable ship will not returns to a normal upright position when tilted. Because the vessel is top-heavy, B and G are located much farther apart then they would be on a stable vessel (Figure 3-11-5). When the vessel tilts, (Figure 3-11-6) the force of G shifts toward the direction of the slope; together the two opposing forces act to heel the ship even farther until it capsizes. The metacenter M, instead of being above G as in a stable ship is well below.

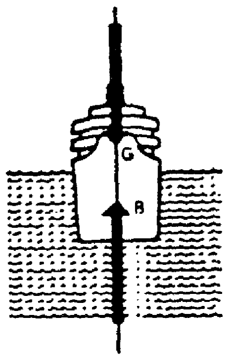


FIGURE 3-11-5

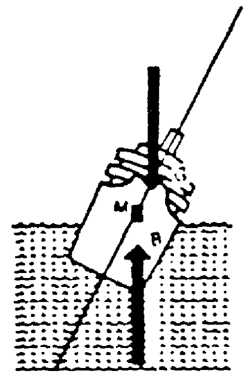


FIGURE 3-11-6

(8) Pierre Bouguer, a French mathematician and a founder of modern naval architecture, worked out a practical means, still in standard use, for evaluating the stability of a ship. Bouguer's concept was based on a point he called the metacenter, located at the intersection of the center line of the hull and a vertical line through the center of a listing ship. The distance between the metacenter, M, and the center of gravity, G, Bouguer proved, would measure a ship's stability. This distance, usually referred to as GM, is a matter of prime concern to the designer. If G is above M, there is danger of capsizing. If the GM is small, i.e., the center of gravity is below, but still too close to M, the ship will make long, slow rolls and may readily capsize in the event of a collision. However, if G is too far below M, the vessel will be "stiff" and jerk back to the upright, possibly damaging the cargo and injuring the crew and passengers. A safe GM for the average fully loaded merchant ship is about 5 per cent of her beam.

(9) The center of gravity is dependent upon distribution of weight in the ship and therefore shifts with each addition or unloading of cargo, with each fueling and with each hour's consumption of fuel at sea. It is the job of the ship's architect to take all such factors into consideration, to calculate the position of M and then forecast the vessel's GM value under all foreseeable situations and conditions.

(10) Before a ship goes to sea, she is put through an actual test to verify her calculated stability. First, tracks are installed across the ship's deck. A jumbo truck carrying several tons of weight is put on the tracks and rolled to one side of the ship or the other, thus causing the vessel to list. At various positions of the truck from the center of the ship, the designer measures the angle of inclination of the heeling. A trigonometric equation gives him the result he seeks; confirmation of the

architects estimated value of GM and hence the precise location of G. With this information, the GM from minimum to maximum load condition can be calculated. These data provided to the ship's officers.

(11) Definitions

(a) Force. A force may be thought of as a push or pull. A force has direction as well as magnitude and is measured in pounds, tons or similar units.

(b) Moment. The moment of a force about an axis is equal to the product of the force and the perpendicular distance from its line of action to the axis. Figures 3-11-1 and 3-11-2 (in which the moment axis may be considered to be perpendicular to the paper through the point of rotation) illustrate moment. A moment is measured in foot pounds, foot tons or similar units.

(c) Center of Gravity (CG). The center of gravity of an object is the point through which the total weight of the object may be considered to be acting.

(d) Center of Buoyancy (CB). The center of buoyancy of a submerged object is the point through which the total buoyant force of the object may be considered to be acting.

(e) Equilibrium. In order for a body to be in equilibrium, there must be no unbalanced forces or moments acting on it. A good example of equilibrium is the see-saw in Figure 3-11-4. Here the upward supporting force of the see-saw balances the downward weight forces of the man and boy at the pivoting point. In addition, the clockwise moment exerted by the man is balanced by the counterclockwise moment exerted by the boy.

(f) Ship Stability. A ship which is inclined from its normal upright position and tends to return or right itself is said to be stable. A ship is said to be unstable when, after being inclined by a slight force, it continues to incline, possibly until it capsizes. The righting ability of a ship is determined by its underwater hull form, its built in weight distribution and by its variable weight (e.g., cargo, fuel or ballast) stowage. An initially unstable ship may sometimes incline until it reaches a point of stable equilibrium because of the change in underwater hull form as it inclines.

