

**ARMY WATERCRAFT SAFETY**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY**

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## **PREFACE**

This manual provides guidance and technical information relevant to safety and survival equipment/systems used by US Army watercraft. Safety and survival equipment/systems are identified in AR 56-9.

The manual contains guidance, instructions, technical data, illustrations, and procedures pertinent to the application, inspection, modification, maintenance, and the use of safety equipment, safety policies, and survival systems.

The primary users of this manual are watercraft masters and personnel. This manual will also be used by key personnel engaged in the supervision, operation, or maintenance of US Army watercraft.

The US Army's environmental strategy into the 21st century defines the Army's leadership commitment and philosophy for meeting present and future environmental challenges. It provides a framework to ensure that environmental stewardship ethic governs all Army activities. The Army's environmental vision is to be a national leader in environmental and natural resource stewardship for present and future generations, as an integral part of all Army missions. The Army's environmental vision statement communicates the Army's commitment to the environment.

The proponent of this publication is HQ TRADOC. Submit changes for improving this publication on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forward it to Commander, USATC&FE, ATTN: ATZF-CSS (Marine Safety Office), Fort Eustis, VA 23604-5113.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

## CHAPTER 1

### INTRODUCTION

#### Section I. General

1-1. **PURPOSE.** This manual provides an up-to-date, single source of guidance and technical information relevant to rescue equipment and survival systems and safety policies used on Army watercraft and by Army watercraft personnel.

#### NOTE

Deviations from configurations of equipment presented in this manual are not authorized. To maintain standardization and to preclude the dangers of operating with potentially unsafe equipment, modifications to rescue equipment and survival systems are not authorized.

1-2. **ADMINISTRATION.** Because watercraft units do not have a specific position dedicated to maintenance of rescue and survival equipment, it may be advantageous for the commanding officer to designate, in writing, a person to manage the unit's rescue and survival equipment. It is not intended that this individual actually inspect or maintain the equipment but rather be responsible for administration and coordination of the various requirements set forth in the PMS outlined in this manual. The designated individual should be familiar with this manual and would in effect, become the unit's "expert" for this equipment.

1-3. **CONTENTS.** This manual contains guidance, instructions, technical data, drawings, illustrations, procedures, and descriptions pertinent to the configuration, modification, application, inspection, fabrication, maintenance and repair, and the use of rescue equipment and survival systems. The Transportation Branch Marine Safety Office, Fort Eustis, VA, will formulate, produce, and distribute applicable changes to the equipment and to respective chapters of this manual.

a. **Warnings, Cautions, and Notes.** The following definitions apply to "WARNINGS," "CAUTIONS," and "NOTES" found throughout this manual.

(1) **Warnings.** Operating or maintenance procedures, techniques, and so on that may result in personal injury or loss of life if not carefully followed.

(2) **Cautions.** Operating or maintenance procedures, techniques, and so on that may result in damage to equipment if not carefully followed.

(3) **Notes.** Operating or maintenance procedures, techniques, and so on that are considered essential to emphasize.

b. **Use of the Words “Shall,” “Will,” “May,” and “Should.”** The following definitions apply to the words “shall,” “will,” “may,” and “should” throughout this manual.

(1) ***Shall and will.*** Indicates a mandatory requirement.

(2) ***May and should.*** Indicates an acceptable or suggested means of accomplishment.

1-4. **UPDATING.** This manual will be updated periodically by the issuing of a List of Effective Pages that includes all original, revised, added, and deleted pages. This list will be inserted in the front of each volume, immediately following the title page. Revised and added pages, appropriately dated, will be issued with the change and will be inserted into this volume according to page numbers. The replaced and/or deleted pages and the superseded List of Effective Pages will be discarded. As recommended, interim changes will be submitted for insertion to this manual by the US Army Watercraft Safety Advisory. All directives shall be complied with that are issued after the date of the latest change. These directives will be incorporated into the next change or revision of this manual.

1-5. **COMMENTS AND RECOMMENDATIONS.** Comments or recommendations concerning this manual may be submitted directly to Commander, USATC&FE, ATTN: ATZF-CSS (Marine Safety Office), Fort Eustis, VA 23604-5113.

1-6. **SUPPLEMENTARY PUBLICATIONS.** The following publications supplement this manual:

- CFR 33. Navigation and Navigable Waters.
- CFR 46. Shipping.
- AR 56-9. Watercraft.
- COMDTINST M16672.2C. Navigation Rules, International-Inland.
- FM 55-501. Marine Crewman's Handbook.
- FM 55-501-1. Landing Craft Operator's Handbook.
- FM 55-501-2. Harbor Craft Crewman's Handbook.
- COMDINST M104470.10C, Coast Guard Rescue and Survival Systems Manual.
- Naval Ship's Technical Manual.

## Section II. US Army Policy and Procedures

1-7. **GENERAL.** Procedures for the use of rescue and survival equipment and systems are contained in AR 56-9. Policies and procedures pertaining to all other aspects of the equipment and systems are stated in this manual.

1-8. **ALLOWANCE.** Allowances of rescue and survival equipment are determined by the type of vessel and mission. Additional equipment may be required to provide for passengers and maintenance. Specific allowances may be found in the appropriate watercraft basic issue items TB. Commanding officers should establish appropriate allowances of rescue and survival equipment to ensure adequate quantities and proper fit where applicable.

1-9. **INSPECTIONS.** Conduct the following inspections for personal protective equipment and rescue and survival equipment.

a. **Personal Protective Equipment Inspection.** A 180-day inspection cycle has been established for ALL personal protective equipment. This inspection accomplishes the following:

- Protects crew members against the dangers of operating with potentially unsafe equipment.
- Ensures the latest equipment modifications are incorporated.
- Provides a ready evaluation of maintenance.
- Enables units to attain maximum operating efficiency and safety.

Although personal safety items are inspected by the wearer before use, commanding officers are encouraged to inspect such items to ensure compliance with this manual. This inspection may be in the form of a personnel inspection, with crew members wearing their survival equipment.

b. **Rescue and Survival Equipment Inspection.** All other rescue and survival equipment will be subjected to periodic inspections, maintenance, and testing in accordance with the applicable chapters of this manual. As these tasks are the primary means of keeping survival equipment in proper working order, instances of carelessness or willful neglect should not pass unnoticed.

1-10. **PROCUREMENT DATA.** Each chapter provides a list and requisitioning information on the rescue and survival equipment used by watercraft units and personnel. The list is not intended to restrict material or quantities needed, but to recommend items believed to be the best currently available. All stock procurement data must be verified by current supply directives and references before any procurement requests are processed. Always use applicable parts lists and current cross references to ensure procurement of the actual item requested.

## CHAPTER 2

### WATERCRAFT ACCIDENT REPORTING AND INVESTIGATION

2-1. **INTRODUCTION.** Reporting and investigating watercraft accidents in a complete and timely manner is an extremely important function. This chapter gives procedures for watercraft accident investigation and written reports according to AR 385-40 and DA Pamphlet 385-40.

2-2. **WATERCRAFT ACCIDENT.** Watercraft accident is an unplanned event or series of events. These events could result in one or more of the following:

- Accidents occurring while loading, off-loading, or receiving services at dockside.
- Damage to Army property (including government-furnished material, government-property, or government-furnished equipment provided to a contractor).
- Accidents occurring during amphibious or on-shore warfare training operations.
- Injury (fatal or nonfatal) to on or off duty military personnel.
- Injury (fatal or nonfatal) to on-duty Army civilian personnel. Includes nonappropriated fund employees and foreign nationals employed by the Army when incurred during performance of duties while in a work-compensable status.
- Occupational injury or illness (fatal or nonfatal) to Army military personnel, Army civilian employees, nonappropriated fund employees, or foreign nationals employed by the Army.
- Injury or illness (fatal or nonfatal) to non-Army personnel or damage to non-Army property.

Watercraft accidents do not include accidents that are reportable under other major categories as described in AR 385-40. Examples of these types of accidents are aircraft, missile, or chemical agent.

This chapter also covers watercraft under the jurisdiction of the DA. These type of watercraft are as follows:

- Used in LOTS operations; CHI waterways; and ocean operations.
- Identified in AR 56-9, Table 1-1.
- Operated and exclusively controlled or directed by the Army. This includes watercraft furnished by a contractor or another Government agency when operated by Army watercraft personnel.
- Lended or leased to non-Army organizations for modification, maintenance, repair, test, contractor, research, or development projects for the Army.
- Under test by Army agencies responsible for research, development, and test of equipment.
- Under operational control of a contractor.

2-3. **MASTER'S RESPONSIBILITIES.** If an Army watercraft is involved in an accident, the master/operator must report the accident as soon as possible in accordance with AR 385-40. This is in addition and previous to a later detailed DA Form 285 report. This chapter does not negate the master's responsibility to report any applicable watercraft accident, injury, or death involving commercial watercraft or property to the US Coast Guard.

2-4. **ACCIDENT REPORT.** Watercraft accidents must be reported on DA Form 285. The report is prepared according to AR 385-40, Chapter 7 and DA Pamphlet 385-40.

NOTE

This report is intended only for accident prevention purposes and will not be used for administrative or disciplinary actions within the DOD.

In addition to the DA Form 285, watercraft accidents involving grounding that creates a hazard to navigation, watercraft safety, or any occurrence affecting the watercraft's seaworthiness or fitness for service (including but not limited to, fire, flooding, or damage to fixed fire extinguishing systems, life saving equipment, or bilge pumping systems) will be reported to the Transportation Branch Marine Safety Office, ATTN: ATZF-CSS, Fort Eustis, VA 23604-5113 within 24 hours.

The following additional information will be included in DA Form 285 as an enclosure:

- Time and place of commencement of voyage and destination.
- Current (direction and force).
- Wind (direction and force).
- Visibility in yards.
- Tide and sea conditions.
- Name of person in charge of navigation and persons on the bridge.
- Name and rank of lookout and where stationed.
- Time when bridge personnel and lookouts were posted on duty.
- Course and speed of watercraft.
- Number of passengers and crew on board.
- Names of crew and passengers.
- Copies of all pertinent log entries.
- List of the names and addresses of witnesses.
- When steering gear and controls were last tested.
- When and where compasses were last adjusted and the deviation, if any, at time of accident.
- Statement of any outside assistance received.
- Diagrams of damage and pertinent documents.
- Photos of damage.
- Any further details not covered above.

2-5. **INVESTIGATE AND REPORT ACCIDENTS.** Watercraft accidents are investigated and reported to identify problem areas (deficiencies) as early as possible in order to save personnel and equipment. Changes, corrections, and countermeasures can be developed and implemented to these deficiencies before more people are hurt or killed or equipment is damaged, destroyed, or lost. If an accident is never reported, the responsible person will not know there is a problem. Also, nothing will be done to fix the problem. People will continue to pay the price.

2-6. **ACCIDENTS TO INVESTIGATE AND REPORT.** It is mandatory that all watercraft accidents are reported, regardless of class, to the local activity or installation safety office. However, only certain accidents require completion and submission of DA Form 285. These recordable accidents include classes A, B, and C accidents and class D property-damage accidents (see AR 385-40 and DA Pamphlet 385-40 for details).

The Army classifies accident by severity of injury and property damage. These classes (A through D) are used to determine the appropriate investigative and reporting procedures. These classes are described below.

a. **Class A.** The total cost of reportable damage is \$1,000,000 or more. An Army aircraft, watercraft, missile, or spacecraft is destroyed; or occupational illness results in a fatality or permanent total disability.

b. **Class B.** The total cost of reportable property damage is \$200,000 or more, but less than \$1,000,000. An injury and/or occupational illness results in permanent partial disability; or five or more people are hospitalized as inpatients.

c. **Class C.** The total cost of property damage is \$10,000 or more, but less than \$200,000. A nonfatal injury causes any loss of time from work beyond the day or shift on which it occurred; or a nonfatal illness or disability causes loss of time from work or disability at any time (lost time case).

d. **Class D.** The cost of property damage is \$2,000 or more, but less than \$10,000. Or, a nonfatal injury does not meet the criteria of a class C accident such as no time was lost or time lost was restricted to the day or shift on which the injury occurred.

**NOTE**

Property damage is defined as the cost to repair or replace. Property damage cost are separated from personnel injury/illness costs for classifying A through C accidents.

2-7. **PERSONNEL WHO INVESTIGATE AND REPORT.** For watercraft accidents that require a DA Form 285, the commander or supervisor directly responsible for the operation, materiel, or people involved in the accident will make sure of the following:

- An investigation is performed to obtain the facts and circumstances of the accident for accident prevention purposes only (AR 385-40).
- Evidence is preserved in accordance with AR 385-40.
- DA Form 285 is completed according to instructions on the form and DA Pamphlet 385-40. The form must be forwarded through the installation safety office to the Army Safety Center for recording in the ASMIS within 30 days of the accident. ARNG reports will be sent to the state safety office.

See AR 385-40 for accidents that require a board investigation.

2-8. **COLLATERAL INVESTIGATION REPORTS.** A collateral investigation report is required in many cases for class A, B, or C accidents to make and preserve a record of the facts for litigation, claims, and disciplinary and administrative actions. These investigations are conducted in accordance with AR 15-6 and the procedures in DA Pamphlet 385-40. A collateral investigation is required on all fatal accidents. It is also required for those accidents that generate a high degree of public interest or are likely to result in litigation for or against the Government.

NOTE

Personnel investigating an accident under AR 385-40 WILL NOT be involved in tracking, handling, or reviewing collateral investigations. Neither will they be involved in establishing collateral investigation procedures.

## CHAPTER 3

### RISK MANAGEMENT

3-1. **BACKGROUND.** Accidents cost the Army about 500 million dollars each year and significantly reduces mission capabilities. Because the Army must be prepared to operate worldwide in many different watercraft environments, the watercraft mission has become increasingly demanding and so have the risks inherent in that mission. This increase in risk requires leaders to balance mission needs with hazards involved and make wise risk decisions.

3-2. **DEFINITION.** Risk is the severity of a potential accident combined with the probability that it will actually happen. The loss can be death, injury, property damage, or mission failure. Risk management identifies risks associated with a particular operation and weighs these risks against the overall training value to be gained. The four rules of risk management areas follows:

- Accept no unnecessary risk.
- Accept risks when benefits outweigh costs.
- Make risk decisions at the right command level.
- Manage risk in the concept and planning stages whenever possible.

3-3. **RISK MANAGEMENT PROCESS.** The risk management process uses the following approach:

- *Identify hazards.* Look for hazards in each phase of the training or operation.
- *Assess the risk.* Ask the following questions:
  - What type of injury or equipment damage can be expected?
  - What is the probability of an accident happening?

#### NOTE

A low probability of an accident and an expected minor injury equals low risk. A high probability of an accident and an expected fatality equals high risk.

*Develop risk control alternatives and make risk decisions.* If you cannot eliminate the risk, then you must control it without sacrificing essential mission requirements. You can control some risks by modifying tasks, changing location, increasing supervision, wearing protective clothing, changing time of operation, and so on. Decisions take several forms:

- Selecting from available controls.
- Modifying the mission because risk is too great.
- Accepting risk because mission benefits outweigh potential loss.

- *Implement risk control measures.* You must integrate procedures to control risks into plans, orders, SOPs, and training. You must also ensure risk reduction measures are used during actual operations.
- *Supervise the operations.* Make sure leaders know what controls are in place, what standards are expected, and then hold those in charge accountable for implementation. This is the point when accident prevention actually happens.
- *Evaluate the results.* Include the effectiveness of risk management controls when you assess the operational results. Use lessons learned to modify future missions.

3-4. **RISK ASSESSMENT ELEMENTS.** Assessing risks has no hard and fast rules or formats. For example, pre-sail orders and inspections are in essence an assessment of risk. Different missions involve different elements that can affect operational safety. The following six elements however, are central to safely completing most missions:

- Planning.
- Supervision.
- Soldier selection.
- Soldier endurance.
- Mission environment (weather).
- Mission essential equipment.

Using matrices that assign a risk level to each of the elements is one way to quickly appreciate the overall risks. The following matrices (Tables 3-1 through 3-6) are examples of risk assessments for the six elements common to watercraft missions.

NOTE

The factors are arbitrarily weighted. Modify them based on your particular mission and unit.

- Measure planning risk (Table 3- 1) by comparing the level of guidance given to the time and effort expended on preparation.

Table 3-1. Planning matrix

PLANNING			
GUIDANCE	PREPARATION		
	INDEPTH	ADEQUATE	MINIMAL
VAGUE	Medium	High	High
IMPLIED	Low	Medium	High
SPECIFIC	Low	Low	Medium

EXAMPLE: A landing craft ordered to make a dry ramp landing on a beach that had not been surveyed for gradient and underwater obstructions would create a high risk situation.

- Measure supervision risk (Table 3-2) by comparing command and control to the mission environment.

Table 3-2. Supervision matrix

SUPERVISION			
COMMAND/CONTROL	MISSION ENVIRONMENT		
	NONTACTICAL	DAY TACTICAL	NIGHT TACTICAL
OPCON	Medium	High	High
ATTACHED	Low	Medium	High
ORGANIC	Low	Low	Medium

EXAMPLE: Your vessel has been placed under operational control of a Navy unit. You cannot adequately communicate with the Navy unit because of equipment incompatibility and communication procedures. In a night tactical environment, the risk becomes high.

- Measure soldier selection risk (Table 3-3) by comparing task complexity with soldier experience.

*Table 3-3. Soldier selection matrix*

<b>SOLDIER SELECTION</b>			
<b>TASK</b>	<b>SOLDIER EXPERIENCE</b>		
	<b>HIGHLY QUALIFIED</b>	<b>MOS QUALIFIED</b>	<b>OJT ONLY</b>
<b>COMPLEX</b>	<b>Medium</b>	<b>High</b>	<b>High</b>
<b>ROUTINE</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>SIMPLE</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>

EXAMPLE: You are the master operating an LCU with no mate on board in restricted waters. If you leave the bridge, you have placed the vessel at high risk.

Measure soldier endurance risk (Table 3-4) by comparing the mission environment with availability of basic needs (such as rest, food, water, and so on):

*Table 3-4. Soldier endurance matrix*

<b>SOLDIER ENDURANCE</b>			
<b>MISSION ENVIRONMENT</b>	<b>AVAILABILITY OF BASIC NEEDS</b>		
	<b>OPTIMUM</b>	<b>ADEQUATE</b>	<b>MINIMAL</b>
<b>OCEAN/COASTAL</b>	<b>Medium</b>	<b>High</b>	<b>High</b>
<b>RIVERS/BAYS</b>	<b>Low</b>	<b>Medium</b>	<b>High</b>
<b>HARBORS</b>	<b>Low</b>	<b>Low</b>	<b>Medium</b>

EXAMPLE: You are the master on an LSV operating coastal waters with a crew shortage that does not allow for adequate crew rest. This would place your vessel at high risk.

- Measure mission environment risk (Table 3-5) by comparing the level of supervision to the task location.

*Table 3-5. Mission environment (weather) matrix*

MISSION ENVIRONMENT (WEATHER)			
CONDITIONS	AVAILABILITY OF SAFE HAVEN		
	OPTIMUM	ADEQUATE	MINIMAL
SEVERE UNFAVORABLE FAVORABLE	High Low Low	High Medium Low	High High Medium

EXAMPLE: You are operating a causeway ferry during a LOTS operation off the coast with severe weather moving in. Safe haven is four hours away, but you have been released only two hours before the weather hits. This places your vessel at high risk.

- Measure essential equipment risk (Table 3-6) by comparing the availability of mission essential equipment with the readiness of that equipment.

*Table 3-6. Mission essential equipment matrix*

MISSION ESSENTIAL EQUIPMENT			
AVAILABILITY	EQUIPMENT READINESS		
	OPTIMUM	ADEQUATE	MINIMAL
SHORT CRITICAL SHORT NOT CRITICAL NO SHORTAGES	Medium Low Low	Medium Medium Low	High High Medium

EXAMPLE: You are a operator of a LARC-60 carrying VIP's during a LOTS operation. You do not have an enough life jackets for personnel on board. This would place crew and passengers at high risk.

- After assessing all the risks, the overall risk value equals the highest risk identified for any one element. Now is the time to focus on high risk elements and develop controls to reduce risks to an acceptable level. Control examples may include more planning, changes in location, supervision, personnel or equipment, waiting for better weather, and so on.

3-5. **DECISION LEVEL.** The level of the decision maker should correspond to the level of the risk. The greater the risk the more senior the final decision maker should be.

- It should be understood that masters aboard Army watercraft who are underway, must make high risk decisions based on their judgement of the situation.

- Medium risk training warrants complete unit command involvement. If you cannot reduce the risk level, the company commander should decide to train or defer the mission.

- Operations with a high risk value warrant battalion involvement. If you cannot reduce the risk level, the battalion commander should decide to train or defer the mission.

3-6. **RISK CONTROL ALTERNATIVES.** The following options can help control risk

- Eliminate the hazard totally, if possible, or substitute a less hazardous alternative.
- Reduce the magnitude of the hazard by changing tasks, locations, times, and so on.
- Modify operational procedures to reduce risk exposure consistent with mission needs.
- Train and motivate personnel to perform to standards to avoid hazards.