(g) Effects of Weights. Any weight added, removed or shifted in a ship may affect its stability. The location of these weights has a definite relationship to the resultant stability. Furthermore, the addition of liquids, such as water from flooding or firefighting, may have a detrimental effect on stability separate from any weight effects. This is due to the virtual rise in a ship's center of gravity caused by large amounts of liquid free surface in the ship. (Free surface effects in slack tanks produce the same results and, therefore, should be minimized.)

b. <u>The Stability of a Ship</u>

(1) <u>Ship Upright</u>. In order for a ship to float, the weight of the ship (W) acting downward through its center of gravity must be balanced by the buoyant forces acting upward through the center of buoyancy of the hull. Furthermore, if no wind and wave forces are acting on the ship and the CG is directly above the CB (Figure 3-11-7) so that the weight and buoyant forces act in the same vertical line, the ship will float upright with no tendency to heel.

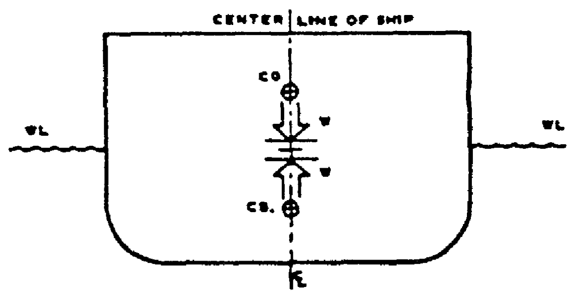


FIGURE 3-11-7

(2) <u>Ship Heeled, Righting Moment</u>. Unless weight is added, removed or shifted in a ship when it heels, the location of its center of gravity does not change. However, its center buoyancy shifts to a new position (Figure 3-11-8) away from the centerline in the direction of heel. Bearing in mind that the center of buoyancy is the center of gravity of the water displaced by the hull, its change in position is a result of the change in shape of the displaced water as the ship heels. In contrast to the ship when upright, as depicted above, the weight of the heeled ship acting downward through the center of gravity and the equal upwards, buoyant force acting through the relocated center of buoyancy now form a couple with an arm, GZ, creating a righting moment. This righting moment equals W x GZ and tends to return the ship to its upright position.

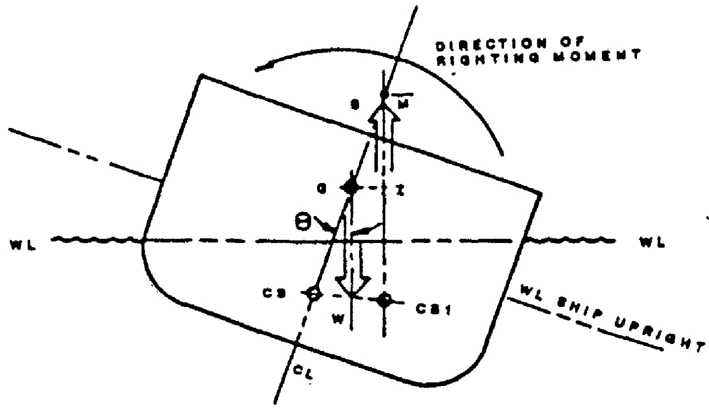


FIGURE 3-11-8

(3) Initial Stability, GM. Note that in Figure 3-11-8 the distance GM is a function of the righting arm GZ. Therefore, GM is also a measure of the ship's righting ability. The point M is the transverse metacenter of the ship and GM is known as the metacentric height. The length of the righting arm GZ, and therefore the metacentric height, is determined solely by the shape of the hull. Within a limited heel of up to 10 or 15 degrees, GM is a measure of the ship's initial stability and can be expressed as follows:

$$GM = \frac{GZ}{\text{Sin } \phi \text{ (of heel)}}$$

Now if the value for GZ was substituted in the expression for righting moment, W x GZ, the ship's righting moment when initially heeled would become equal to W x GM x sin ϕ.