3-7. **SUPERVISION.** Leaders must monitor the operation to ensure risk control measures are followed. Never underestimate subordinates' ability to sidetrack a decision they do not understand or support. You must also monitor the impact of risk reduction procedures when they are implemented to see that they really work. This is especially true of new, untested procedures.

3-8. **PAYOFFS.** Risk management gives you the flexibility to modify your mission and environment while retaining essential mission values. Risk management is consistent with METT-T decision processes and can be used in battle to increase mission effectiveness.

## CHAPTER 4

### SAILING ORDER

- 4-1. **GENERAL.** This chapter contains minimum requirements for publishing a sailing order directing Army watercraft missions.
- 4-2. **APPLICATION.** Commanders and vessel masters will ensure that a sailing order is published in accordance with AR 56-9 for each Army watercraft before departing home port.
- 4-3. **SAILING ORDER INFORMATION.** Each sailing order will contain the information in the sample sailing order shown in Figure 4-1, page 4-2.
- 4-4. **DOCUMENTS SUPPORTING THE SAILING ORDER.** The following documents (as appropriate to the class of vessel) will be provided in support of the sailing order.
- a. **Mission Risk Assessment.** See Chapter 3, Risk Management.
  - b. **Voyage Plan.** Each voyage plan will contain the information in the same voyage plan as shown in Figure 4-2, page 4-3.
  - c. **Class A Vessel Presail Checklist.** Each Class A Vessel Presail Checklist will contain the information as shown in the sample checklist in Figure 4-3, page 4-4.
  - d. **Class B Vessel Presail Checklist.** Each Class B Vessel Presail Checklist will contain the information as shown in the sample checklist in Figure 4-4, page 4-5.
  - e. **Crew/Passenger List.** Each Crew/Passenger List will contain the information as shown in the sample list in Figure 4-5, page 4-6.
- 4-5. **REUSABLE FORMS.** To ensure concurrence with AR 56-9 and fleet wide standardization for issuing sailing orders, each command is encouraged to reprint and use the forms in this chapter.

# HEADQUARTERS

Sailing Order Number \_\_\_\_\_

US Army Vessel \_\_\_\_\_

1. ETD home port \_\_\_\_\_

2. When in all respects ready for sea, and the Presail Checklist, Risk Assessment, Crew/Passenger List, and Voyage Plan are submitted to the Harbormaster, vessel will proceed to

\_\_\_\_\_

Upon completion of mission, return to \_\_\_\_\_

3. This order is subject to revision while underway or in port by competent military authorities.

4. IAW higher Headquarter's SOP/Directives, Master will make the following reports to:

\_\_\_\_\_

Frequency/Channels: \_\_\_\_\_ Times: \_\_\_\_\_

1) vessel's position, 2) any deviation to voyage plan to include reason(s) and adjusted ETA,

3) destination arrival time, 4) weather and sea state.

5. Considering controls that have been instituted, the risk for this mission is assessed at E, H, M, L, (circle one) level. It is understood that when faced with unforeseen risks, the Master will do everything possible for the safety of his crew and the prevention of damage to the vessel.

6. Disagreements in acceptability of risk are as noted below (initial each comment).

\_\_\_\_\_

\_\_\_\_\_

7. Signature of the risk level authority constitutes an order to proceed despite of noted disagreements.

\_\_\_\_\_  
Vessel Master

\_\_\_\_\_  
Risk Level Authority

\_\_\_\_\_  
Harbormaster

*Figure 4-1. Sample sailing order*

DEPARTMENT OF THE ARMY					
VOYAGE PLAN					
Sailing Order Number:			Date:		
Vessel:					
The following information is submitted as the planned route for the above mission.					
The information provided below will be updated if changes are required while enroute.					
ETD(DTG)	ETA(DTG)	LOCATION	CRSE(T)	SPEED (KTS)	REMARKS
Master/Coxswain					
DATA SHEET					

Figure 4-2. Sample voyage plan

VESSEL \_\_\_\_\_ IS IN COMPLIANCE WITH AR 56-9 AND IS IN ALL RESPECTS SATISFACTORY AND READY FOR SEA. THIS VESSEL IS CREWED WITH PROPERLY QUALIFIED PERSONNEL, KNOWLEDGEABLE IN THEIR JOB AND DRILLED IN EMERGENCY PROCEDURES. ALL TEST DRILLS AND INSPECTIONS (TDI) REQUIRED BY THAT ARE APPLICABLE TO THIS VESSEL HAVE BEEN ACCOMPLISHED WITHIN THE TIME SPECIFIED WITH SATISFACTORY RESULTS. THE FOLLOWING LIST SHOWS STATUS OF VESSEL EQUIPMENT, CHARTS, AND PUBLICATIONS.

DATE \_\_\_\_\_

VESSEL \_\_\_\_\_

COMMUNICATIONS	SAT	UNSAT	PUBLICATIONS	SAT	UNSAT		SAT	UNSAT
BRIDGE TO BRIDGE			CHARTS			EMERGENCY POSITION INDICATING RADIO BEACON (EPIRB)		
TACTICAL			LIGHT LIST/LIST OF LIGHTS			LIFE RINGS W/90 FEET LINE/SMOKE/LIGHTS		
HIGH FREQUENCY			COAST PILOTS/SAILING DIRECTIONS			LIFE JACKETS W/LIGHTS/WHISTLES/REFLECTIVE TAPE		
NAVIGATION			WORLDWIDE WEATHER FORECASTS			WORK VESTS W/LIGHTS/WHISTLES/REFLECTIVE TAPE		
RADAR			SHIP'S MEDICINE CHEST			ANTI-EXPOSURE COVERALLS/IMMERSION SUITS W/LIGHTS/WHISTLES/REFLECTIVE TAPE		
GYRO AND MAGNETIC COMPASSES			TCFE REG 210-6			FIREMAN'S ENSEMBLES		
WHISTLES/HORN			10TH TRANS BN POLICIES			OXYGEN BREATHING APPARATUSES		
GPS/SAT BAY			SIGHT REDUCTION TABLES			SHIP'S MEDICAL KIT		
DEPTH SOUNDER			NAUTICAL ALMANAC			LITTER W/STRAPS, FLotation COLLAR, LIFTING SLING, BALLAST		
NAVIGATION LIGHTS			STATION BILL			EMERGENCY LIFEBOAT RADIO		
ANCHORS W/CHAIN			SHIP'S RADIO AUTHORIZATION			DAMAGE CONTROL EQUIPMENT		
SEARCH LIGHT			LOADLINE CERTIFICATE			TOWING GEAR		
BELL			RADIO NAVIGATION AIDS			CARGO RESTRAINING DEVICES		
INTERNATIONAL CODE FLAGS			3RD PORT SOP			PAINT LOCKER HAZARDOUS MATERIAL PROPERLY STORED		
PUBLICATIONS			ARs 56-9, 385-40 DA PAM 385-40			FIRE BLANKETS		
NAVIGATION RULES			SAFETY EQUIPMENT			EMERGENCY BATTERIES		
DMA PUB 102, INTERNATIONAL CODE OF SIGNALS			LIFERAFTS/LIFEBOATS W/HYDROSTATIC RELEASES			PORTABLE PUMP		
TIDE TABLES			DISTRESS FLARES (12 RED PARACHUTES)			FIRE/SMOKE DETECTING SYSTEM		
CURRENT TABLES			LINE THROWING DEVICE			INTERNAL COMMUNICATION SYSTEMS		
COMPASS DEVIATION CARD			PORTABLE FIRE EXTINGUISHERS			RUDDER ANGLE INDICATOR		
MANUEVERING INFORMATION			FIXED FIRE FIGHTING SYSTEM					
LOGBOOKS (DECK, RADIOS, REFUSE)			FIRE HOSES, NOZZLES, & APPLICATIONS					

THE LAST SANITATION INSPECTION WAS CONDUCTED BY \_\_\_\_\_ PREVENTIVE MEDICINE ACTIVITY ON \_\_\_\_\_  
VESSEL GALLEY [WILL] [WILL NOT] BE UTILIZED. THE FOLLOWING TYPE MEALS WILL BE CONSUMED BY PERSONNEL ABOARD \_\_\_\_\_  
A-RATIONS \_\_\_\_\_ B-RATIONS \_\_\_\_\_ C-RATIONS \_\_\_\_\_ BOX LUNCHES \_\_\_\_\_ OTHER (SPECIFY) \_\_\_\_\_  
THE LAST POTABLE WATER SAMPLE WAS TURNED IN: \_\_\_\_\_

VESSEL MASTER SIGNATURE: \_\_\_\_\_ HARBORMASTER SIGNATURE BLOCK \_\_\_\_\_

Figure 4-3. Sample presail operational checklist for class A vessels

VESSEL \_\_\_\_\_ IS IN COMPLIANCE WITH AR 56-9 AND IS IN ALL RESPECTS SATISFACTORY AND READY FOR SEA. THIS VESSEL IS CREWED WITH PROPERLY QUALIFIED PERSONNEL, KNOWLEDGEABLE IN THEIR JOB AND DRILLED IN EMERGENCY PROCEDURES. ALL TEST DRILLS AND INSPECTIONS (TDI) REQUIRED BY \_\_\_\_\_ THAT ARE APPLICABLE TO THIS VESSEL HAVE BEEN ACCOMPLISHED WITHIN THE TIME SPECIFIED WITH SATISFACTORY RESULTS. THE FOLLOWING LIST SHOWS STATUS OF VESSEL EQUIPMENT, CHARTS, AND PUBLICATIONS.

DATE \_\_\_\_\_ VESSEL \_\_\_\_\_

COMMUNICATIONS	SAT	UNSAT	SAFETY EQUIPMENT	SAT	UNSAT
BRIDGE TO BRIDGE RADIO			PORTABLE FIRE EXTINGUISHER		
TACTICAL RADIO W/SOI			FIXED FIRE FIGHTING SYSTEM		
PUBLICATIONS			LIFE RINGS W/90 FEET LINE, LIGHTS		
NAVIGATION RULES			EMERGENCY STEERING GEAR		
DMA PUB 102, INTERNATIONAL CODE OF SIGNALS			DAMAGE CONTROL EQUIPMENT		
TIDE TABLES			LIFE JACKETS W/LIGHTS, WHISTLES, REFLECTIVE TAPE (1 PER PERSON)		
CURRENT TABLES			ANTI-EXPOSURE COVERALLS W/LIGHTS, WHISTLES, REFLECTIVE TAPE		
COMPASS DEVIATION CARD			WORK VESTS W/LIGHTS, WHISTLES, REFLECTIVE TAPE		
STATION BILL			CODE FLAGS (A,B,D,U,V,W)		
MANEUVERING INFORMATION			MEDICAL KIT		
LOGBOOKS DECK/ENGINE, RADIOS			DISTRESS FLARES (12 SMOKE/ILLUMINATED)		
CHARTS			PAINT/HAZARDOUS MATERIALS PROPERLY STORED		
AR 56-9					
FM 21-11/SHIP'S MEDICINE					
NAVIGATION					
HORN/WHISTLE					
COMPASS					
SPOT/SEARCHLIGHT					
STEERING SYSTEMS					
NAVIGATION LIGHTS					
BELL					
ANCHOR W/CHAIN					

HARBORMASTER'S SIGNATURE AND STAMP \_\_\_\_\_ COXSWAIN SIGNATURE \_\_\_\_\_

Figure 4-4. Sample presail operational checklist for class B vessels

DEPARTMENT OF THE ARMY				
CREW/PASSENGER LIST				
Vessel Number/Name _____		Departure Date _____		
Sailing Order Number _____				
I state that the personnel listed below constitutes a complete and accurate listing of crew and passengers aboard at the time of sailing. I understand that I am responsible for keeping this list up to date and notifying the Harbormaster Office of all personnel changes giving the information listed below and the reason for the change.				
<b>CREW</b>				
NAME (Last, First, MI)	RANK	SSN	LIC/CERT	EXP DATE

DATA SHEET

*Figure 4-5. Sample crew/passenger list*

## CHAPTER 5

## LOCKOUT/TAGOUT OF ENERGY SOURCES

5-1. **GENERAL.** This chapter details the procedures for using lockout/tagout devices aboard US Army watercraft.

5-2. **DISCUSSION.** A lockout/tagout procedure is necessary due to the complexity of modern Army watercraft and the cost and potential affects of delays associated with equipment down time. The procedure is also necessary due to the hazards to personnel which could result in their injury or in the worse case, death. This lockout/tagout program is mandatory for all Army watercraft. The program is designed to notify personnel that locked/tagged equipment or systems are NOT to be operated under any circumstances. The lockout/tagout system consists of a series of locks and tags that are attached to individual components to indicate that they are restricted from operation or that SOPs must be modified due to abnormal operating conditions. Each tag contains the necessary information to prevent a possible injury to personnel or damage to installed equipment. Tags associated with the tagout procedure should never be used for valve identification, for marking leaks, or any other purpose not specified in this tagout procedure.

The use of tags or other labels is not a substitute for other safety measures such as chaining or locking valves, removing fuses, or racking out circuit breakers. However, tags will be attached to the fuse panel, racked out circuit breaker cabinet, or locked valve, to indicate the need for such action. If any component has more than one type of tag or sticker attached; the DANGER (RED) tag, when present, will take precedence over all other tags or stickers.

Standard lockout/tagout procedures are to be used for all maintenance, including work to be done by support maintenance units and local contractors. Each maintenance action will require its own set of tags even if two or more maintenance actions require the same equipment to be tagged. Never rely on the tags from other maintenance actions to provide protection for the work you are assigned to do. Lockout/tagout procedures will be enforced at all times. Violation of any tag compromises the entire tagout system and could in itself have serious consequences. Therefore, strict adherence to the tagout procedure without exception is required by all personnel.

5-3. **DEFINITIONS.** The following describes terms related to lockout/tagout procedures.

- *Authorizing officer.* The person with the authority to sign tags to be issued or cleared is the Authorizing Officer. The Authorizing Officer is responsible for ensuring that persons assigned to make a tagout are qualified to perform the duties pursuant to this instruction. The Authorizing Officer for Army watercraft will be the Chief Engineer. He is the one who locks out or tags out machines or equipment in order to perform maintenance, repair, or replacement of equipment.

- *Energy isolating device.* A mechanical device that physically prevents the release or transmission of energy. These devices include but are not limited to the following:

- Manually operated breakers, disconnects, or switches.
- Valves.
- Blank flanges.

## NOTE

Push buttons, selector switches, and other types of circuit devices **ARE NOT** energy isolating devices.

- **Energy source.** Any device, component, or system which contains potential energy capable of injuring personnel or damaging installed equipment. Energy sources may be electrical, pneumatic, hydraulic, thermal, chemical, or in a mechanical form such as a rotating element.
- **Lockout device.** A device that uses a positive means such as a lock to hold an energy isolating device in a safe position preventing the energizing of equipment or the release of another form of energy. Lockout devices include any device which mechanically prevents the energy isolating device from being repositioned. This may be as simple as wire rope with clips.
- **Maintenance action.** Any preventative or corrective maintenance performed by the vessel's crew and support unit maintenance personnel and private contractor personnel. Each maintenance action will require its own set of tags. This does not include maintenance performed during a cyclic maintenance period. Lockout/tagout will be governed by the shipyard performing the cyclic maintenance.
- **Tagout.** Tags affixed to energy isolating devices for warning purposes. They **DO NOT** provide the physical restraint that lockout devices provide. These tags are as follows:

- **Danger tag (see Figure 5-1, page 5-4).** This tag is red. It prohibits the operation of equipment that could jeopardize the safety of personnel or endanger equipment and associated systems. Under no circumstances will equipment be operated when danger tags are attached. Laminated danger tags intended for repeated use will not be used aboard Army watercraft.
- **Caution tag (see Figure 5-2, page 5-5).** This tag is yellow. It is used as a precaution to advise personnel of temporary special instructions or to indicate that unusual caution must be exercised to operate equipment. These instructions must state the specific reason why the tag is installed. The phrase "Do not operate without the Chief Engineer's permission" is not acceptable since no equipment should be operated without direct permission.

- **Tagout log.** The tagout log consists of the Tagout Index, active Tagout Record Sheets, and the inactive Tagout Record Sheets. The purpose of the log is to provide a ready reference of all active tagouts, ensure that serial numbers are sequentially issued, and assist in conducting audits and reviews of the tagout program for the vessel in question. The Tagout Index (see Figure 5-3, page 5-6) and Tagout Record Sheet (see Figure 5-4, pages 5-7 and 5-8) may be locally reproduced.

5-4. **PROGRAM RESPONSIBILITIES.** The following are the responsibilities of the chief engineer, company commander, and company and/or battalion marine maintenance officer.

- a. **Chief Engineer.** The vessel chief engineer is responsible for enforcing these procedures aboard the watercraft to which he is assigned. Aboard Army watercraft, the chief engineer is the Authorizing Officer.

b. **Company Commander.** The company commander is responsible for ensuring his unit is in compliance with these procedures. He also makes sure that these procedures are addressed within the company maintenance SOP to include the proper indoctrination of new unit personnel.

c. **Company and/or Battalion Marine Maintenance Officer.** The company/battalion marine maintenance officer will routinely audit individual vessels to ensure compliance with this program.

5-5. **APPLICATION.** These requirements apply to all maintenance actions performed aboard Army watercraft where the unexpected energizing, startup, or release of stored energy of equipment would be likely to endanger personnel or the equipment itself.

5-6. **PROCEDURES.** The following describes lockout/tagout procedures to be followed by all Army watercraft personnel.

a. **Preparation of Tags and Logs.** Danger and Caution tags will be prepared as follows:

(1) Each tagout action is assigned a serial number in sequence from the Tagout Log Index (see Figure 5-3). This serial number will also be used to identify each tag associated with the tagout action. When a tagout action requires more than one tag, the same base number will be used with a sequence number to identify individual tags (for example, 001-1, 001-2, and so on).

(2) Tagout entries will provide sufficient information to give personnel reviewing the log a clear understanding of the purpose and necessity for each tagout action.

(3) Enough tags and lockout devices will be used to completely isolate the system or component being worked on and to prevent operation of a system or component from all stations that could exercise control. System diagrams and circuit schematics should be used to determine the adequacy of all tagout actions.

(4) The person requesting the tags will prepare the Tagout Record Sheet (see Figure 5-4) and associated tags. Figures 5-1 and 5-2 contain detailed instructions for completing associated tags. Figure 5-4 contains detailed instructions for completing the Tagout Record Sheet.

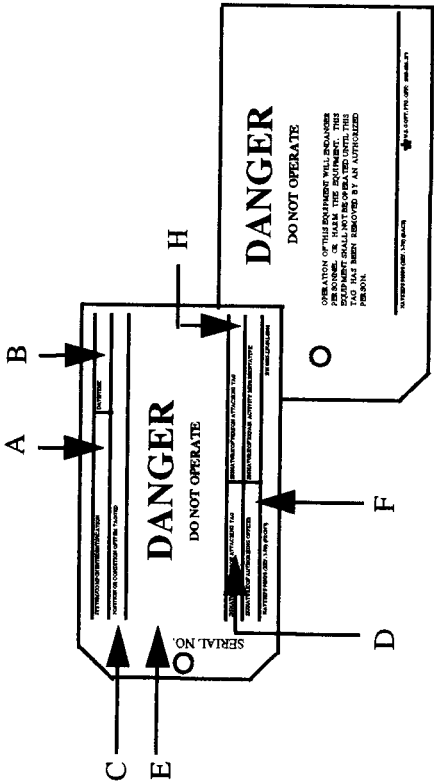
(5) The Authorizing Officer (Chief Engineer) will review the tagout log entries and tags for completeness and accuracy. When satisfied, the Authorizing Officer will sign the Tagout Record Sheet and tags authorizing the installation of the tags.

(6) The person attaching the tags and lockout devices will ensure that the items being tagged are in the prescribed position or condition (for example, shut, locked shut, fuses removed, and so on) exactly as stated on the tag, then sign and attach the tags and locking devices if required. The tags will be securely attached so they are apparent to anyone who may try and operate the component.

(7) After the tag is attached, a second person will independently verify the tagged equipment or component is in the position or condition indicated on the tag and that the tag and lockout device, if required, is properly attached. That person will sign the tags and the Tagout Record Sheet. Only qualified personnel will perform the second check of tag installation.

This table describes the DANGER tag

TAG	COLOR	FUNCTION	Operate The Component?
DANGER	RED	Prevent equipment from being energized	NO



PROCEDURES FOR COMPLETING THE DANGER TAG			
Step	Action	By Whom	Location On Tag
1	Select the proper tag. (Example: Danger, Caution)	Person doing work	
2	Fill in the system comp. identification. (Example: #1 SSDG)	Person doing work	A
3	Fill in date/time.	Person doing work	B
4	Indicate position or condition of item being tagged.	Person doing work	C
5	Enter serial # in num. order from Tagout Index.	Person doing work	E
*6	Authorizing Officer signs tag.	Chief Engineer	F
7	Position the valve or component, install locking devices if required. Sign tag and hang.	Person doing work	D
8	Second person performs independent check and signs tag.	Person checking tags	H

\*Before the Authorizing Officer signs the tag, the Tagout Record Sheet must be completed by the person initiating the tagout.

Figure 5-1. Danger tag

PROCEDURES FOR COMPLETING THE CAUTION TAG			
Step	Action	By Whom	Location On Tag
1	Select the proper tag. (Example: Danger, Caution)	Person doing work	
2	Fill in the system comp. identification. (Example: #1 SSDG)	Person doing work	A
3	Fill in date/time.	Person doing work	B
4	Indicate temporary precautionary instructions.	Person doing work	C
5	Enter serial # in num. order from Tagout Index.	Person doing work	E
*6	Authorizing Officer signs tag.	Chief Engineer	F
7	Place the tag onto the equipment and sign tag.	Person doing work	D
8	Second person performs independent check and signs tag.	Person checking tags	H

\*Before the Authorizing Officer signs the tag, the Tagout Record Sheet must be completed by the person initiating the tagout.

This table describes the CAUTION tag

TAG	COLOR	FUNCTION	Operate The Component?
CAUTION	YELLOW	Temporary precautionary instructions	YES

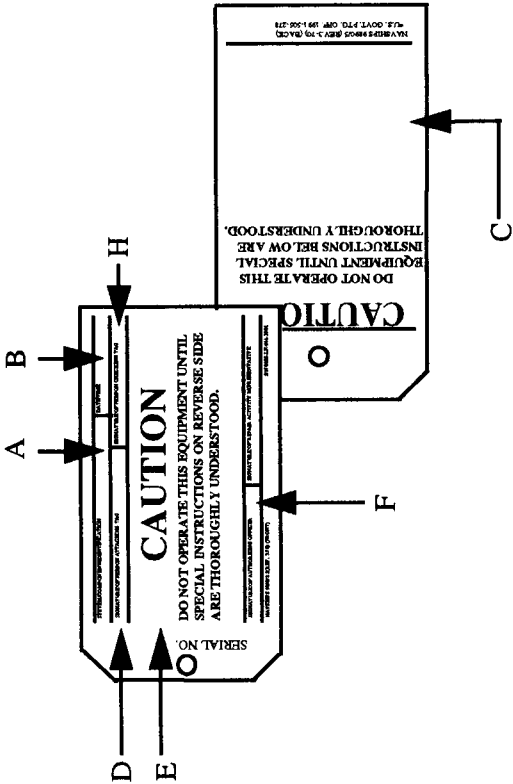


Figure 5-2. Caution tag

[illegible]

*Figure 5-3. Tagout index*

DANGER/CAUTION TAGOUT RECORD SHEET							
SYSTEM OR COMPONENT A				LOG SERIAL NUMBER A			
REASON FOR TAGOUT:  B							
PERSONNEL/EQUIPMENT HAZARDS INVOLVED (MANDATORY FOR DANGER TAGS):  B							
AMPLIFYING INSTRUCTIONS (MANDATORY FOR CAUTION TAGS):  B							
WORK NECESSARY TO CLEAR TAG(S) (INCLUDING TESTS):  B							
TAG NO.	LOCATION	TAGGED POSITION/ CONDITION	POSTED BY (INITIAL)	POSTING CHECKED BY (INITIAL)	CLEARANCE AUTHORIZED (SIGNATURE)	DATE/TIME CLEARED	CLEARED BY (INITIAL)
C	D	D	F	G	H	I	I
SIGNATURE OF AUTHORIZING OFFICER:  E				DATE/TIME:  E			

Figure 5-4. Tagout record sheet

PROCEDURES FOR TAGOUT RECORD SHEET	LOCATION
Log serial number. Each tagout is assigned a log serial number in sequence. The Tagout Index will be used for assigning log serial numbers. Enter the system or component being tagged out.	<b>A</b>
The reason for the tagout, the hazards involved, amplifying instructions, and work necessary to clear the tags will be sufficiently detailed to give watchstanders reviewing the Tagout Log a clear understanding of the purpose of and necessity for each tagout action.	<b>B</b>
Enough tags should be used to completely isolate the system, piping, or circuit being worked on or to prevent operation of a system. Each tag will contain the Log serial number followed by a dash and number (Example: 001-1). The -1 indicated the first tag for serial number 001. Additional tags would be numbered -2, -3, and so on.	<b>C</b>
The location (for example #1 SSDG circuit breaker) and the position/condition (for example: open, shut, locked shut, racked out, fuses removed, and so on) of the tagged item should be indicated by the most easily identifiable means. The position/condition column need not be filled in for caution tags.	<b>D</b>
The Authorizing Officer will review the Tagout Record Sheet and tags for completeness and accuracy. When satisfied, he/she will sign and enter the date/time the Tagout Record Sheet and tags authorizing the tags to be installed.	<b>E</b>
The individual installing the tags and locking devices will reposition the item to conform with the required position/condition as stated on the tag. He/she will then sign the tag and then hang it. This same individual will then initial the Tagout Record Sheet indicating the tag and locking devices were installed.	<b>F</b>
After the person initiating the tagout has completed installing the tags, a second individual will independently check each tag to ensure the tag and any locking devices are properly installed and the item is in the proper condition/position. This individual will sign the tag and then initial the Tagout Record Sheet to indicate the tag was correctly installed.	<b>G</b>
After the work is completed, the Authorizing Officer (Chief Engineer) will inspect and when satisfied, authorize removal of the tags by signing the Tagout Record Sheet.	<b>H</b>
The individual assigned to clear the tags and locking devices will enter the date/time the tag was cleared and initial the Tagout Record Sheet indicating the tag was removed. All removed tags will be returned to the Authorizing Officer for destruction. The Tagout Record Sheet will be filed in the inactive section of the Tagout Log for six months.	<b>I</b>

*Figure 5-4. Tagout record sheet (continued)*

b. **Tag Removal.** Danger and Caution tags will be removed immediately when the situation requiring the tagout has been corrected. Danger tags will be properly cleared and removed before a system or portion of a system is operationally tested and restored to service.

(1) No tags and lockout devices will be cleared without the approval of the Authorizing Officer. The Authorizing Officer's approval will be annotated on the Tagout Record Sheet indicating which tags are to be removed.

(2) The person who initiated the tagout should, if possible, be the person who clears the tags. However, do not delay the removal of tags when work is completed and the individual is not available.

(3) As the tags and lockout devices are removed, they will be returned immediately to the Authorizing Officer. Using the returned tags and Tagout Record Sheet, the Authorizing Officer will verify that all the tags have been cleared by all parties. The date and time cleared will be annotated on the Tagout Record Sheet and the date entered on the Tagout Index Sheet.

(4) Removed tags will be destroyed after they have been delivered to the Authorizing Officer. The Authorizing Officer will file it in the inactive section of the Tagout Log. Inactive Tagout Record Sheets will be maintained for six months, then destroyed.

c. **Lost or Missing Tags.** Tags which are missing or have come off the item to which they are to be attached will immediately be reported to the Authorizing Officer.

(1) The Authorizing Officer will direct a new tag to be added to the Tagout Record Sheet using the above procedure for initiating a tagout.

(2) After the new tag is installed and verified by a second party, the Authorizing Officer will then clear the old tag from the Tagout Record Sheet using the above procedures for clearing/removing tags.

## CHAPTER 6

### BLOODBORNE PATHOGENS/UNIVERSAL PRECAUTIONS

6-1. **GENERAL.** This chapter will discuss the risk of exposure, protection, and handling of bloodborne pathogens. Also covered is Hepatitis B vaccinations, personal protection, and OSHA/CPR 29, Part 1910.1030 pertaining to bloodborne pathogens.

6-2. **DEFINITIONS.** The following describes terms related to bloodborne pathogens/universal precautions.

- **Blood.** Human blood, human blood components, and products made from human blood.
- **Bloodborne pathogens.** Pathogenic microorganisms that are present in human blood and can cause disease in humans. These pathogens include, but are not limited to, HBV and HIV.
- **Contaminated.** The presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.
- **Contaminated laundry.** Laundry which has been soiled with blood or other potentially infectious materials or may contain sharps.
- **Contaminated sharps.** Any contaminated objects that can penetrate the skin including, but not limited to, needles, scalpels, broken glass, broken capillary tubes, and exposed ends of dental wires.
- **Decontamination.** The use of physical or chemical means to remove, inactivate, or destroy bloodborne pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.
- **Exposure incident.** A specific eye, mouth, other mucous membrane, nonintact skin, or parenteral contact with blood results from the performance of an employee's duties.
- **Handwashing facilities.** A facility providing an adequate supply of running potable water, soap, and single use towels or hot air drying machines.
- **HBV.** Hepatitis B virus.
- **HIV.** Human immunodeficiency virus.
- **Occupational exposure.** Reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties.
- **Other potentially infectious materials.**
  - The following human body fluids: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, pericardial fluid, peritoneal fluid, amniotic fluid, saliva in dental procedures, body fluids that are visibly contaminated with blood, and all body fluids in situations where it is difficult or impossible to distinguish between body fluids.
  - Any unfixed tissue or organ (other than intact skin) from a human (living or dead).
  - HIV-containing cell or tissue cultures, organ cultures, and HIV- or HBV-containing culture medium or other solutions; and blood, organs, or other tissues from experimental animals infected with HIV or HBV.

- **Personal protective equipment.** PPE is specialized clothing or equipment worn by an employee for protection against a hazard. General work clothes (such as uniforms, pants, shirts, or blouses) not intended to function as protection against a hazard are not considered to be PPE.

- **Regulated waste.** Liquid or semi-liquid blood or other potentially infectious materials; contaminated items that would release blood or other potentially infectious materials in a liquid or semi-liquid state if compressed; items that are caked with dried blood or other potentially infectious materials and are capable of releasing these materials during handling; contaminated sharps; and pathological and micro-biological wastes containing blood or other potentially infectious materials.

- **Source individual.** Any individual, living or dead, whose blood or other potentially infectious materials may be a source of occupational exposure to the employee. Examples include, but are not limited to, hospitals and clinic patients; clients in institutions for the developmentally disabled; trauma victims; clients of drug and alcohol treatment facilities; residents of hospices and nursing homes; human remains; and individuals who donate or sell blood or blood components.

- **Sterilize.** The use of a physical or chemical procedures to destroy all microbial life including highly resistant bacterial endospores.

- **Work practice controls.** Controls that reduce the likelihood of exposure by altering the manner in which a task is performed (such as prohibiting recapping of needles by two-handed technique).

6-3. **DISCUSSION.** The medical field no longer refers to AIDS as affecting “risk groups” such as gay or bisexual because the virus cannot tell if you are black, white, gay, straight, male, or female, and it does not care. Instead, focusing on behaviors, it is not who you are but what you do that puts you at risk for HIV infections.

6-4. **FIRST AID PROVIDER.** OSHA announced it will allow employers to offer hepatitis B vaccinations to certain employees after they have been given first aid rather than offering pre-exposure vaccinations. As of 6 July 1992, based on the low risk of exposure for first aid providers, OSHA believes that post-exposure prophylaxis, including hepatitis B vaccination within 24 hours of possible exposure, both reduces the risk to employees and lessens demands on limited supplies of the vaccine. All first aid providers who render assistance in any situation involving the presence of blood or other potentially infectious materials, regardless of whether or not a specific exposure incident occurs, must be offered the full immunization series--as soon as possible but in no event later than 24 hours.

6-5. **REPORTING PROCEDURES.** Procedures must be in place under the exposure control plan to ensure that all first aid incidents involving exposure are reported to the employer before the end of the work shift during which the incident occurs. If an exposure incident as defined in the standard has taken place, other post-exposure follow-up procedures must be initiated immediately, per the requirements of the standard. First aid providers must receive training under the bloodborne pathogens standard that covers the specifics of the reporting procedures.

6-6. **PROTECTION WHEN HANDLING SHARPS.** A needlestick or a cut from a contaminated scalpel can lead to infection from HBV or HIV which causes AIDS. Although few cases of AIDS have been documented from occupational exposure, approximately 8,700 health care workers each year contract hepatitis B. About 200 will die as a result. The new OSHA standard covering bloodborne pathogens specifies measures to reduce these risks of infection.

**6-7. SHARPS CONTAINERS.** Containers used for sharps must be puncture resistant. The sides and the bottom must be leakproof. They must be labeled or color coded red to ensure that everyone knows the contents are hazardous. Containers for disposable sharps must have a lid, and they must be maintained upright to keep liquids and the sharps inside.

Employees must never reach by hand into containers of contaminated sharps. Containers for reusable sharps could be equipped with wire basket liners for easy removal during reprocessing, or employees could use tongs or forceps to withdraw the contents. Reusable sharps disposal containers may not be opened, emptied, or cleaned manually.

Containers need to be located as near to as feasible the area of use. In some cases, they may be placed on carts to prevent access to mentally disturbed or pediatric patients. Containers also should be available wherever sharps may be found, such as in laundries. The containers must be replaced routinely. Do not overfill these containers. Overfilling increases the risk of needlesticks or cuts.

**6-8. HANDLING CONTAINERS.** When employees are ready to discard containers, they should first close the lids. If there is a chance of leakage from the primary container, the employees should use a secondary container that closes, is labeled or color coded, and leak resistant. Careful handling of sharps can prevent injury and reduce the risk of infection. By following these work practices, employees can decrease their chances of contracting bloodborne illness.

**6-9. HEPATITIS B VACCINATION PROTECTION.** HBV is a potentially life threatening bloodborne pathogen. The Center for Disease Control estimates there are approximately 280,000 HBV infections each year in the US.

If a worker experiences an exposure incident, such as a needlestick or a blood splash in the eye, they must receive confidential medical evaluation from a licensed health care professional with appropriate follow-up. To the extent possible by law, the employer is to determine the source individual for HBV as well as HIV infectivity. The worker's blood will also be screened if they agree.

The health care professional is to follow the guidelines of the US Public Health Service in providing treatment. This would include hepatitis B vaccination. The health care professional must give written opinion on whether or not vaccination is recommended and whether the employee received it. Only this information is reported to the employer. Employee medical records must remain confidential. HIV or HBV status must NOT be reported to the employer.

**6-10. PERSONAL PROTECTION EQUIPMENT.** Wearing gloves, gowns, masks, and eye protection can significantly reduce health risks for workers exposed to blood and other potentially infectious materials. Workers who have direct exposure to blood and other potentially infectious materials on their jobs run the risk of contracting bloodborne infections from HBV, HIV which causes AIDS, and other pathogens. Although the risk of contracting AIDS through occupational exposure is much lower, wearing proper PPE can greatly reduce potential exposure to all bloodborne infections.

a. **Selecting PPE.** Personal protective clothing and equipment must be suitable. This means the level of protection must fit the expected exposure. For example, gloves would be

sufficient for a laboratory technician who is drawing blood, whereas a pathologist conducting an autopsy would need considerably more protective clothing.

**b. Decontaminating and Disposing of PPE.** Employees must remove personal protective clothing and equipment before leaving the work area or when the PPE becomes contaminated. If a garment is penetrated, workers must remove it immediately or as soon as feasible. Used protective clothing and equipment must be placed in designated containers for storage, decontamination, or disposal. Every employer whose employees are exposed to blood or other potentially infectious materials must develop a written schedule for cleaning each area where exposure occurs. The methods of decontaminating different surfaces must be specified, determined by the type of surface to be cleaned, the soil present, and the tasks or procedures that occurs in that area.

**c. Other Protective Devices.** If an employee's skin or mucous membranes come into contact with blood, they are to wash with soap and water and flush eyes with water as soon as feasible. Workers must also wash their hands immediately or as soon as feasible after removing PPE. If soap and water are not immediately available, employers may provide other handwashing measures such as moist towelettes. Employees must still wash with soap and water as soon as possible. Employees must refrain from eating, drinking, smoking, applying cosmetics or lip balm, and handling contact lenses in areas where they may be exposed to blood or other potentially infectious materials.

## CHAPTER 7

### CONFINED SPACES

7-1. **GENERAL.** This chapter outlines procedures for the identification, preparation, testing, and entry in and rescue from confined spaces within the Army watercraft fleet.

#### WARNING

All spaces are permit-required spaces for welding operations.

7-2. **DEFINITIONS.** The following describes terms related to confined spaces.

- *Acceptable entry conditions.* The conditions that must exist in a permit space to allow entry and to ensure that employees involved with a permit-required confined space can safely enter into and work within the space.
- *Attendant.* An individual stationed outside one or more permit spaces who monitors the authorized entrants and who performs all duties assigned in accordance with the unit's permit space program.
- *Authorized entrant.* An individual who is authorized by the Commander to enter a confined space.
- *Confined space.* A confined space is one that meets the following conditions:
  - Large enough that an individual can bodily enter and perform assigned work.
  - Has limited or restricted means for entry or exit (for example, tanks, vessels, vaults, pits, and fuel cells).
  - Not designed for continuous occupancy.
- *Emergency.* Any occurrence (including any failure of a hazard control or monitoring equipment) or event (internal or external) to the permit space that could endanger entrants.
- *Engulfment.* The surrounding and effective capture of a person by a liquid or finely divided (flowable) solid substance that can be aspirated to cause death by filling or plugging the respiratory system or that can exert enough force on the body to cause death by strangulation, constriction, or crushing.
- *Entry.* The action by which a person passes through an opening into a permit-required confined space. Entry includes ensuing work activated in that space and is considered to have occurred as soon as any part of the entrant's body breaks the plane of an opening into the space.
- *Entry permit.* The written or printed document that is provided by the Unit Safety Office to allow and control entry into a permit space and that contains the information specified in this manual.
- *Entry supervisor.* The person responsible for determining if acceptable entry conditions are present at a permit space where entry is planned, for authorizing entry and overseeing entry operations, and for terminating entry as required.

NOTE

An entry supervisor may also serve as an attendant. Also, the duties of entry supervisor may be passed from one individual to another during the course of an entry operation.

- *Hazardous atmosphere.* An atmosphere that may expose personnel to the risk of death, incapacitation, impairment of ability to self-rescue (that is escape unaided from a permit space), injury, or acute illness from one or more of the following causes:

- Flammable gas, vapor, or mist in excess of 10 percent of its LEL.
- Airborne combustible dust at a concentration that meets or exceeds its LEL.

NOTE

This concentration may be approximated as a condition which the dust obscures vision at a distance of 5 feet or less.

- Atmospheric concentration of any substance for which a dose or a permissible exposure limit is published, and which could result in personnel exposure in excess of its dose or permissible exposure limit.

- Atmospheric oxygen concentration below 19.5 percent or above 23.5 percent.
- Any other atmospheric condition that is immediately dangerous to life or health.

- *Hotwork permit.* The Command's written authorization to perform operations (such as welding) is capable of providing a source of ignition.

- *Immediately dangerous to life or health.* Any condition that poses an immediate or delayed threat to life or that would cause irreversible adverse health effects or that would interfere with an individual's ability to escape unaided from a permit space.

- *Non-permit confined space.* A confined space that does not contain or, with respect to atmospheric hazards, has the potential to contain any hazard capable of causing death or serious physical harm.

- *Oxygen deficient atmosphere.* An atmosphere containing less than 19.5 percent oxygen by volume.

- *Oxygen enriched atmosphere.* An atmosphere containing more than 23.5 percent oxygen by volume.

- *Permit-required confined space.* A space that has one or more of the following characteristics:

- Contains or has a potential to contain a hazardous atmosphere.
- Contains a material that has the potential for engulfing an entrant.

- Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls or by a floor which slopes downward and tapers to a smaller cross-section.

- Contains any other recognized safety or health hazard.

- *Permit required confined space program.* The Command's overall program for controlling, and, where appropriate, for protecting personnel from permit space hazards and for regulating personnel entry into permit spaces.

- *Permit system.* The Command's written procedures for preparing and issuing permits for entry and for returning the permit space to service following termination of entry.

- *Prohibited condition.* Any condition in a permit space that is not allowed by the permit during the period when entry is authorized.

- *Rescue service.* The personnel designated to rescue personnel from permit spaces.

- *Retrieval system.* The equipment used for non-entry rescue of persons from permit spaces.

- *Testing.* The process by which the hazards, that may confront entrants of a permit space, are identified and evaluated. Testing includes specifying the tests that are to be performed in the permit space.

7-3. **DUTIES AND RESPONSIBILITIES.** The following identify the duties and responsibilities of those involved with confined space entry.

a. **Commanders.** Commanders are responsible for the following:

- Establish a confined space entry SOP within each organization conducting entry operations.
- Ensure recommended equipment to support confined space entry operations is purchased and maintained.
- Ensure personnel assigned confined space entry duties are adequately trained and certified.
- Maintain an inventory of all confined spaces within the organization.
- Establish risk approval procedures within the organization.

b. **Entry Supervisor.** The entry supervisor is responsible for the following:

- Know the potential hazards during entry and work.
- Determine if acceptable entry conditions are present prior to entry and maintained throughout the work process.
- Authorize entry and oversee entry operations.
- Terminate entry as required by 29 CFR 1910.146.
- Verify that rescue services are readily available and the means for summoning them are operable.
- Remove unauthorized individuals from confined space entry sites.
- Ensure that permits are completed and maintained IAW 29 CFR 1910.146.
- Ensure that equipment used for atmospheric testing is properly calibrated and maintained.

c. **Entrant.** The entrant is responsible for the following:

- Know hazards that may be faced during entry.
- Be able to recognize signs or symptoms of hazard exposure and understand the consequences of such exposure.
- Use equipment properly.
- Maintain communication with the attendant.
- Alert the attendant to hazards discovered while in the space.
- Exit the space quickly when required.

d. **Attendant.** The attendant is responsible for the following:

- Know hazards that may be faced during entry.
- Be able to recognize signs or symptoms of hazard exposure.
- Maintain accurate entrant identification.
- Remain outside the space at all times.
- Maintain communication with the entrant and be able to communicate with the entry supervisor when needed.
- Monitor entry activities.
- Summon rescue services when needed.
- Prevent unauthorized entry.
- Perform non-entry rescue.
- Perform no conflicting duties.