(4) Unstable Ship. A ship which will tend to right itself when heeled is a stable ship. However, during normal operations, because of changes in the amount and/or location of variable weights aboard, a ship may lose this ability to right itself when heeled. Figure 3-11-9 shows the characteristics of an unstable ship. As indicated, the center of gravity is above the metacenter and the moment (W x GZ = W x GM sin ϕ) now tends to increase the heel rather than oppose it as in the stable ship of Figure 3-11-8. The addition of topside weight such as ice or deck cargo or the removal of weight low in the ship, by burning fuel oil or using fresh water, will raise the center of gravity and may result in an unstable condition.

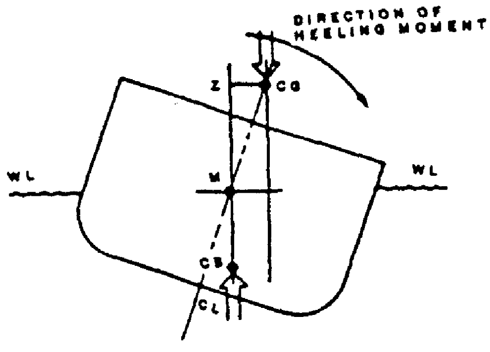


FIGURE 3-11-9

(5) In summary, the stability of a ship is determined by the weight distribution of the ship and by the buoyant forces acting on the hull which in turn are determined by the underwater shape of the hull. It is in controlling the weight distribution in the ship that the ship's officers control its stability. The stability problem which must be solved involves the ship's vertical center of gravity as determined by the various weights and their locations. The procedure for solving the stability problem is as follows.

(a) Find a starting condition for which the displacement and locations of the centers of gravity and buoyancy can be determined.

(b) Correct the starting condition by adding or subtracting weights as appropriate so that the actual or anticipated condition is reached.

(c) Determine whether the new center of gravity is above or below the metacenter. The center of gravity must be below the metacenter for the ship to be stable.

(d) If the ship is stable, determine whether the available GM is adequate for the anticipated voyage or applicable regulations. If it is not (or if the ship is not stable), action must be taken to lower the ship's center of gravity and thereby increase the GM.

3-11-4 FACTORS AFFECTING STABILITY

a. Mechanical Relationship between Center of Gravity and Center of Buoyancy

(1) Center of buoyancy depends upon the shape of the immersed watertight hull; it changes with:

(a) <u>Wave profile</u>

1. Longitudinal differences cause pitching.

2. Transverse differences cause rolling.

(b) Damage to watertight shape of the hull which may flood:

1. Compartments centered in the ship, causing no change in trim.

2. Compartments on one side of the ship, causing off center shifting of the center of buoyancy, and change in trim.

(c) Center of buoyancy cannot be controlled directly by ships' officers. It can be controlled indirectly:

1. By changing the effect of waves through course and speed changes.

2. By maintaining the watertight envelope.

(d) <u>M & GM</u>. At small angles of heel, the intersection of the vertical line through the center of buoyancy with the centerline plane of the ship is a point, designated as the metacenter or "M." The distance between the ship's center of gravity, CG, and M is the metacentric height, GM. As can be seen from the geometric relations shown in Figure 3-11-10, the righting arm, GZ, is proportional to the sine of the angle of heel.

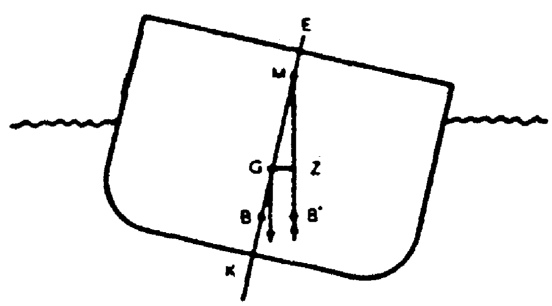


FIGURE 3-11-10

(e) <u>Curves of Form</u>. The designed characteristics of the ship which contribute to the ship's buoyancy and stability are described by a plan called the "Curves of Form" or "Hydrostatic Curves of Form." These curves indicate, for any draft, the ship's displacement, tons per inch, the moment to trim 1 inch, the location of the center of buoyancy above reference point KB and the angles of heel (Metacenter) above reference point K. These locations are shown from both longitudinal and transverse axis, therefore, care must be taken to use the transverse centers when transverse stability is considered. These curves in tabular form are included in the Trim and Stability Booklet.