7-4. **BACKGROUND.** The primary cause of injury or death in confined spaces is asphyxiation. The second leading cause is fire. In the past, over 60 percent of all fatalities in confined spaces where untrained rescuers. Implementation of the OSHA standard and these procedures will greatly reduce the potential for loss of life during entry into the many confined spaces within this command.

7-5. **CONFINED SPACE CLASSIFICATION.** Each space must be evaluated on its own merit at the time of entry. Despite some lead way in the federal standards, you must treat all spaces as permit spaces prior to entry. This means that prior to entry, an entry supervisor will verify and document test results for oxygen content, flammability, and toxicity as well as evaluating other potential hazards. The entry supervisor may modify entry procedures based on this initial evaluation by classifying the space as non-permit. But, the space must clearly demonstrate no potential for developing a serious hazard during the work process. If a space is designated as non-permit, initial atmospheric test results must be documented and maintained on file for one year following the entry.

7-6. **PREVENTING UNAUTHORIZED ENTRY.** Observe the following to prevent unauthorized entry.

- Each organization responsible for entering confined spaces must maintain an inventory of such spaces. The inventory must be organized so that the location of referenced spaces are easily identified.
- All spaces that have the potential to contain atmospheric or other serious hazards must be marked using a “Danger” sign and secured, if possible, to prevent unauthorized entry.
- All entries must be approved by a certified entry supervisor.

- During entry operations, an attendant will be positioned at the point of entry to ensure that only authorized entrants are allowed in the space. Attendants will summon the entry supervisor should unauthorized individuals interfere with safe operations. The entry supervisor will remove such individuals.

- To aid in preventing unauthorized entry, a safe zone must be identified around the point of entry using barricade tape or other means to warn individuals of a restricted area. Also, a “Danger” sign must be posted at the point of entry.

**7-7. CONFINED SPACE ENTRY EQUIPMENT.** The following covers meter requirements and meter maintenance.

- Organizations required to enter confined spaces will purchase and maintain a meter capable of measuring oxygen, flammability, and any toxic gases that can reasonably be expected to exist in the space atmosphere.

- The following Army watercraft are authorized to purchase one MSA Passport Kit: LSV, LT-800, LCU Class 2000, LCU Class 1600, FMS, ROWPU, and each Class B watercraft company maintenance section.

- Army watercraft are authorized purchase of the MSA, Passport Meter.

- ADD Form 314, or other suitable records, must be maintained on all meters to document periodic, unit level calibration. Calibration must be done prior to each daily use, but will not exceed monthly if the meter is not in use.

- Organizations must ensure that calibration gas and replacement sensors are available when needed.

- Other equipment required for safe entry is identified on the entry permit and must be maintained and issued. Should such equipment not be available in the organization, entry may not proceed until it is obtained. Such equipment may include airline respirator, tripod, lifeline and harness, non-sparking tools, lighting approved for hazardous atmospheres, ventilation blower, eye protection, hearing protection, gloves, and so on.

**7-8. EVALUATING CONFINED SPACE HAZARDS.** Use the following steps to evaluate confined space hazards.

- **Step 1.** The following atmospheric tests will be conducted prior to entry:

- Percent of oxygen not below 19.5 percent or above 23.5 percent.
- Percent of LFL not above 10 percent.
- Parts per million of carbon monoxide not above 35 ppm.
- Other atmospheric hazards not above the published PEL. See the MSDS for

specific contaminants.

- Should there be an indication that other atmospheric hazards may exist but cannot be identified at the unit level, contact your supporting MEDDAC for a consultation.

- **Step 2.** Visual inspection of the space prior to entry should identify other hazards that may exist. These may include noise, fall hazards, entrapment hazards, heat/cold, high pressure lines, inadequate lighting, chemicals, piping carrying hazardous materials, moving machinery, electrical hazards, biohazards, radiation hazards, and so forth.

7-9. **CONTROLLING CONFINED SPACE HAZARDS.** The goal of each entry is to have optimum conditions. This means you should always strive to have 20.8 percent oxygen, 0 percent LFL, 0 ppm CO, 0 ppm of other hazardous gases, and fully control all other hazards. The entry supervisor is trained to establish these controls. Ventilation is the primary means of eliminating atmospheric hazards. Basic ventilation criteria is as follows:

- Meter readings must be taken prior to and after ventilating to evaluate the effectiveness.
- Normally, oxygen hazards will be controlled by blowing fresh air into the space and flammable/toxic hazards will be controlled by exhausting contaminated air from the space.
- If hazardous conditions are being created during the work process, ventilation may be needed continuously during the entry.
- Single point hazards such as welding and burning can best be controlled using local exhaust ventilation.
- When hazardous gases are heavier than air, exhaust low in the space and replace air high in the space. When hazardous gases are lighter than air, exhaust high in the space and replace air low in the space. Refer to the contaminants vapor density on the MSDS for determination.
- Should there be any doubt about the use of ventilation or its effectiveness, contact your supporting MEDDAC for a consultation.

Isolation of hazardous conditions is necessary before entry is allowed. Isolation is the process of ensuring that space remains free from release of energy or other hazards while the space is open for entry operations. The entry supervisor is responsible for evaluating hazards and the most effective means of isolation. Some controls include:

- Blanking and blinding.
- Removal of pipe sections.
- Double block and bleed.
- Lockout and/or tagout.
- Disconnecting mechanical linkages.

Elimination of other hazards through cleaning, inerting, removal, guarding, reengineering, and soon should be the goal of the entry supervisor. If hazards cannot be fully controlled, protective equipment must be used. Use of respirators in confined spaces will be determined IAW AR 11-34. Controls identified on the entry permit must remain in place during the work processor the entry must be terminated.

7-10. **HOT WORK.** The following procedures will be used to protect against the possibility of fire or explosion when performing hot work in or adjacent to confined spaces.

- Hot work includes any spark, flame, or extreme heat producing work such as welding, burning, brazing, grinding, cutting, chipping, use of tools that produce an electrical arc, and so on. An entry supervisor will decide what work constitutes hot work prior to entry.
- If atmospheric testing shows or through evaluation of the work process a flammable environment is expected, both an entry permit (see Figure 7-1, page 7-8) and a hotwork permit (see Figure 7-2, page 7-9) must be completed before work can begin.

- Hot work will not be accomplished in or near spaces containing more than 10 percent of LFL.

- Organizations must make every attempt to engineer potentially flammable environments to 0 percent LFL before work commences or to fully control the potential hazard. This will be done by:

- Identifying all sources of flammable/combustible liquids, gases, and solids and using an acceptable means of isolating such sources from the space.

- Inerting spaces with a non-flammable inert gas if deemed appropriate by the entry supervisor. (Keep in mind that inerting creates an oxygen deficient atmosphere.)

- Cleaning and purging the space to remove flammable/combustible materials and residue.

- Covering combustible surfaces with a welding blanket or other suitable barrier.

- Using non-sparking tools and electrical appliances approved for the class and group of hazardous location expected (see the NEC).

- Continuously monitoring LFL levels when the work process may produce a flammable/combustible atmosphere.

- Evaluating all adjacent spaces to ensure that there is no potential for igniting products in those areas.

- Having adequate fire extinguishing equipment on hand.

- Using a fire watch when necessary.

**7-11. EMERGENCY RESPONSE.** The following procedures will be used for an emergency response.

- The entry team is trained to identify symptoms of hazard exposure. The goal of each entry is to conduct self rescue in the case of any incident. The attendant or entrant, once an incident occurs, is obligated to clear the space immediately. This includes a meter alarm. If a meter alarm sounds with an entrant in the space, the space must be cleared immediately without first evaluating the reason for the alarm.

- Should an injury occur in the space and the entrant cannot conduct a self rescue, the attendant must initiate a rescue by contacting the installation fire department or other rescue service.

- Prior to the rescue team arriving, the attendant will notify the entry supervisor and may attempt a non-entry rescue; however, the attendant may not enter the space.

**7-12. CONFINED SPACE ENTRY TRAINING.** The following are the minimum standards for confined space entry training.

- Each confined space entry team member must be trained to the standards in 29 CFR 1910.146. Certification training can be scheduled by contacting the Marine Safety Office, DSN 927-1327/3995.

- Four hours of refresher training and a practice entry must be conducted annually within each organization to maintain proficiency and certification.

- All training will be properly documented to include individual student identification. Central records will be maintained at the Marine Safety Office.

U.S. ARMY TRANSPORTATION CENTER CONFINED SPACE ENTRY PERMIT																																																																																																																			
<b>GENERAL INFORMATION</b>						Permit No. _____																																																																																																													
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Location/Building: _____				Authorized Duration of Permit: Date: _____ To: _____ Time: _____ To: _____																																																																																																															
<b>POTENTIAL HAZARDS IDENTIFIED</b> (Check all that apply) <input type="checkbox"/> Oxygen deficiency <input type="checkbox"/> Engulfment <input type="checkbox"/> Oxygen enrichment <input type="checkbox"/> Unsafe worker surface <input type="checkbox"/> Flammable gases or vapors <input type="checkbox"/> Entrapment <input type="checkbox"/> Airborne combustible dust <input type="checkbox"/> Radiation <input type="checkbox"/> Toxic gases or vapors <input type="checkbox"/> High pressure <input type="checkbox"/> Mechanical hazards <input type="checkbox"/> Lighting <input type="checkbox"/> Electrical shock <input type="checkbox"/> Heat/cold <input type="checkbox"/> Hazardous Chemicals  Other: _____				<b>EQUIPMENT REQUIRED FOR ENTRY AND WORK</b> SPECIFY AS REQUIRED: Personal Protective Equipment: _____  Respiratory Protection: _____  Atmospheric Testing/Monitoring: _____  Communication: _____  Rescue Equipment: _____  Other: _____																																																																																																															
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<b>EMERGENCY SERVICE</b> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Name of Service</th> <th style="text-align: left; border-bottom: 1px solid black;">Phone Number</th> <th style="text-align: left; border-bottom: 1px solid black;">Method of Contact</th> </tr> </thead> <tbody> <tr> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> <td style="border-bottom: 1px solid black;"> </td> </tr> </tbody> </table>				Name of Service	Phone Number	Method of Contact				<b>AUTHORIZED ENTRANTS</b> (List by name or attached roster.) _____ _____ _____																																																																																																									
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<b>TESTING RECORD</b> <div style="display: flex; justify-content: space-between;"> <span>Continuous Monitoring Required    <input type="checkbox"/> YES    <input type="checkbox"/> NO</span> <span>Periodic Monitoring Every _____ Minutes.</span> </div> <table style="width: 100%; border-collapse: collapse; font-size: 0.8em;"> <thead> <tr> <th style="text-align: left;">Time</th> <th style="text-align: left;">Acceptable Conditions</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> <th style="text-align: left;">Result : AM/PM</th> </tr> </thead> <tbody> <tr> <td>Oxygen-min.</td> <td>&gt;19.5%</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Oxygen-max.</td> <td>&lt;23.5%</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Flammability</td> <td>&lt;10% LEL/LFL</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>H<sub>2</sub>S</td> <td>&lt;10 ppm</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Toxic (specify)</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Cl<sub>2</sub></td> <td>&lt;0.5 ppm</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>CO</td> <td>&lt;35 ppm</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>SO<sub>2</sub></td> <td>&lt;2 ppm</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Heat</td> <td>F/ C</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Other</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Tester Initials</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>								Time	Acceptable Conditions	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Result : AM/PM	Oxygen-min.	>19.5%	_____	_____	_____	_____	_____	_____	_____	Oxygen-max.	<23.5%	_____	_____	_____	_____	_____	_____	_____	Flammability	<10% LEL/LFL	_____	_____	_____	_____	_____	_____	_____	H <sub>2</sub> S	<10 ppm	_____	_____	_____	_____	_____	_____	_____	Toxic (specify)	_____	_____	_____	_____	_____	_____	_____	_____	Cl <sub>2</sub>	<0.5 ppm	_____	_____	_____	_____	_____	_____	_____	CO	<35 ppm	_____	_____	_____	_____	_____	_____	_____	SO <sub>2</sub>	<2 ppm	_____	_____	_____	_____	_____	_____	_____	Heat	F/ C	_____	_____	_____	_____	_____	_____	_____	Other	_____	_____	_____	_____	_____	_____	_____	_____	Tester Initials	_____	_____	_____	_____	_____	_____	_____	_____
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TCFE FORM 124-SAFETY  
Sep 94

ORIGINAL White  
COPY (Color)

Copy 1 Post at Site  
Copy 2 Supervisor Retain for One Year

Figure 7-1. Confined space entry permit

<b>U.S. ARMY TRANSPORTATION CENTER HOTWORK PERMIT</b>																											
<b>GENERAL INFORMATION</b>			<b>Permit No.</b>																								
<b>Worksite identification:</b> <hr/> <hr/>		<b>Hotwork to be Performed:</b> <hr/> <hr/>																									
<b>Location/Building:</b> <hr/> <hr/>		<b>Authorized Duration of Permit:</b> <b>Date:</b> <b>to</b> <hr/> <b>Time:</b> <b>to</b> <hr/>																									
<b>SOURCE OF IGNITION</b> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"><input type="checkbox"/> Acetylene torch</div> <div style="width: 33%;"><input type="checkbox"/> Electric tools</div> <div style="width: 33%;"><input type="checkbox"/> Soldering</div> <div style="width: 33%;"><input type="checkbox"/> Abrasive saw</div> <div style="width: 33%;"><input type="checkbox"/> Heliarc welding</div> <div style="width: 33%;"><input type="checkbox"/> Drilling</div> <div style="width: 33%;"><input type="checkbox"/> Electric arc</div> <div style="width: 33%;"><input type="checkbox"/> Propane torch</div> <div style="width: 33%;"><input type="checkbox"/> Other: _____</div> </div>																											
<div style="display: flex;"> <div style="width: 35%;"> <p><b>SOURCE OF IGNITION</b> THIS HOTWORK PERMIT MAY BE SIGNED AND HOTWORK AUTHORIZED ONLY AFTER SATISFACTORY COMPLIANCE WITH ALL ITEMS OUTLINED IN THIS PERMIT.</p> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"><input type="checkbox"/> Floors swept clean of combustibles?</div> <div style="width: 33%;"><input type="checkbox"/> Remaining combustible or flammable materials 35 feet horizontally as well as vertically from source of heat?</div> <div style="width: 33%;"><input type="checkbox"/> Non-movable combustible or flammable materials isolated, covered/shielded with fire retardant material?</div> <div style="width: 33%;"><input type="checkbox"/> Vertical and horizontal openings within 35 feet sealed or covered for spark/vapor control?</div> <div style="width: 33%;"><input type="checkbox"/> Heat transmission, conduction, radiation controlled?</div> <div style="width: 33%;"><input type="checkbox"/> Hazardous material transfers disconnected within 60 feet of hot work?</div> <div style="width: 33%;"><input type="checkbox"/> Lockout/tagout of electrical, mechanical, chemical, blanking, cap piping implemented?</div> </div> </div> <div style="width: 65%;"> <div style="display: flex; flex-wrap: wrap;"> <div style="width: 33%;"><input type="checkbox"/> Vessels, equipment drained, purged, ventilated, cleaned?</div> <div style="width: 33%;"><input type="checkbox"/> Automatic fire sprinkler system operational?</div> <div style="width: 33%;"><input type="checkbox"/> Inert gas blanket required?</div> <div style="width: 33%;"><input type="checkbox"/> Oxygen-rich environment evaluated?</div> <div style="width: 33%;"><input type="checkbox"/> Welding, cutting fume ventilation or respirator required?</div> <div style="width: 33%;"><input type="checkbox"/> Continuous monitoring of atmospheric conditions maintained?</div> <div style="width: 33%;"><input type="checkbox"/> Building/area air currents and outdoor wind direction known?</div> <div style="width: 33%;"><input type="checkbox"/> Checking for flammable/combustible gas and oxygen levels?</div> <div style="width: 33%;"><input type="checkbox"/> Hazardous material spill release equipment and countermeasures available.</div> <div style="width: 33%;"><input type="checkbox"/> Special danger, caution, warning signs posted?</div> <div style="width: 33%;"><input type="checkbox"/> Supervisor notified work location and time of operation?</div> <div style="width: 33%;"><input type="checkbox"/> Trenches over four feet deep shored or sloped?</div> <div style="width: 33%;"><input type="checkbox"/> Involved personnel and contractor employees advised of hazards?</div> <div style="width: 33%;"><input type="checkbox"/> Firewatch provided during work and 30 minutes after completion of work?</div> <div style="width: 33%;"><input type="checkbox"/> Means of egress identified and available?</div> <div style="width: 33%;"><input type="checkbox"/> Work areas and adjacent areas where sparks may have spread checked out 30 minutes after work completed?</div> <div style="width: 33%;"><input type="checkbox"/> Fire protection equipment available and operational?</div> </div> </div> </div>																											
<b>APPROVALS AND AUTHORIZATIONS</b> <p>This permit is valid only so long as work conditions existing at the time of issuance continue. It expires on any change in condition that adversely affects safety of the work area while work is in progress.</p> <p style="text-align: center;"><b>STOP WORK IMMEDIATELY IF PLANT EMERGENCY ALARM SIGNALS AN EMERGENCY IN OR NEAR YOUR WORK AREA. FOLLOW FIREWATCH INSTRUCTIONS.</b></p> <p>I have personally inspected the location where the above work is to be done. I have checked for compliance with the safety precautions listed on the permit and authorized the work to be performed.</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 25%;">Title</th> <th style="width: 25%;">Printed Name</th> <th style="width: 25%;">Signature</th> <th style="width: 25%;">Date</th> </tr> </thead> <tbody> <tr> <td>Originator/Approver</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Safety Officer</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Welder</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Firewatch</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> <tr> <td>Fire Inspector</td> <td>_____</td> <td>_____</td> <td>_____</td> </tr> </tbody> </table>				Title	Printed Name	Signature	Date	Originator/Approver	_____	_____	_____	Safety Officer	_____	_____	_____	Welder	_____	_____	_____	Firewatch	_____	_____	_____	Fire Inspector	_____	_____	_____
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<b>THIS PERMIT MUST BE POSTED ON JOB SITE - GOOD ONLY ON INDICATED DATE</b>																											

TCFE Form 6060-TD (16 Jan 96)

Figure 7-2. Hotwork permit

7-13. **PERMITS.** Permits will be used according to the following.

- An entry permit will be used to document results of atmospheric tests and control safe entry. Each organization will use the permit shown at Figure 7-1.
- Only certified entry supervisors may approve entry permits.
- Entry permits will be approved for the minimum time necessary to complete operations.
- The original permit will be posted at the point of entry while work is in progress. A copy of the permit will be maintained by the organization for one year following the entry.
- Only those entrants identified on the permit may enter the space.
- Hot work may require special precautions that are not identified on the entry permit. Should this occur, the permit at Figure 7-2 will be used in conjunction with the entry permit. In such cases, the entry permit and the other permit will be posted at the point of entry.

7-14. **COMMUNICATION.** The entry supervisor will establish procedures for communication relative to each entry. Continuous communication between the entrant and attendant is required and emergency communication is required between the attendant and the rescue team and entry supervisor. Communication may be visual, verbal, signals, and so forth, but must be identified on the entry permit.

7-15. **CONTRACTORS.** Each organization must accomplish the following prior to contractor entries into confined spaces managed by this Command:

- Inform the contractor of permit program requirements.
- Apprise the contractor of safety precautions and procedures specific to the confined space being entered.
- Apprise the contractor of emergency response procedures on the installation.

7-16. **CONCLUDING CONFINED SPACE ENTRIES.** At the completion of work, the following will be done:

- Cancel the permit and file it for one year.
- Close the space and ensure that it is identified as a restricted area by having a “Danger” sign posted at the point of entry.

7-17. **PROCUREMENT.** The following MSA Passport Kit and/or individual parts may be purchased as follows: MSA Part Number "US ARMY-PPT-A-3210L-1000-CO-P42-133". This kit includes the following:

- One each, MSA Passport Meter, four gas (oxygen, carbon monoxide, hydrogen sulfide, and combustible), with alkaline battery (size C) pack, external pump, 25 feet sampling line, three feet probe, vinyl jacket, and a large pelican case to hold the instrument (MSA Part Number 804645).
- One each, calibration regulator (MSA Part Number 467895).
- One each, calibration gas, CO and LEL (MSA Part Number 478191).
- One each, calibration gas, H<sub>2</sub>S (MSA Part Number 467898).
- One each, calibration tubing (MSA Part Number 24194).
- One each, remote alarm, 105db (MSA Part Number 800991).
- One each, remote alarm cable (MSA Part Number 8 12706).

To order all of the above as a kit, call 1-800-883-4001. Or you can write to the following:

OBBCO SAFETY& SUPPLY  
1737 South Park Court  
Chesapeake, VA 23320

To order individual parts, call 1-800-672-2222. Or you can write to the following:

Mine Safety Appliances Company  
P.O. Box 426  
Pittsburgh, PA 15230

Use the GSA Contract Number GS-24F-1086B and the individual MSA Part Number when ordering.

## CHAPTER 8

### HOT WORK

8-1. **GENERAL.** Hot work in the context of gas free engineering includes the following:

- Flame heating, welding, torch cutting, brazing, or carbon arc gouging.
- Any operation producing temperatures of 204.4 degrees C (400 degrees F).
- Any operation occurring in the presence of flammable materials or in a flammable atmosphere which requires the use or presence of an ignition source. Examples of such work include the following:

- Spark-producing or static discharge.
- Friction.
- Open flames or embers.
- Impact.
- Nonexplosion-proof equipment (such as lights, fixtures, or motors).

#### CAUTION

When open flame or heat producing work such as welding, cutting, or brazing is to be conducted, the worksite, regardless of the location, is to be inspected by the gas free engineer or safety NCO.

8-2. **APPLICATION.** The provisions in this chapter apply to all hot work performed in confined or enclosed spaces, machinery rooms, bilges, and other locations proximate to flammable atmospheres (such as near fuel tank vents and sounding tubes). This chapter also applies to hot work performed on closed structures or containers such as pipes, drums, ducts, tubes, jacketed vessels, and similar items.

8-3. **CLEANING AND VENTILATING FOR HOT WORK.** Before hot work is begun in a confined or enclosed space, the space shall be tested, inspected, emptied of flammable cargo, cleaned, ventilated, and certified safe for hot work. Extraneous flammable or combustible materials such as scrap wood, paper, ropes, or rags shall be removed from the space. Combustible materials that cannot be removed shall be adequately protected. Ventilation ducting shall be made of noncombustible metal, of flexible construction, and free from hazardous combustible residues.

8-4. **FIRE WATCH.** When open flame or heat-producing work such as welding, cutting, or brazing is to be conducted, establish a trained fire watch at the worksite. When hot work may transmit fire hazards to other spaces by overheating the connecting deck, overhead, or bulkheads, provide fire watches on both sides of the hot deck, overhead, or bulkheads. Fire watch communications will enable the fire watch to report hazardous conditions on the opposite side of separating structures and provide a signal to stop hot work. Fire watches on both sides of the separating structure shall have, and know how to use, fire extinguishing equipment suitable to the exposure. Fire watches shall be equipped with personnel protective equipment as required for the

operation being conducted (such as goggles, helmet, approved respiratory protective devices, and fire retardant clothing). After completion of the hot work operation, fire watches shall remain on station for a minimum of 30 minutes, ensure the area is cool to the touch, and that no smoldering embers remain.

8-5. **FIRE EXTINGUISHING EQUIPMENT.** Fire extinguishing equipment shall be provided which is suitable for the nature and amount of flammable or combustibles present. Never use vaporizing liquid extinguishers in confined or enclosed spaces. Use PKP and CO<sub>2</sub> extinguishers only after determining that the extinguisher is appropriate for the exposure. Also determine whether the displacement of oxygen by discharge of CO<sub>2</sub> into the space is likely to cause a hazard to personnel. Water extinguishers or firehoses equipped with vari-nozzles, fog nozzles, or fog applicators are the most suitable fire extinguishing equipment for hot work in the presence of ordinary (class A) combustible material, flammable residues, coating, or insulation. Evaluate fire extinguishing equipment for the following:

- Ability to suppress the fire.
- Hazards that the extinguishing agent might create in the space.
- Capacity of the equipment compared to the fire potential. Firehoses equipped with a vari-nozzle, fog nozzle, applicator, or portable fire extinguisher are acceptable. The nature of the space or ship may restrict selection of fire equipment.

NOTE

Class A combustibles are those which leave embers and must therefore be cooled throughout the entire mass.

8-6. **HOT WORK LOCATIONS.** Prior to beginning hot work, an assessment of potential hazards must be made at each location. The following, although not all inclusive, provides guidance regarding what hazards to expect.

a. **Boundary Spaces.** When hot work is to be performed on fuel tanks, associated vent spaces, or other spaces containing flammables (such as paint lockers and flammable liquid storerooms), the adjacent spaces above, below, and on all sides (boundary spaces) shall first be inspected and tested, cleaned, and ventilated or inerted as appropriate, then certified **SAFE FOR HOT WORK**.

b. **Pipes, Tubes, and Coils.** Hollow connections to a space can present the same hazards as the space itself. Pipes, tubes, and coils or similar items which service, enter, or exit a confined or enclosed space shall be flushed, blown, purged, or otherwise cleaned and certified **Safe for Hot Work** before the performance of hot work on such items. If not so treated and certified, the certificate for the space shall be marked **Not Safe for Hot Work**. Valves to pipes, tubes, or similar items shall be dosed, the pipes blanked off, and tagged out, following the provisions of the Ship's Tagout Procedures, to prevent inadvertent discharge or backflow of materials into the space.

c. **Hot Work on Closed Containers or Structures.** Prior to beginning hot work on hollow structures, drums, containers, jacketed vessels, or similar items, the items shall be cleaned, flushed, purged, inerted, tilled with water, or otherwise made safe. The items shall be inspected, cleaned, tested, and certified before performing hot work. Items which are dosed and subject to pressure buildup from any application of heat shall be vented to relieve any pressure created by the hot work. The method of venting shall be selected to prevent ignition or explosion during the venting process.

d. **Hot Work Near Preservative Coatings.** Characteristics of a particular coating determine the procedures and precautions for hot work near that coating.

e. **Flammable Coatings.** Flammable coating hot work requirements areas follows:

- Determine the flammability of coatings before starting hot work. Remove combustible coating from the hot work area to a distance sufficient to prevent ignition or outgassing (from temperature increase) at least 4 inches on all sides from the outer edge of the hot work.
- Never use flame or uncontrolled heat for stripping flammable coating.
- Test continuously for flammable atmospheres during hot work. Where significant outgassing is detected, stop hot work and further strip the coating. Start artificial cooling methods, such as wetting down, to prevent temperature increases in the unstrapped areas.
- Shield flammable coatings from slag or sparks in the area of the hot work. Wet down surrounding areas or cover with netted fire retardant cloth.
- Ventilate area, if applicable.
- At a minimum, keep a 1-inch firehose with a vari-nozzle, fire nozzle, or fog applicator in the immediate vicinity, charged, and ready for instant use, except where prohibited by the nature of the space or ship.

f. **Toxic Coatings.** Before hot work, strip any coating which becomes toxic when heated to at least 4 inches beyond the area that will be heated. Equip personnel with airline respirators or equivalent respiratory protection. Ventilate to remove toxic fumes or vapors from the space.

g. **Hot Work Near Damaged Surfaces.** Tank walls and coating deformities may carry toxicants and other hazards. Blisters, scales, and similar formations inside tanks that have held flammable materials may, even after cleaning and ventilating, hold flammable residues. Consider the following when planning hot work

- Determine whether any previous tank contents may have left hazardous residues.
- Assess the possibility of a surface flash which would involve the entire space.

h. **Clean Scales or Blisters.** Consider the following when cleaning scales or blisters.

- Remove scales or blisters which contain highly flammable residues (flashpoint 37.8 degrees C (100 degrees F) such as gasoline or JP-4 fuel) from the entire space before hot work.
- Clean away scales or blisters containing less flammable residues (flashpoint above 37.8 degrees C (100 degrees F) such as fuel oil or JP-5 fuel) to a distance of 4 inches on all sides from the outer edge of the hot work. In all cases, the area cleaned shall be sufficient to prevent outgassing from surrounding areas and to prevent ignition of residues.
- Clean or protect areas below the hot work. Use screens, fire retardant cloth, or devices to capture sparks and slag.

- Wet down areas around hot work to reduce the residue vaporization and to prevent small fires and flashes.
- Assign fire watches with equipment to extinguish any resulting fire.

i. **Hot Work Near Pressurized Systems.** Before beginning hot work, repressurize nearby pressurized systems (such as hydraulics or Freon). Protect piping, fittings, valves, and other system components from contact with flames, arcs, slag, or sparks. Clean space and remove contaminants before hot work.

**WARNING**

When subjected to high temperatures, hydraulic fluid can decompose and produce highly toxic by-products. Noncombustible insulation such as fiberglass may have combustible backing or adhesive materials.

j. **Hot Work Near Insulation.** Conduct hot work carefully near combustible insulation. Some insulation materials may be ignited by welding, slag, or other short-duration exposure to ignition sources. Foam insulation materials are particularly likely to ignite and generate toxic combustion gases. The following are procedures for hot work near insulation:

- Remove insulation from the area of hot work.
- Wet down nonremovable insulation with water then cover the insulation with watersoaked, fire-retardant cloth.
- Station a fire watch with a charged 1-inch firehose, ready for use in the immediate area.

k. **Hot Work Near Ammunition and Explosives.** The following procedures are for hot work near ammunition or explosives:

- Remove ammunition and explosives from the area of hot work.
- Ventilate the area of the hot work.

8-7. **HAZARDOUS BY-PRODUCTS.** Welding, cutting, heating, or burning in the presence of certain materials (such as adulate fluids, Freons, chlorinated solvents, or halons) can cause decomposition and produce hazardous by-products. Ensure that hot work is not conducted on or near such materials. Keep welding or cutting operations, which produce high levels of ultraviolet radiation, at least 200 feet from exposed chlorinated solvents.

8-8. **GAS WELDING AND CUTTING OPERATIONS.** The following shall be observed when performing gas welding or cutting operations.

a. **Compressed Gas Cylinders.** Transport, handle, and store compressed gas cylinders in accordance with the Code of Federal Regulations. Keep compressed gas cylinders or gas manifolds, used in welding and cutting operations, out of confined or enclosed spaces. Place them outside the space in open air, away from any fire, explosion, or emergency situation. Station an attendant, who

shall in an emergency, immediately turn off the gas supply from the compressed gas cylinders or gas manifolds.

b. **Gas Welding and Cutting Equipment.** Follow the procedures outlined in applicable manuals to inspect, test, operate, and maintain gas welding and cutting equipment such as hoses, connections, and torches. Remove torches and hoses from the space at work-crew change and at night. Remove open-ended hoses immediately after disconnecting torches or other devices from the hose.

c. **Gas Supplies.** Turn off gas supplies at the cylinder or manifold outside the space when equipment is unattended or unused for substantial periods of time. These include during breaks, lunch periods, work-crew changes, or overnight.

d. **Electric Arc Equipment.** Inspect, test, operate, and maintain electric arc equipment in accordance with the Code of Federal Regulations and appropriate manuals. Personnel engaged in electric arc welding repairs should be aware that the welder cabling produces strong magnetic fields during operation. Welding cables should be routed a minimum of 6 feet from sensitive electronic equipment such as radio or navigation equipment.

e. **Electrode Holders.** When electrode holders are left unattended, such as at breaks or during lunch periods, remove the electrodes from their holders. Place holders in a safe location and open the power switch to the equipment. If unattended for longer periods, such as overnight, remove electrode holders, cables, and other equipment from the space and disconnect the power supply to the equipment.

f. **Inert Gas Welding Process.** When using inert gases for welding, supply sufficient oxygen to the confined or enclosed space. Remove inert gasses discharged into the space during the operation and provide adequate makeup air. Inspect hoses, connections, and fitting for leaks. Position inert compressed gas sources outside the space and turn off at the source when equipment is unattended even for short periods. If unattended for extended periods, such as overnight, remove or disconnect the hoses and torch equipment and turn off the gas supply at the source.

## CHAPTER 9

### DISTRESS SIGNALS

9-1. **GENERAL.** This chapter contains information about military pyrotechnic distress signal devices authorized for US Army watercraft. These devices have no expiration date. This chapter describes the following pyrotechnic devices:

- Signal, Illumination, Ground, Red Star, Parachute.
- Marker, Location, Marine,
- Signal, Smoke and Illumination, Marine.

9-2. **PRECAUTIONS.** Precautions should be taken when using, handling, and storing pyrotechnic devices. The following are warnings, precautions, and procedures for these devices.

#### WARNING

Existing safety requirements and precautions shall be complied with by all personnel handling pyrotechnic signal flares. Pyrotechnics are hazardous due to the nature of their explosive, flammable, or toxic tiller.

- DO NOT remove the signal device from its hermetically sealed container until immediately before use.
- Read and follow the firing instructions on the signal body.
- Handle pyrotechnic flares with the same care as high explosives.
- Protect flares and signals from moisture.
- Remove and replace flares when there is evidence of moisture.
- Disassembly of flares is strictly prohibited.
- DO NOT use flares when they are rusted, dented, or deformed. (They must be segregated for disposal.)
- Avoid any rough handling, throwing, or dropping of pyrotechnics.
- DO NOT look into the firing end of any signaling device.
- Remove flares and signals from watercraft placed in storage.

9-3. **MISFIRES.** Misfired signals must NOT be approached until at least 30 minutes have elapsed after firing was attempted. All misfires and malfunctions involving these signals will be reported through the appropriate munitions supply channels.

9-4. **AUTHORIZED PYROTECHNICS.** US Army watercraft are authorized certain pyrotechnics (see Table 9-1, page 9-2). These pyrotechnics are described below.

a. **Signal, Illumination, Ground, Red Star, Parachute, M126A.** This rocket-propelled, fin-stabilized device, is a hand launched distress signal for watercraft operating in ocean or coastal waters. A description of the signal is shown in Figure 9-1, page 9-3.

*Table 9-1. US Army watercraft authorized pyrotechnics*

<b>Type of Watercraft</b>	<b>Illumination Red Star Parachute</b>	<b>Marker Location Marine</b>	<b>Smoke and Illumination</b>
LSV	12	2	0
LCU 2000	12	2	0
LCU 1600	12	1	0
LT (800 series)	12	2	0
LT (100 foot)	12	2	0
ST (65 foot)	0	0	12
LCM-8	0	0	12
LARC XV	0	0	12
CHI	0	0	12
FMS	0	0	12
SLWT	0	0	12
BD	0	0	12

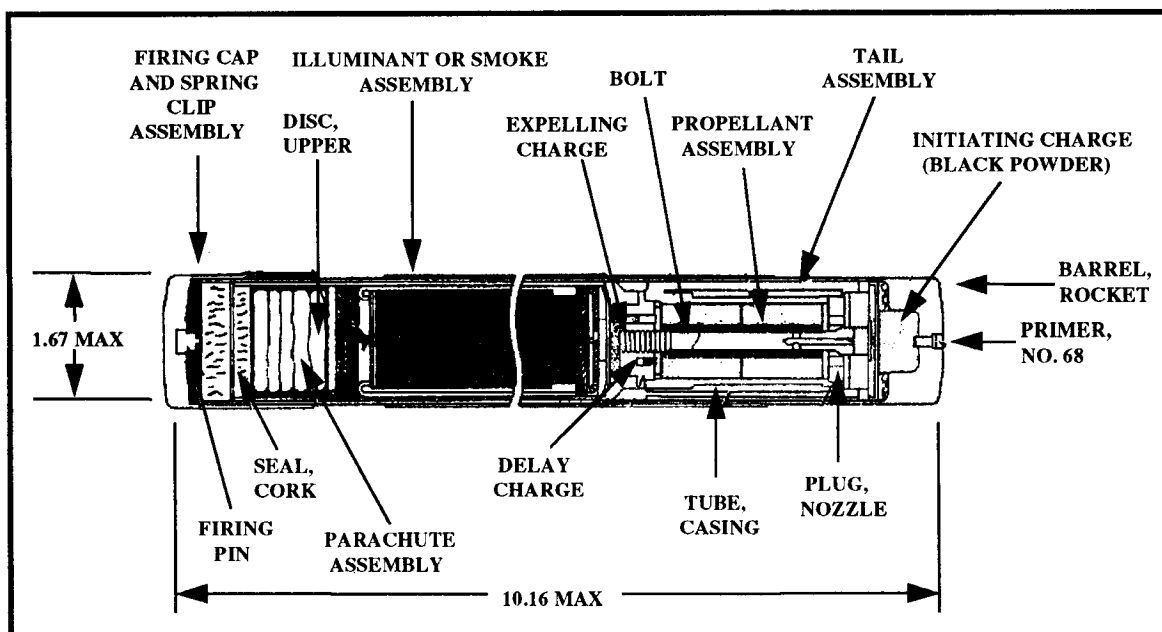


Figure 9-1. Signal, illumination red star, parachute - M126A1

(1) **Intended use.** When fired vertically, the signal projects to an altitude of 650 to 700 feet. It also produces a parachute-suspended red star that burns for approximately 50 seconds while descending at the rate of 8 feet per second.

(2) **Firing instructions.** Perform the following to fire the illumination signal.

#### WARNING

Prior to pulling the lever downward, position all fingers below top of signal.

- Remove the signal in accordance with instructions printed on the container.
- Hold the signal in the left hand (red knurled band up) with thumb and forefingers in alignment with the red band.
- Remove the firing cap from the lower end of the signal
- Point the ejection end of the signal (the end opposite the red knurled band) away from the body and away from personnel, equipment, and materials. SLOWLY push the firing cap onto the primer (red band) end until the cap is aligned with the lower edge of the knurled band. DO NOT permit the cap to go beyond the lower edge of the band.
- Hold the signal FIRMLY at arm's length with the left hand in a vertical position (90 degrees) with the firing cap downward.
- Strike the firing cap bottom sharply with the palm of the right hand, keeping the left arm rigid.

(3) **Procurement.** Order the illumination signal by NSN 1370-00-629-2336 (DODIC L311).

(4) **Disposal of illumination signal.** Dispose of the illumination signal IAW HAZMAT/Environmental SOP.

b. **Marker, Location, Marine, Mk 58 Mod 1.** This marker consists of a cylindrical tin can (21.78 inches long and 5.03 inches in diameter). The ignition end of the marker has three holes, two for smoke and flame emission and one for entry of water to activate the signal. Adhesive foil discs hermetically seal the two emission holes and a reinforced adhesive foil strip with a rectangular pull hermetically seals the hole for water activation. The adhesive foil seals are protected during handling and shipping by a replaceable polyethylene protective cover. A description of the marker is shown in Figure 9-2.

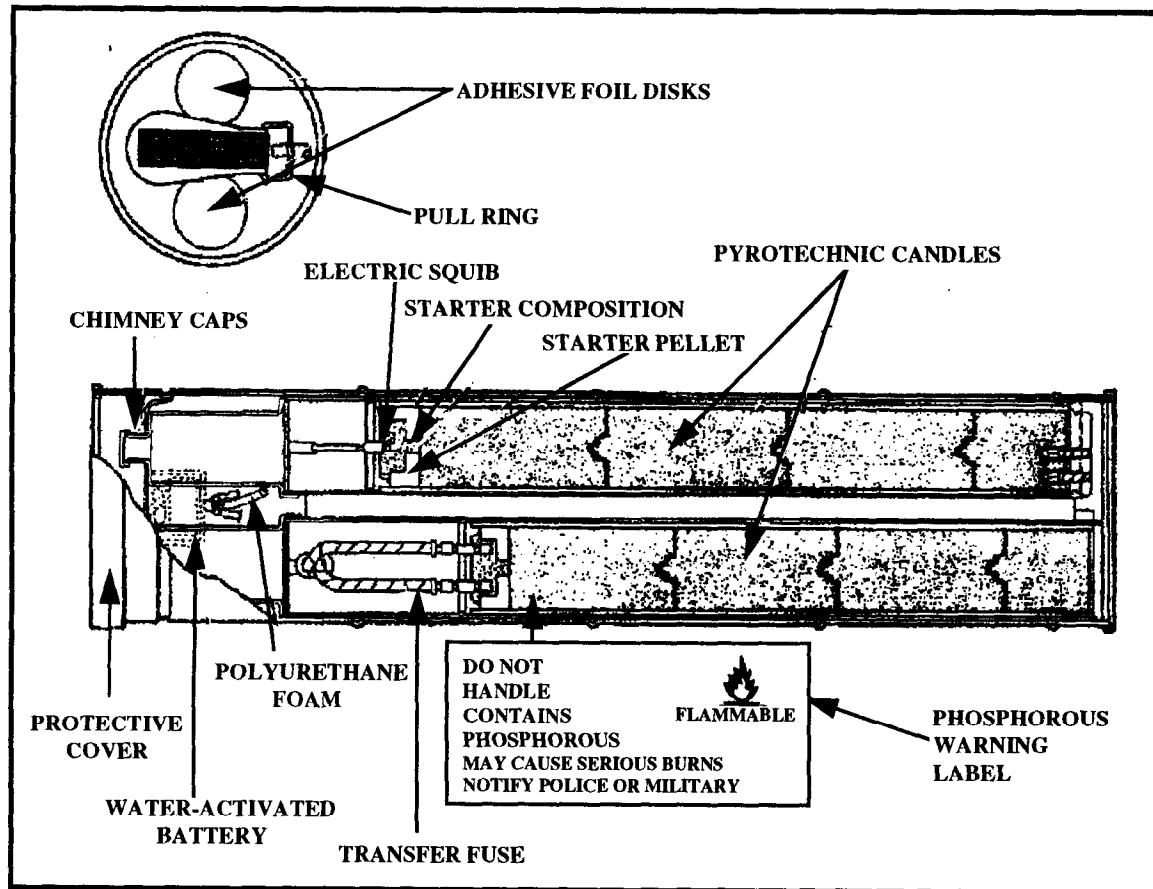


Figure 9-2. Marine location marker, Mk 58 Mod 1

(1) **Intended use.** This marker is designed for day or night use. It can be used for man overboard and any other condition calling for long-burning, smoke and flame reference point marker on the ocean surface. It produces a yellow flame and white smoke for a minimum of 40 minutes and a maximum of 60 minutes. It is visible for at least 3 miles under normal conditions.