(2) Center of gravity depends upon the distribution of weights in and on the ship. These include:

(a) Cargo distribution

1. Shifts ship's CG vertically, transversely and longitudinally.

2. Due to the weight of cargo, the influence of loading is usually a large and important factor.

3. For a given leg of a voyage, the cargo is a weight that is not normally considered to be under control of ships' officers.

4. Shifting of poorly stowed cargo while at sea may result in changing the ship's center of gravity, causing heel and a possibly dangerous condition in addition to internal damages.

(b) Operating weights

1. As a result of operation, weights, of fuel, water and stores are consumed which, due to location and size, cause important changes in the center of gravity, usually raising it and therefore reducing the GM and subsequently the righting arm.

2. Tanks emptied may be off center, giving the ship a heel to one side.

3. If counterbalancing tanks are used, both may be slack, permitting liquid to move from side to side freely, causing changes in the virtual CG.

a. Since for small angles of roll, the amount of liquid that can move depends primarily on its surface area, this effect upon the CG is called "free surface effect." The Trim and Stability Booklet contains tables showing the effect of liquid shifting in each of the ship's tanks.

b. Free surface effect also depends upon the unfilled space which permits the movement of the liquid. Free surface effect can be reduced by pressing up the tank.

c. Due to their location in the bottom of the ship, fuel tanks are particularly important. When they are emptied, the ship's resulting center of gravity rises, reducing the righting arm. Filling these tanks with salt water ballast results in maximum improvement in stability by adding weight low in the ship, and eliminating free surface by filling the tanks up their fullest extent.

(c) Special weight problems in cargo handling. Cargo being loaded with the ship's booms is a special problem, particularly heavy lifts. The lift is concentrated at the head of the boom as soon as the weight is supported by the gear, therefore it has an unusually high vertical lever. The large transverse lever has a corresponding effect on the ship's CG. The combined effect of vertical and transverse levers results in an unusually large shift in the ship's CG and lessening of available stability. Cargoes such as grain, coal and ore may act like a fluid, shifting under the ship's roll and causing off center weights. These must be secured against movement.

b. Grounding or Dry-docking. These are special cases of ship stability since:

(1) The weight of the ship is supported partially by the sea bottom, rocks or dry-dock blocks instead of water.

(2) The support, if off center, would cause a heeling moment, which may change as the water level changes with tide or dry-dock level.

(3) Grounding must be considered as an individual problem. Unless the ship cannot be refloated quickly by lightening, grounding is a problem for the salvage teams. The ship must be kept from pounding if possible, by flooding if necessary.

(4) Loss of stability due to faulty support by the dry-dock will be indicated by the ship taking a heel independently of the dry-dock attitude. The dockmaster should be notified as soon as heel is noted since the ship must be refloated to correct the support.

c. Ship Design and Damage Resistance

(1) A ship is designed and built so as to be able to survive the casualties that experience indicates may be encountered.

(2) The two essential factors of survival are buoyancy and stability. A damaged ship may have enough buoyancy to float upside down, yet it cannot be considered to have survived the damage.

(3) Buoyancy of a ship is built into the hull by providing, in addition to a watertight shell:

(a) Transverse watertight bulkheads. The spacing of the watertight bulkheads is arranged so that the loaded ship, if damaged in one or two watertight compartments, would not sink beyond an arbitrary margin line located 3 inches below the bulkhead deck.

(b) These bulkheads are joined longitudinally by one or more decks. The uppermost continuous deck to which the transverse watertight bulkheads extend is designated as the bulkhead deck. This deck may be either continuous or stepped in way of transverse bulkheads, extending above the deck such as in ships with forecastle, poop and well deck. The bulkhead deck, where covered by a house or where the shell extends above this deck as an enclosure, need not be watertight but requires protection by weathertight doors and coamings through the exposed bulkheads.