(2) **Operation.** Perform the following to use the location marker.

- Remove the polyethylene protective cover.
- Remove the pull ring reinforced adhesive foil strip.
- Throw the signal overboard with life ring. The signal will activate within

25 seconds of impacting the water.

(3) **Procurement.** Order the location marker by NSN 1370-01-074-0591 (DODIC L580).

c. **Signal, Smoke and Illumination, Marine, Mk 124 Mod 0.** This signal is made of metal and cylinder-filled with illuminant composition in one end and smoke in the other. Each end is fitted with a plastic cap. The cap on the flare end has molded protrusions or beads on the face for night identification. The smoke (day signal) end cap is smooth. A label around the signal body further identifies each end and provides precise instructions for use. A description of this smoke and illumination signal is shown in Figure 9-3.

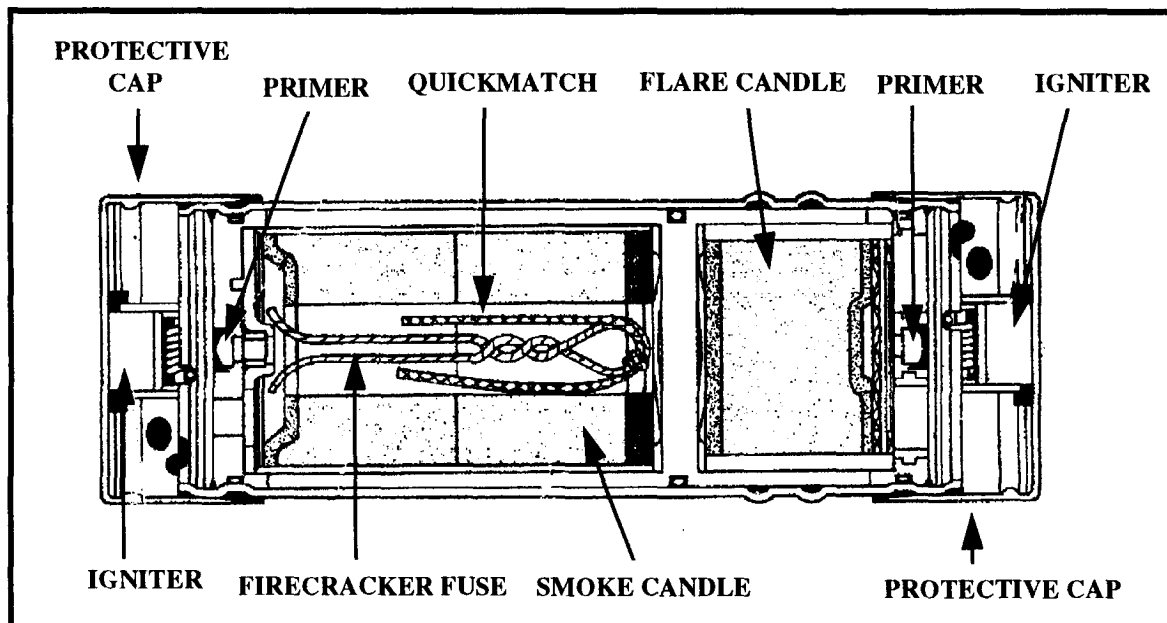


Figure 9-3. Marine smoke and illumination signal, Mk 124 Mod 0

(1) **Intended use.** This signal can be used for day or night signaling. The signal is a one-handed operable device intended for rescue use. Its small size permits it to be carried in life vests and on life rafts.

(2) **Firing instructions.** After choosing the type of display desired, smoke for day or flare for night, operate the signal as follows:

**WARNING**

Prior to pulling the lever downward, position all fingers below top of signal.

- Remove the protective cap from the end to be ignited.
- Slide the lever horizontally to the fully extended position.
- Pull the lever downward until firing pin is released.
- If the smoke end flames, briefly immerse in water or hold against solid object.
- During and after ignition, hold signal firmly with arm fully extended overhead at an angle of 45 degrees from the body.
- DO NOT direct either end of the signal toward user or other personnel.
- After using the signal, douse the used end in water to cool. If used on land, place the signal on a noncombustible surface to cool. Save the signal for use of other end in case it is needed.

**WARNING**

Under no circumstances shall both ends of this signal be ignited at the same time.

(3) **Procurement.** Order the smoke and illumination signal by NSN 1370-01-030-8330 (DODIC L283).

**NOTE**

When ordering, you may receive Signal, Smoke and Illumination, Marine: An Mk 13 Mod 0 (NSN 1370-00-309-5028) instead of the Mk 124 Mod 0 signal. The Mk 13 Mod 0 signal (see Figure 9-4) is being issued until the stock is depleted.

9-5. **ANNUAL VISUAL INSPECTION.** Pyrotechnics shall be inspected annually for current expiration date (if applicable), corrosion, dents, swelling or punctures, missing safety pins and caps, and the presence of chemical odors. Turn in defective or damaged pyrotechnics to the nearest Army supply facility.

9-6. **TRAINING.** No specific devices are designated for training use. To promote the safe and effective use of pyrotechnics, all units shall provide annual periods of instruction to develop and maintain proficiency and confidence in the military distress signals. The following training methods are recommended:

- Training shall cover the particular pyrotechnic item used aboard that watercraft, its manner of use, and safety precautions.
- A demonstration allows first hand observation of the device. At least one of each device will be expended on board. No additional expenditure is deemed necessary. Training will be combined with several units/watercraft to reduce the number of expended devices.
- Pyrotechnics used for training will be fired from the oldest lots on hand.
- To prevent a false sighting report, units that conduct training will notify the appropriate Harbormaster and US Coast Guard office well in advance, noting the time, place, and pyrotechnic devices to be used.

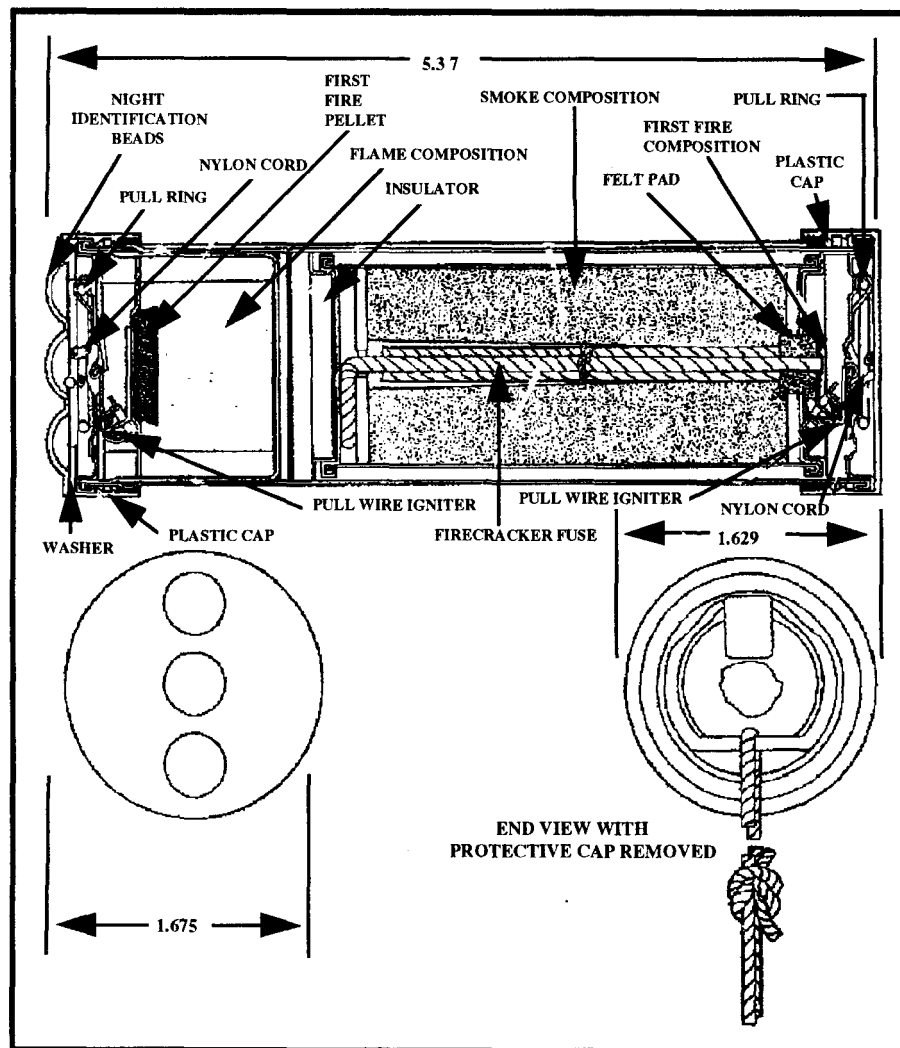


Figure 9-4. Marine smoke and illumination signal, Mk 13

## CHAPTER 10

## EMERGENCY POSITION-INDICATING RADIO BEACON

10-1. **GENERAL.** This chapter covers the operation of SATFIND-406 M3 EPIRB. The beacon is an item of survival equipment. Vessels at sea carry the beacon onboard so it is readily available in any emergency. This chapter describes the following types of beacons:

- Class A.
- Class C.
- Category 1 (406).

a. **Class A EPIRB.** US Army vessels have commercially manufactured Coast Guard approved EPIRBs which meet the requirements of Title 46, Code of Federal Regulations, Subpart 161.011. Class A EPIRBs transmit on VHF 121.5 MHz and UHF 243.0 MHz simultaneously and have a line-of-sight range. These EPIRBs may be detected by SARSAT and by aircraft flying overhead. This international project uses satellites to detect and determine the position of EPIRBs.

(1) **Equipment description.** The class A EPIRB is a floatable, battery operated unit. The beacon case is orange with mounting bracket. The unit consists of a flexible antenna, transiting indicator light, waterproof test switch (push button), bridle, spacer rings, and bottom cap (removable for battery replacement).

(2) **Operation.** Store the beacon in its special bracket (with antenna pointed down) and ensure that it is free of obstructions. This will also ensure that it will automatically float off and activate if the vessel sinks. The person responsible for manually removing the beacon and attaching to personnel or survival craft with the provided lanyard will be designated on the station bill. When the unit is turned "ON" (by removal from the bracket and inverted) it transmits tone modulation signals (UHF/VHF). Rescue aircraft or vessels equipped with suitable direction finding equipment can "home" to the transmitting unit. Another means of detection is by SARSAT.

(3) **Inspection and maintenance.** Inspect the EPIRB every 30 days by completing the following steps:

- Rinse the outside of the unit with fresh water to remove any salt buildup on case or exposed parts.
- Check the antenna tip and spring for any signs of damage and corrosion.
- Check the antenna vinyl tube covering for any signs of chafing, wear, cracks, or other damage. Also check for signs of corrosion beneath the tubing.
- Check the antenna socket at the cap surface for any sign of looseness or corrosion.
- Check the beacon housing for any signs of damage or mishandling. Visible external damage may result in an equipment malfunction during an emergency.
- Check the nylon lanyard for chafing, fraying, or any damage. Check the lanyard and bridle for tightness. Resecure the lanyard only to the anchor point and make sure it is tight.

- Spray silicone lubricant on push button switch shaft.
- Check bracket area for hidden hazards that may foul, entangle, or prevent the beacon from being removed or floating off in case of an emergency.

(4) **Operational testing.** With the beacon in the bracket, press the “TEST” switch and hold. Remove the beacon from the bracket and turn it upright while holding the “TEST” switch.

**NOTE**

Conduct testing ONLY during the first 5-minute period of the hour and ONLY for three sweeps of the audio modulating tone or 1 second, whichever is longer. If the indicator does not light, hold the "TEST" switch for additional time. It takes 10 to 30 seconds for the beacon to reach full power. If the indicator remains unlit, replace the battery.

(5) **Battery replacement.** Class A EPIRB batteries have a service life of 36 months from date of manufacture. Do not extend the battery service life beyond the date shown on the battery label. The following are recommend steps on how to replace the class A EPIRB battery.

**NOTE**

You must lay the unit on a horizontal surface when replacing the battery. Removing the bottom cap while holding the unit right side up may cause the battery to fall out and therefore damage the wire leads. An angle greater than 90 degrees will turn “ON” the unit due to the gravity switch.

- Lay the EPIRB horizontally on a table and remove the bottom cap by turning it counterclockwise.
- Remove the foam spacer and battery by pulling on the nylon cord attached to the battery. CAUTION: Do not pull apart by the wire leads. Do not short circuit internally fused battery.
- Gently disconnect the colored wire leads by pulling at the connector.
- Reconnect the fresh battery, check for polarity, and insert battery. Fold lead wires alongside of the battery as you insert the battery.
- Examine gasket seal carefully to check that there are no foreign deposits to interfere with making a good seal.
- Replace foam spacer and weighted bottom cap. Apply silicon grease around cap screws and O-ring (NSN 6850-00-880-7616). Tighten cap firmly to ensure watertight seal.
- Examine bottom cap end and be sure you screw it in far enough to seal the gasket properly.
- Test the EPIRB using previous instructions given.

(6) **Disposal of battery.** Dispose of the battery IAW HAZMAT/Environmental SOP.

b. **Class C EPIRB.** Some US Army watercraft have class C EPIRBs installed. The units are commercially manufactured, FCC type accepted. Class C EPIRBs transmit on maritime VHF channels 15 and 16 and have a line of sight range.

(1) **Configuration.** The class C EPIRB is a floatable, battery operated unit. The beacon case, with its external antenna, is waterproof. The top of the beacon usually has an ON/OFF switch, strobe light, and red LED operation indicator.

(2) **Inspection.** Remove the beacon from its mounting bracket. Unscrew the antenna cap and fully extend the antenna. When depressing the small locking button next to the switch and rotating the switch to the “ON” position, a flashing red light indicates proper transmitter operation. The strobe may operate depending on ambient conditions.

(3) **Inspection and maintenance.** Inspect the EPIRB every 60 days by completing the following steps:

- Rinse the outside of the unit with fresh water to remove any salt buildup on case or exposed parts.
- Extend the antenna and check for signs of corrosion or damage. Spray the antenna with silicone lubricant and wipe clean.
- Check the beacon housing for signs of damage or mishandling. Visible external damage may result in an equipment malfunction during an emergency.
- Spray silicone lubricant on rotary switch shaft.

(4) **Operational testing.** Test every 60 days. Conduct testing ONLY during the first 5-minute period of the hour and for not more than 5 seconds. Complete the following steps to test:

- Unscrew antenna cap and extend antenna fully (37 inches).
- Depress small locking button next to switch and rotate switch to “ON”.
- If the EPIRB is operating properly, the red lamp and the strobe light will flash simultaneously in 1.5 seconds. This is the self test for the lamps. The lamps will continue to flash every second. Shade the red LED lamp in bright sunlight because the lamp may not be bright enough to see. The strobe will stop flashing when used either in below freezing temperatures or during daylight hours. This conserves battery power to the transmitter.
- Tune the VHF-FM radio to either channel 15 or 16. The EPIRB will transmit on channel 16 for 1.5 seconds and then automatically switch to channel 15 for 14.5 seconds.
- Turn the EPIRB “OFF”. Should the EPIRB FAIL the testing, replace the battery.

(5) **Battery replacement.** Replace class B EPIRB batteries every 6 months or after 30 minutes of accumulated use. Install only fresh name-brand alkaline batteries. DO NOT extend the battery service life beyond the date shown on the battery label. To replace the battery perform the following steps:

- Be sure the EPIRB is "OFF". Then turn it upside down and remove the cap by turning it counterclockwise. If the cap will not turn with the bare hand, use a cloth or bottle cap remover.

- Slide the battery holder out slowly by rotating unit upright.
- Coat each contact surface of cells and cap threads with a thin coating of silicon grease (NSN 6859-00-880-7616).

- Install eight fresh alkaline "C" cells, checking for correct polarity. Slide battery pack into tube.

- Inspect gasket for tears, cracks, and rips.
- Replace end cap.
- Rotate cap clockwise until just sealed, then tighten two turns further. Cap must be tight to obtain watertight seal.

- Test the EPIRB using the previous mentioned instructions.

(6) **Disposal of battery.** Dispose of the battery IAW HAZMAT/Environmental SOP.

c. **Category 1,406 EPIRB.** US Army watercraft have commercially manufactured EPIRBs. Category 1,406 EPIRBs (see Figure 10-1, page 10-6) transmit on 406.025 MHz and VHF 121.5 MHz simultaneously and have a line of sight range. SARSAT or COSPAS emergency surveillance systems may detect these EPIRBs. This international project uses satellites to detect and determine position of EPIRBs.

(1) **Description of category.** The 406 EPIRB is an automatic, float-free, battery-operated unit. The beacon case with its antenna, is waterproof. The unit has a "TEST" switch and a xenon strobe homing light installed on top.

(2) **Operation.** Store the beacon in its special bracket and free of obstructions. This will ensure that it will automatically float off and activate if the vessel sinks. The person responsible for manually removing the beacon and attaching to personnel or survival craft with the provided lanyard will be designated on the station bill. When set to "ARMED", the beacon starts transmitting when removed from the bracket (see Figure 10-2, page 10-6). It transmits tone modulated signals (VHF 121.5 MHz) so rescue aircraft or vessels equipped with suitable direction finding receiving equipment can "home" to the transmitting unit. Other means of detection are by COSPAS or SARSAT satellites.

**NOTE**

Use CAUTION when handling the beacon to prevent inadvertent transmission of emergency signals. Unit may not properly transmit after activation unless it is at least 1 meter away from metal surface.

(3) **Inspection and maintenance.** Inspect the EPIRB every 30 days by completing the following steps:

- Rinse the outside of the unit with fresh water to remove any salt buildup on case or exposed parts.
- Check the beacon housing for signs of damage or mishandling. Visible external damage may result in an equipment malfunction during an emergency.
- Check bracket for security and expiration date of hydrostatic release. Also check bracket area for hidden hazards that may foul, entangle, or prevent the beacon from being removed or floating off during an emergency.

(4) **Operational testing.** To ensure that the EPIRB is operational, perform the following steps:

#### NOTE

Make sure the ring is in the "OFF" position before removing the beacon from the bracket. Failure to do so will result in transmission of emergency signals. If the beacon fails to test, return the beacon to an authorized dealer. The beacon has no user-serviceable parts. An authorized dealer must perform all service operations.

- With the beacon in the bracket mount, rotate or press the "TEST" switch and hold.
  - The beacon light should flash within 4 seconds. If the beacon light does not flash within 4 seconds, the ship's structure may have caused interference from radiation. Remove the unit from bracket before testing.
  - Make sure the ring/switch is in the "OFF" position. Disconnect the yellow strap latch from the strap by pulling the strap towards you. Remove the beacon by carefully lifting the unit from the bracket.
  - Move the beacon at least 1 meter from the ship's structure. Rotate or press the "TEST" switch and hold. The beacon light should flash within 4 seconds. Turn the beacon to the "OFF" position after testing.
  - Replace the beacon in the bracket by replacing the bottom of the unit in first. Then push the top of the unit into place. Make sure the beacon is properly seated in the bracket. To properly seat the beacon, you must position the notch on the back into the mount correctly.
  - Replace the end of the strap in the bail of the latch. Push the latch back into the closed position.
  - Rotate the ring/switch to the "ARMED" position.

#### NOTE

Ensure the ring/switch is in the "ARMED" position after putting the beacon in the bracket. Failure to do so will prevent the beacon from transmitting when deployed.

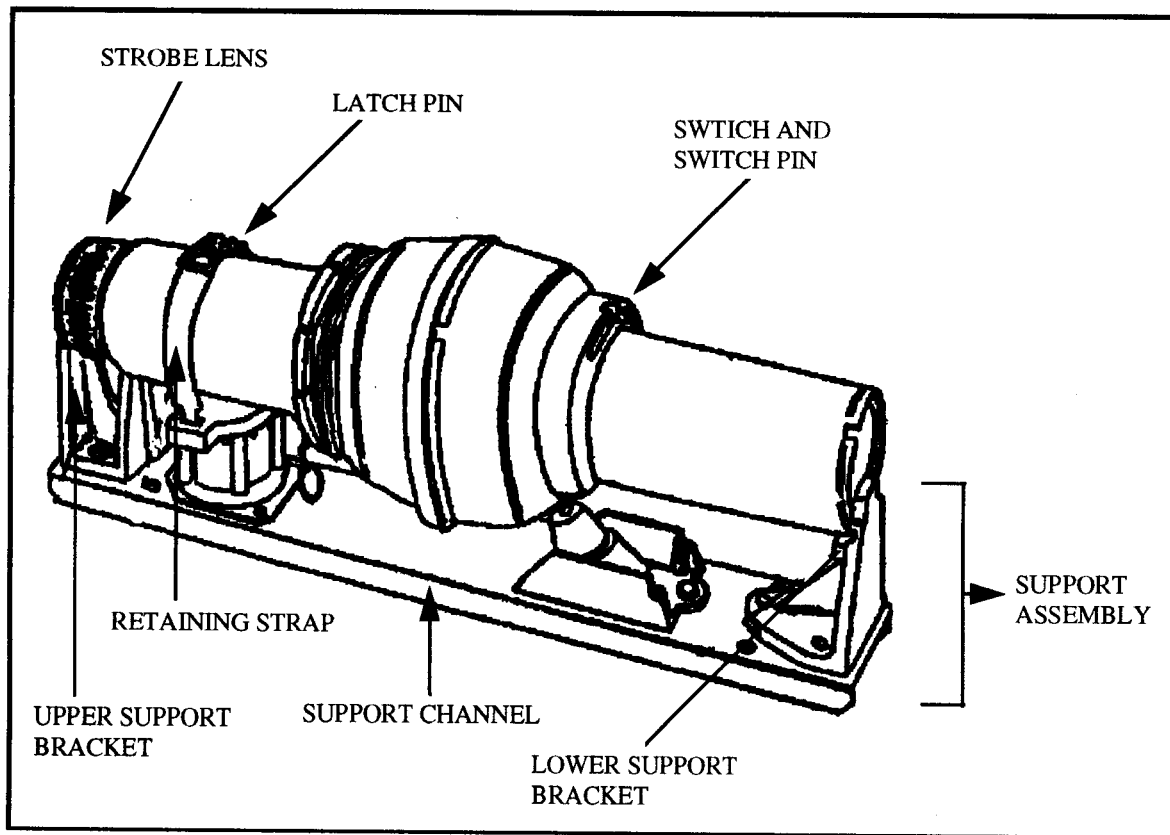


Figure 10-1. Category 1 (406) EPIRB

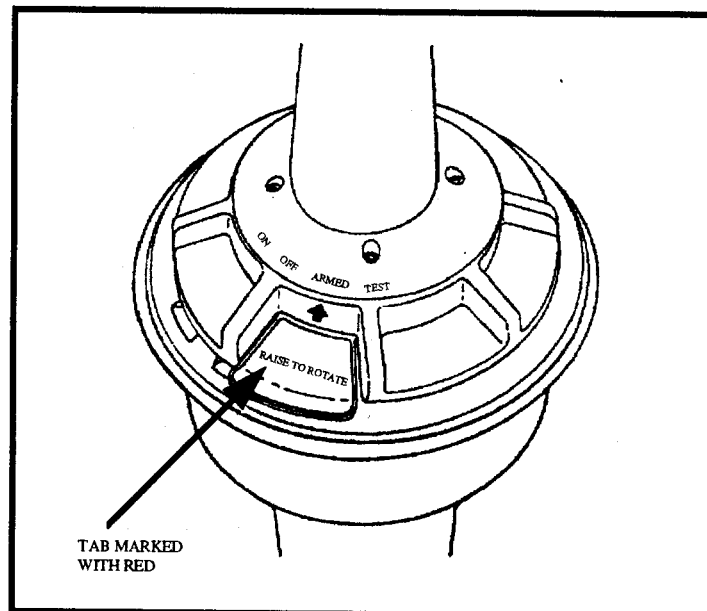


Figure 10-2. 406 EPIRB in armed position

(5) **Hydrostatic release mechanism.** This water pressure activated device, releases the beacon from its bracket when it reaches a depth of 1.5 to 4 meters. The hydrostatic release mechanism expires 2 years from the month of installation onboard. The crew will replace the hydrostatic release mechanism by following the manufacturer's instructions.

(6) **Battery replacement.** Category 1,406 beacons have a shelf life or service life of 5 years from date of manufacture. If the battery is out of date, disarm and remove the beacon from the bracket. Return it to an authorized dealer for battery replacement. Do not extend battery service life beyond date shown on the battery label.

**10-2. REGISTRATION OF EPIRB.** The code programmed into the EPIRB and imprinted on the registration card will not be changed during the life of the unit. Fill out the registration card and send it to the following address:

NOAA/USMCC  
CHIEF USMCC  
SEARCH AND RESCUE SATELLITE  
OPERATION DIVISION  
CODE E/SP  
FEDERAL BUILDING  
WASHINGTON, D.C. 20233

**10-3. PROOF OF REGISTRATION.** Annually, an updated "Proof of Registration" decal must be attached to the outer case of the EPIRB. The decal contains the coded signal for your EPIRB, vessel name, and one year expiration date. Make sure the coded signal matches the EPIRB's signal code. Each year, NOAA will send a form to the office controlling the EPIRB registration. This form must be completed and returned to:

NOAA (NOAA/NESDIS)  
SARSAT OPERATIONS DIVISION  
CODE E/SP3  
FEDERAL BUILDING 4  
WASHINGTON, D.C. 20233  
TELEPHONE: (301) 457-5678

They, in turn, will send an updated "Proof of Registration" decal to be attached to the EPIRB.

**10-4. PROCUREMENT.** Order the Category 1 (406) EPIRB by NSN 6320-01-378-0221.

## CHAPTER 11

### HYPOTHERMIA PROTECTIVE CLOTHING

11-1. **GENERAL.** This chapter contains information about hypothermia protective clothing designed to permit personnel to function and survive in cold water. This chapter describes the following clothing:

- Survival (Exposure) Suit.
- Antiexposure Coverall.

#### WARNINGS

The survival (exposure) suit provides the best protection from hypothermia in the water. However, it is extremely bulky and awkward to work in and is therefore limited to use for crews operating in cold weather when abandoning ship.

The antiexposure coverall provides good durability and out-of-water protection from the elements. It provides limited protection from hypothermia to crew members in the water.

11-2. **APPLICATION.** Commanders and vessel masters will ensure compliance with the guidelines described below:

- Watercraft crew members, rescue swimmers, and so forth, shall wear hypothermia protective clothing if the water temperature is below 60 degrees F.
- The commander or vessel master may waive the requirement for wearing an antiexposure coverall if the degree of risk to hypothermia is small (such as in nonhazardous daylight rescue operations in calm water).
- A PFD should NOT be worn over an antiexposure coverall or survival suit because the device is inherently buoyant. Although a PFD will improve chances for survival during prolonged periods because it provides improved flotation, the additional buoyancy creates problems for the wearer attempting to leave capsized watercraft.

11-3. **SURVIVAL SUIT.** The survival suit (often referred to as an “exposure suit” or “immersion suit”) is worn by crews when abandoning ship. The suit affords protection from exposure to cold water, wind, and spray. The foam fabric is a durable and elastic material with high flotation characteristics providing approximately 35 pounds of buoyancy.

a. **Configuration.** The Coast Guard approved survival suit (Figure 11-1, page 11-3) is a one-piece, international orange garment constructed from 3/16-inch nylon-lined neoprene or PVC foam.

NOTE

The buoyancy provided to the lower torso will cause the wearer to float horizontally either face up or face down in rough seas (see Figure 11-2, page 11-4). Additional flotation, such as the inflatable collar provided with the suit, must be used to assure faceup flotation (see Figure 11-3, page 11-4). The Adult Universal survival suit is designed so that one size will fit most persons (weighing between 110 and 330 pounds). Other sizes are available. The thermal qualities of the fabric/foam laminate will keep survivors warm whether they are wet or dry.

b. **Application.** Masters and coxswains of watercraft that have survival suits will ensure that every other abandon ship drill conducted uses the survival (exposure) suits in lieu of the PFD.

WARNING

No storage container for survival suits may be capable of being locked.

c. **Modifications.** Attach a personal distress signal light to the left breast pocket.

d. **Donning.** To don the survival suit, proceed as follows (see also Figure 11-4, page 11-4):

CAUTION

When donning/wearing the survival suit, extreme caution shall be taken to avoid sharp, protruding objects that may snag or tear the suit.

NOTE

During training, use plastic baggies to cover boots to prevent tearing the suit.

- Remove suit from stowage bag with a sharp jerk of the carrying bag (see Figure 11-4, A).
- Don suit in the same fashion as donning coveralls (see Figure 11-4, B).
- Don the hood before you zip up the suit (see Figure 11-4, C).
- Close the zipper completely. To avoid problems zipping up the suit, arch your back to remove wrinkles in the fabric (see Figure 11-4, D).
- Close the spray shield and inflate the collar for additional flotation (see Figure 11-4, E).

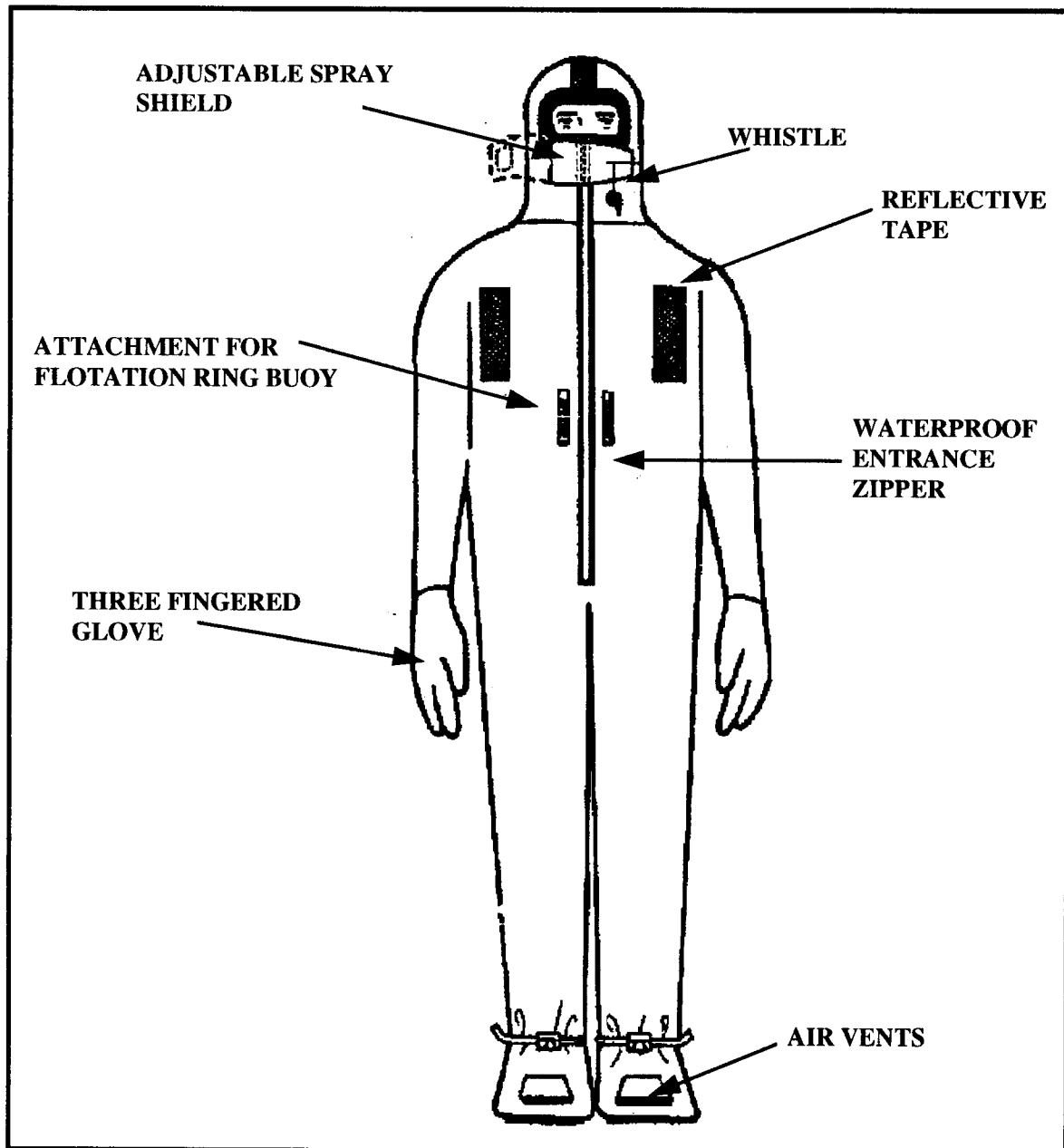
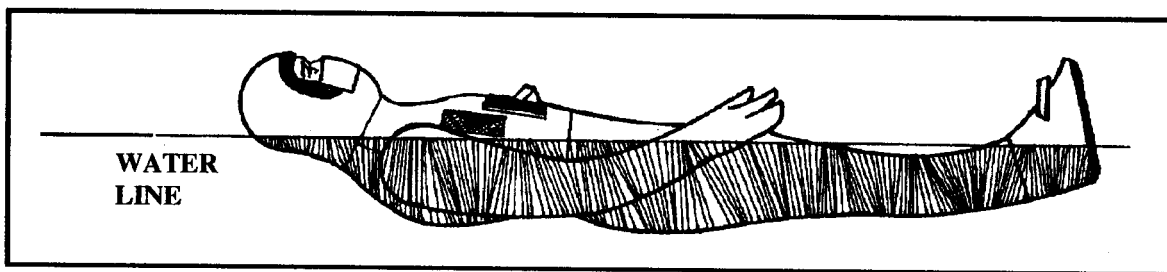
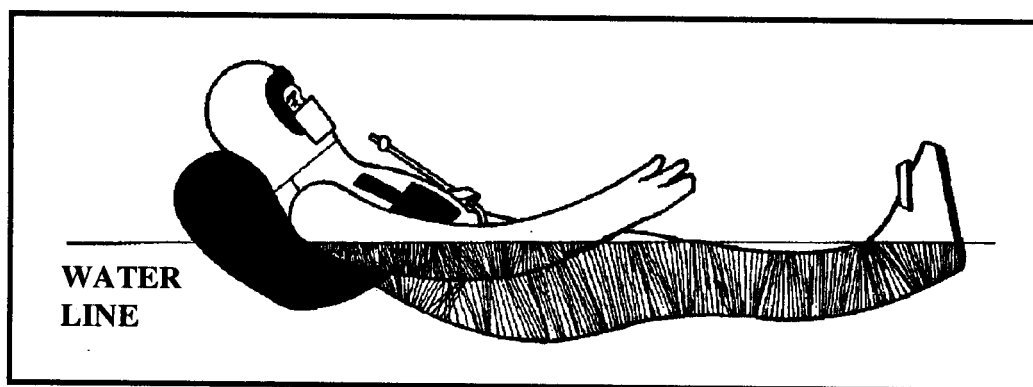


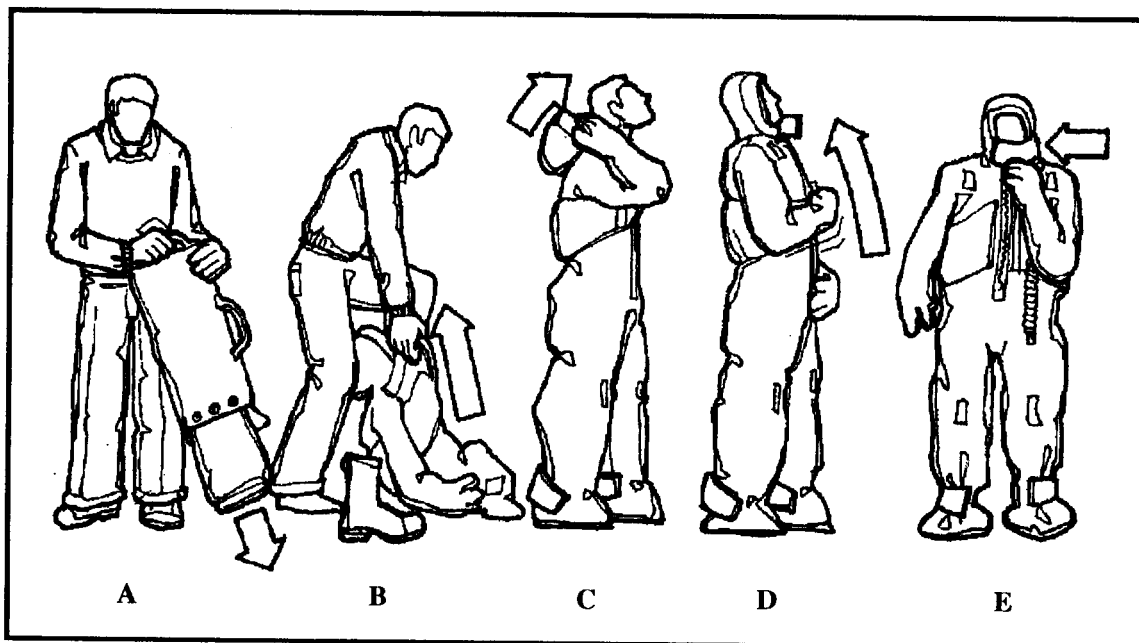
Figure 11-1. Survival (immersion) suit (typical)



*Figure 11-2. Position in the water without auxiliary float ring*



*Figure 11-3. Position in the water with auxiliary float ring*



*Figure 11-4. Steps for donning survival suit*

e. **Inspection.** The survival suit shall be inspected before being placed into service and quarterly thereafter. To inspect the suit, proceed as follows:

(1) **Stowage bag.** Check condition of snaps on bag for ease of operation.

(2) **Suit.** Lay out on a flat, clean surface and check for obvious damage.

(3) **Zipper.** Work zipper up and down to check for ease of operation. If zipper is excessively rough, wipe with a soft, clean, lint-free cloth and lubricate with the wax lubricant found in suit breast pocket.

**NOTE**

The teeth that actually secure the waterproof zipper are the small teeth on the inside of the zipper. A little corrosion on these teeth can block the slider or damage the teeth so the zipper does not operate. If a closed zipper can be separated when probed with a (dull) knife, the zipper needs to be replaced.

(4) **Inflatable collar.** Check collar for obvious damage.

**NOTE**

Periodically inflate and allow to stand overnight. If the collar does not stay firmly inflated overnight, it should be repaired or replaced. Inspect lock screw on inflatable collar inflation tube to ensure that it is in the unlocked position.

(5) **Marking.** Each survival suit must be stenciled, identifying the vessel's name or number.

(6) **Reflective tape/material.** Survival suits are equipped with reflective tape/material when they are manufactured. The material is positioned on the suit to make a person wearing the suit in the water as visible as possible under nighttime search conditions. The pattern is not necessarily the same as that used on a lifejacket or other PFD.

(7) **Survival light.** Make sure the survival light is operational or has not expired.

f. **Packing.** To repack the survival suit after inspection, follow the manufacturer's instructions or proceed as follows:

- Lay out suit on a flat clean surface with front up and arms out.
- Make sure entry zipper is in the open position.
- Roll or fold suit, feet first, up to chin, making sure not to wrinkle water valves.

- Fold arms horizontally across roll.
- Place suit in bag and close snaps.
- Stow bag with handle exposed.

g. **Repairs.** The following repairs are authorized on the survival suit. Commercial assistance should be obtained for repairs beyond the capability of the unit.

**CAUTION**

Repairs should be made only with neoprene cement. Other cements may contain solvents that would weaken the material.

(1) **Separated seams.** To repair separated seams, complete the following steps:

- Trim jagged edges with scissors until new rubber shows.
  - Remove old cement.
  - Thoroughly dry material.
  - Apply four coats of cement along entire surface of material to be repaired.
- Allow each coat to dry between each application (usually 10 minutes).
- When the last coat becomes tacky, align edges. Apply firm and even pressure when pressing edges together. Hold edges together for 3 or 4 minutes.
  - Allow at least 1 hour for cement to set before using repaired item.

(2) **Rips and tears.** To repair rips and tears, follow the same steps as shown in repairing separated seams above.

(3) **Holes.** To repair holes, complete the following steps:

- configuration.
- When entire areas are missing, trim edges of area to convenient
  - Cut a replacement piece conforming to size and shape of prepared area.
  - Proceed as in steps shown in repairing separated seams above.

(4) **Corroded zippers.** To clean zippers, complete the following steps:

- Scrub with toothbrush, using fresh water.
- Rub a bar of soap or paraffin (NO oil or grease) over edges of zipper to act as a lubricant and retard corrosion.

h. **Cleaning.** To clean the survival suit, complete the following steps:

**CAUTION**

In NO situation shall thinners, solvents, or any similar agents be used to clean suits that have been exposed to paint, paint removers, acids, solvents, gasoline, or any substance containing acetones. When suits have been submerged or exposed to salt water spray, suits shall be washed under a shower.

- Wash under a shower with a mild soap.

**CAUTION**

Do NOT wring out survival suits.

- To dry the suit, hang it on a wooden hanger in a cool, dry, well-ventilated area. Do NOT dry in direct sunlight.

i. **Stowage.** Survival suits are intended for “abandon ship” use. Stow them so they are readily accessible to the individuals for whom they are intended. This is to prevent searching throughout the vessel to find them in an emergency.

- Ensure suit is dry and clean.
- Powder suit with a nonallergic hydrous silicate of magnesium powder (talc) (NSN 6810-00-270-9989).

**CAUTION**

Scented powders or body powders should not be used, as they contain chemicals that may cause suit material to deteriorate.