(c) The maximum load line draft, if not exceeded, assures that sufficient reserve buoyancy is available in spite of the added weight of water due to damage by flooding, of one compartment in a one compartment ship and two compartments in a two compartment ship.

(5) Stability of a ship as a function of metacentric height, GM, is determined by locating the center of gravity of the ship in light condition soon after it is built or undergoes any major changes affecting the ship's weight distribution. This is done by means of an inclining experiment.

(6) Calculations are made under, several loading and damaged conditions and wind forces to assure available stability, freeboard and safe operating condition in service.

(7) Stability and trim of a ship is the responsibility of the ship's Master. He in turn requires the First Officer (and deck officers) to maintain the ship's stability through good cargo stowage and trim and the Chief Engineer (and engineering officers) through proper ballasting.

d. Influence of Weather

(1) Wind force affects transverse stability by creating a heeling moment consisting of:

(a) Wind force against the exposed side of the ship's hull and superstructure.

(b) Reaction of the force of the water against the hull acting through the center of the underwater side profile of the ship.

(c) A lever equal to the vertical separation between the two.

(2) Wind heel is often the major factor in determining the requirements for minimum stability.

(3) Ice and snow present a problem in direct proportion to the weight added and its location.

(a) Due to difficulty in determining weights and levers of ice on board, the effect cannot be readily evaluated.

(b) Any slowing in period of roll under icing conditions should be investigated and action taken to reduce the ice and snow loading.

(4) Waves influence stability by:

(a) Changing the shape of the underwater portion of the ship which changes the location of the center of buoyancy causing roll, pitch and yawing.

(b) Adding weight on deck.

1. Major danger is the impact of waves, which may rupture watertight hatches and deckhouses and thus cause flooding.

2. If watertightness is maintained, boarding seas will be drained off the decks by the ship's motion.

3-11-5 TRIM AND STABILITY BOOK

a. Requirements and Responsibilities

(1) USCG requirements state that "Information shall be furnished to the Master which sets forth the stability data necessary to permit efficient handling of the vessel. In general, this information shall be such that the Master can readily determine the metacentric height and determine the freeboard for any condition of loading."

(2) MSC requires a one compartment standard for all ships.

(3) It shall be the Master's responsibility to maintain proper stability at all times.

b. Types of Booklets. There are two basic types of Trim and Stability Booklets. They cover the operation of cargo ships, and ships having no restriction on the method of loading cargo, fuel and water. The two types of Trim and Stability Booklets are:

(1) Cargo

(2) Unrestricted

c. Contents of Booklets. The Trim and Stability Booklets are designed to inform the ship's officers with respect to how much stability is required and how the required stability may be obtained. The booklets contain the following basic information.

(1) Information contained in all booklets

(a) Principal characteristics

(b) Hydrostatic properties

(c) Tank capacities, free surface corrections and centers of gravity

(d) Cargo hold volumes and centers of gravity

d. Using the Booklet. No amount of reading and studying will instruct a ship's officer in the stability characteristics of his particular ship as well as will practical experience. Therefore, the ship's Trim and Stability Booklet should be referred to. Its contents should be noted, the various sheets studied and sample loadings should be worked out. Knowledge of the ship's stability can only be obtained by using the Trim and Stability Booklet regularly:

(1) Upon departure, to assure adequate stability for that condition.

(2) For projected arrival condition.

(3) For intermediate condition at which salt water ballasting will be required if the stability in the projected arrival condition is not adequate.

3-11-6 COMPUTERIZED LOADING TABLES

Some ships are equipped with computerized loading tables to assist with determination of stability for varied loading conditions. These programs may have a dedicated computer or be loaded onto a personal computer. All computer loading tables require input of information from the ship's curves of form, compartment capacities and changes in condition of loading. The output typically includes the expected final draft, trim, list, metacentric height, center of gravity and buoyancy and on more sophisticated programs may include graphs of stability conditions for waves and winds that may be encountered during the voyage and recommended changes to loading to improve stability. The programs should be checked periodically against manual calculations to confirm proper operation and data entry.