- Store suit in a dry, well-ventilated locker, with container handles exposed, or according to manufacturer’s directions.
- Stow suits in or near berthing areas. Duplicate survival suits are required for persons whose normal work station is not near their berthing area.
- Do not stack suits. Excessive stacking can compress suits at the bottom of the pile, eventually damaging the buoyant insulating foam.

j. **Number Required (Class “A” Watercraft).** One survival suit for each person on board, plus an additional survival suit for each underway watch station (such as bridge, lookout, and engineroom).

k. **Procurement.** The following are the NSNs for approved survival suits:

- *Child (NSN 4220-01-251-9123).* Up to 110 pounds, 4 feet, 11 inches tall, 36-inch chest. Yellow carrying bag.
- *Adult, Universal (NSN 4220-01-251-6466).* From 110 to 330 pounds, 6 feet, 3 inches tall, 48-inch chest. Orange carrying bag.
- *Adult, Jumbo (NSN 4220-01-251-6467).* From 330 to 375 pounds, 6 feet, 9 inches tall, 58-inch chest. Green carrying bag.

11-4. **ANTIEXPOSURE COVERALL.** Personnel operating in a cold, wet environment wear the antiexposure coverall when they need protection from hypothermia (see Figure 11-5). The antiexposure coverall (often called a “deck suit” or “work suit”) affords adequate protection from exposure to cold water, wind, and spray. It provides flotation similar to that provided by the work vest. Only Coast Guard-approved antiexposure coveralls are authorized for use.

NOTE

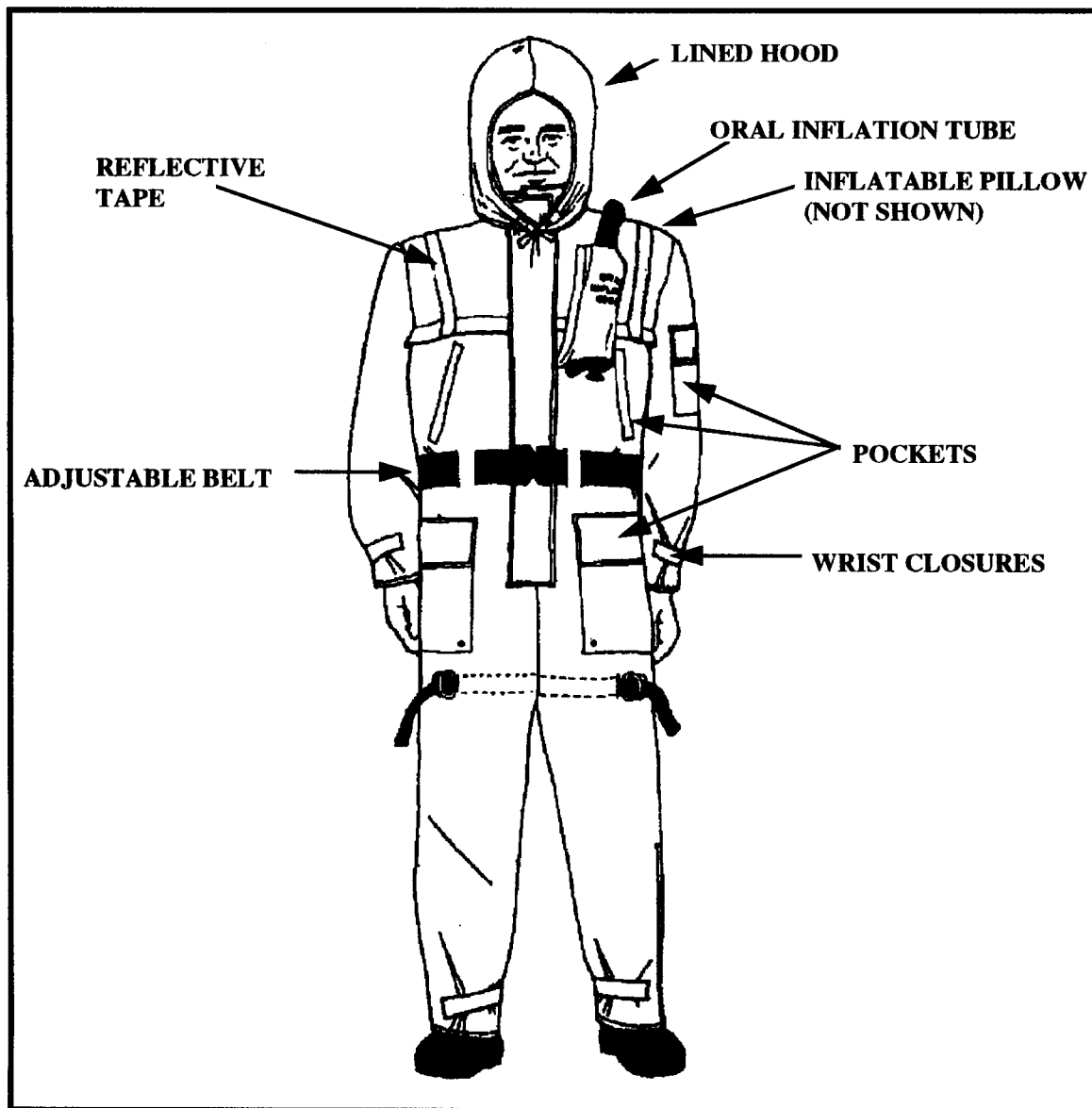
The antiexposure coverall is primarily used by watercraft crew members where they may be exposed to intermittent spray.

a. **Configuration.** The antiexposure coverall is made of orange or orange and navy blue urethane-coated nylon exterior fabric with a closed-cell foam interlining to provide thermal protection. It provides at least 17 ½ pounds of buoyancy. The coverall allows full freedom of movement. The suit features an attached, orally inflated pillow to support the wearer’s head in the water. It also has an attached hood for extra thermal protection and reflective tape/material on the hood and shoulders for better visibility at night. For added protection, personnel should carry wet-suit or ski gloves for use with the antiexposure coverall. The coverall is manufactured in five sizes ranging from small to extra-large.

b. **Application.** Army watercraft personnel shall wear this garment when working in areas where exposure to hypothermia is likely.

NOTE

A rescue swimmer may use the antiexposure coverall if worn with a safety harness and tending line, and the victim’s immediate needs outweigh the swimmer’s risk of becoming hypothermic.



*Figure 11-5. Antiexposure coverall*

**NOTE**

When wearing the antiexposure coverall, you must completely close the zipper and all wrist and ankle seals before entering the water. Inflate the head support/pillow for additional flotation.

- c. **Modification.** Attach a personal distress signal light to the shoulder area.
- d. **Donning.** Don antiexposure coveralls in the same fashion as standard coveralls.
- e. **Inspection.** Units shall inspect the antiexposure coverall quarterly. To inspect the coverall, proceed as follows:
- Lay out suit and check for obvious damage.
  - Work entry zipper up and down to check for ease of operation. You may lubricate the zipper by rubbing a bar of soap or paraffin (NO oil or grease) over edges of zipper.
  - Check buoyancy chamber and inflation tube for obvious damage.
  - Inflate buoyancy chamber and check for leaks.
  - Deflate chamber and stow in chamber casing.
- f. **Repairs.** Units should make only minor sewing repairs to antiexposure coveralls. Obtain commercial assistance for repairs beyond the capabilities of the unit.
- g. **Cleaning.** To clean the antiexposure coverall, complete the following steps:

**CAUTION**

When coveralls have been submerged or exposed to salt water or salt spray, wash them in a shower. Do not use thinners, solvents, or similar agents for cleaning coveralls that have been exposed to paint, paint removers, acids, solvents, gasoline, or any substance containing acetones.

- Wash under a shower with a mild soap.

**CAUTION**

Do NOT wring out antiexposure coverall.

- To dry coveralls, hang on a wooden hanger in a cool, dry, well-ventilated area. Do not dry in direct sunlight.

**NOTE**

Units may machine wash excessively soiled antiexposure coveralls. Use a gentle cycle and mild soap. The water temperature should not exceed 105 degrees F.

**CAUTION**

Do NOT attempt to dry antiexposure coveralls with a clothes dryer.

11-5. **PROCUREMENT.** Units shall purchase only Coast Guard-approved antiexposure coveralls. Units may obtain acceptable coveralls from the following manufacturers:

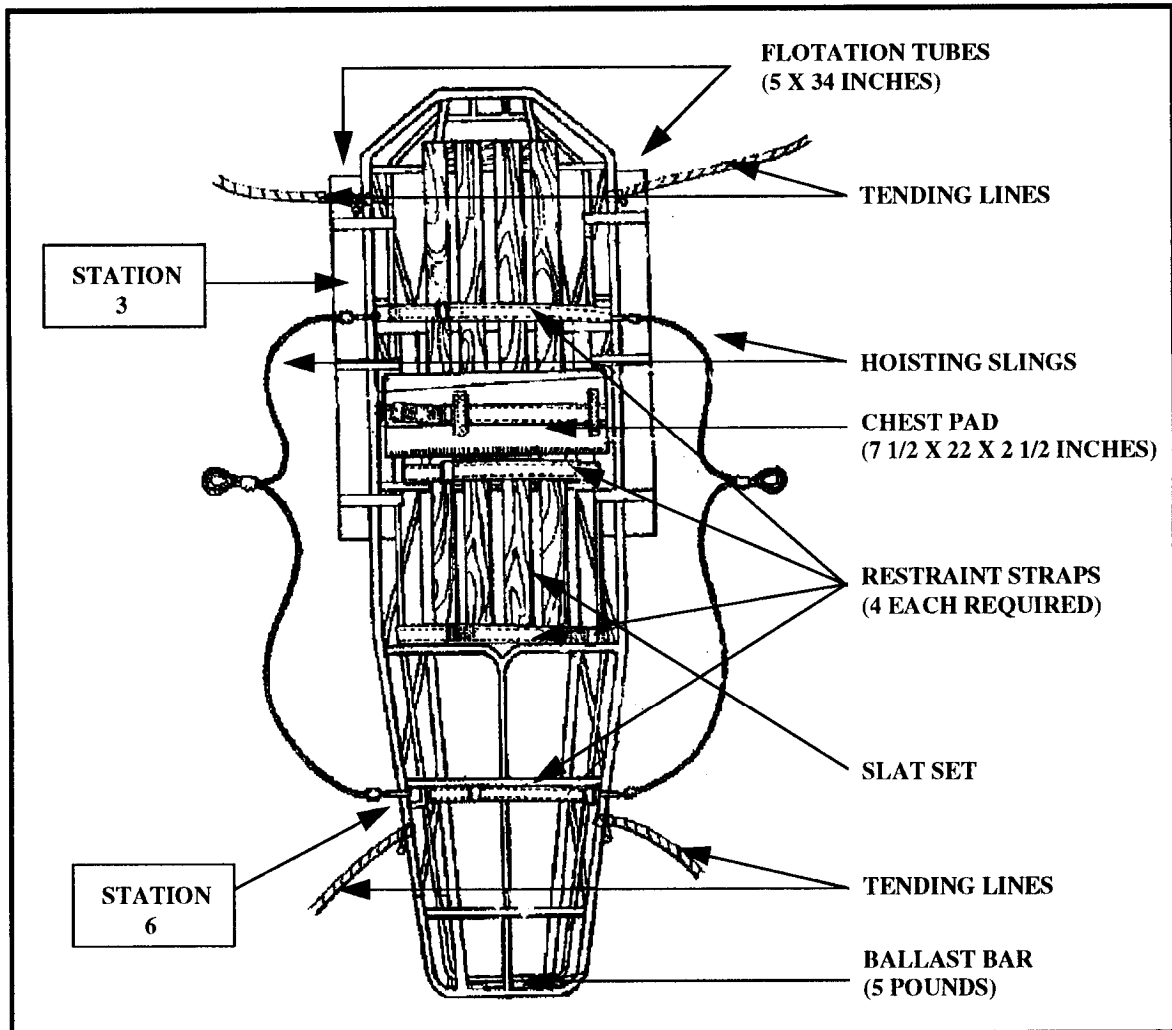
Mustang Manufacturing Company  
3870 Mustang Way  
Bellingham, WA 29226  
(508) 636-6961  
Specify: Mustang Model 2175 (Orange)

Lifesaving Systems Corporation  
720 4th Street, S.W.  
Ruskin, FL 33570-1829  
(813) 645-2768  
Specify: Stearns Model IFS 580 (Orange)

## CHAPTER 12

### STOKES LITTER

12-1. **GENERAL.** This chapter contains information about the corrosion-resistant steel litter used onboard Army watercraft (see Figure 12-1).



*Figure 12-1. Stokes litter (with modifications)*

12-2. **CONFIGURATION.** Stokes litters shall be configured for their intended application and shall not be used otherwise.

a. **Ashore.** Stokes litters used for transporting a person for land operations require no modifications. Steel or aluminum litters may be used.

b. **Over Water.** Stokes litters used for transporting a person onboard boats, over the water, or retrieving a person overboard, shall be configured with a flotation kit assembly (includes

tow flotation tubes with covers, one chest pad with cover, five restraint straps, and one ballast bar), slat set, hoisting slings, and tending lines.

c. **Hoisting.** Stokes litters intended for shipboard or helicopter hoisting operations (using the ship's or aircraft's hoist) shall be equipped with the standard hoisting sling.

**WARNING**

Only steel litters are authorized for hoisting operations.

**NOTES**

Class "A" Army watercraft shall maintain at least one corrosion-resistant steel Stokes litter rigged for over water use.

Class "B" and "C" Army watercraft may maintain at least one corrosion-resistant steel Stokes litter rigged for over water use.

Supply information for procurement of the Stokes litter, slat set, flotation kit assembly, and hoisting sling is shown in the supply information paragraph at the end of this chapter.

12-3. **MODIFICATIONS.** The following paragraphs describe modifications to the Stokes litter.

a. **Flotation Tubes, Chest Pad, and Ballast Weight.** To attach the flotation tubes, chest pad, and ballast weight, complete the following steps (see also Figure 12-1):

**WARNING**

It is essential that the two flotation tubes, chest pad, and ballast bar be positioned at the precise locations on the litter as illustrated in Figure 12-1. If the tubes are positioned too high or too low, the litter may not right itself or keep the patient's head above water.

- Route one end of the flotation tube webbing tie over the top ( $\frac{3}{4}$ -inch) litter tube and the other end of webbing tie under the lower ( $\frac{3}{8}$ -inch) litter tube. Be sure to position ties over the outside of the flotation tube and in the location illustrated in Figure 12-1. Tie or connect ends of webbing together using a square knot or buckles (if so equipped). Tack free ends of webbing using 6-cord nylon thread.

- Route chest pad strap through retainer straps on cover and attach to the lower (3/8-inch) litter tube as illustrated in Figure 12-1.
- To make litter self-righting, attach a 12-pound ballast bar to foot of litter (see Figure 12-1).

b. **Hoisting Sling.** Fabricate the hoisting sling as shown in Figure 12-2 and Figure 12-3, page 12-5. Attach the sling as illustrated in Figure 12-1.

### WARNING

Use two swaging sleeves on each end of the hoisting sling when attaching it to the litter tube.

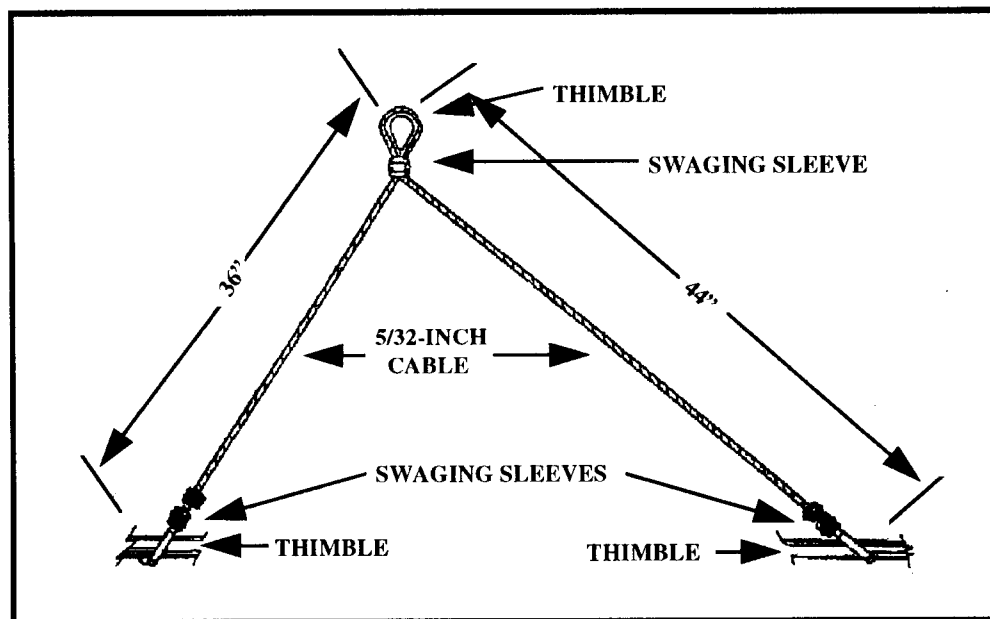


Figure 12-2. Fabrication of hoisting sling for stokes litter

c. **Restraint Straps.** Attach four restraint straps in the positions shown in Figure 12-1. To attach straps to the 3/8-inch tube, pass loop end of restraint strap around outside and under tube, passing strap between wire mesh and tube. Pass opposite end through loop and pull strap tight (see Figure 12-4, page 12-6).

d. **Tending Lines.** Stokes litters shall have tending lines installed so the litter can be held in position and recovered from alongside a vessel for rescue from the water. Use manila line of sufficient length to allow lowering of litter to the water. Attach tending lines, using an eye splice, to the 3/4-inch tubes at stations 3 and 6 of litter (see Figure 12-3).

12-4. **INSPECTION.** Stokes litters and associated equipment shall be inspected after each use but not less than once every 3 months. The latest date of inspection and proof test shall be stenciled

on the bottom of the slat set (in trunk section of litter). The stencil shall be of ½-inch letters in the format shown below:

<b>PROOF TEST</b>	<b>INSPECTED</b>
(month/year)	(month/year)

The following paragraphs contain requirements for inspection of the litter, flotation equipment, hoisting sling, and tending lines.

a. **Litter.** Inspect litter for cracked welds, cracked tubes, rust, pinholes, security and condition of wire mesh, and evidence of wear on the sling attachment points. Inspect restraint straps for security, condition, and quantity (minimum of four per litter).

b. **Flotation Equipment.** After use in salt water, flotation equipment shall be rinsed in fresh water and dried before storage. Flotation equipment shall be thoroughly inspected for wear, rotting, mildew, mold, tears, cuts, broken stitches, and frayed fabric.

c. **Hoisting Sling.** The hoisting sling shall be inspected for corrosion, fraying, or deterioration.

d. **Tending Lines.** Inspect manila tending lines for condition and security. Lines that are frayed or show signs of weathering or rot shall be replaced.

12-5. **PROOF TESTING.** Litters equipped with a hoisting sling shall be proof tested every 6 months. To proof test litter, complete the following steps:

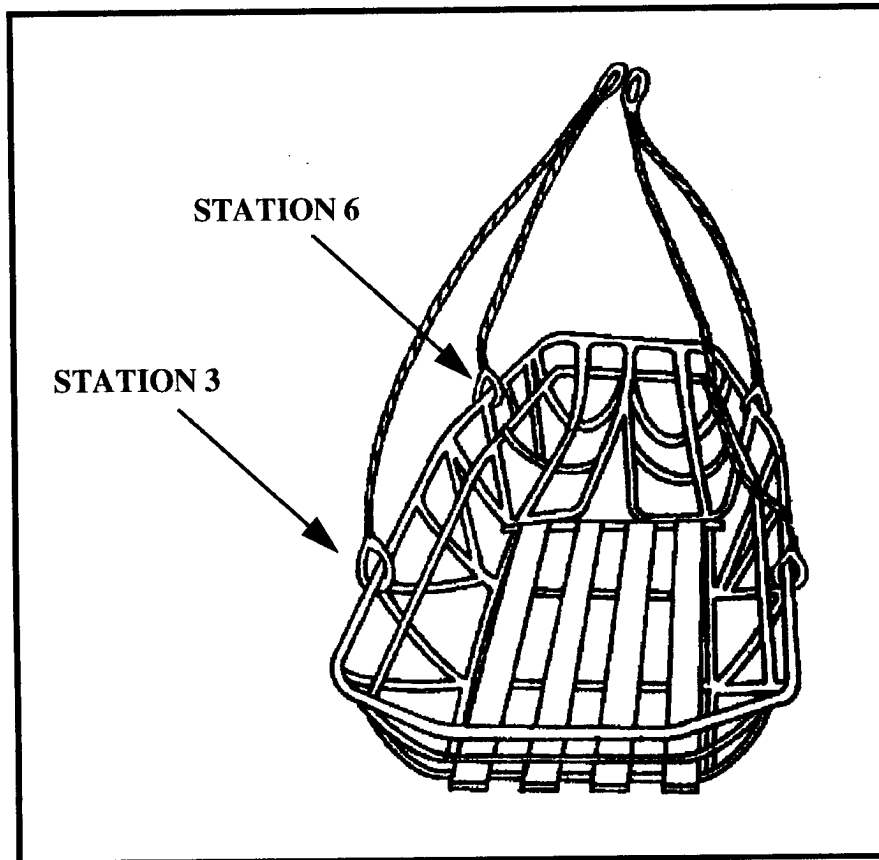
- Distribute 400 pounds evenly in the litter and hoist clear of the deck.
- With litter suspended, inspect litter and sling for deformities.
- Inspect sling for even load distribution at all attachment points.

12-6. **MAINTENANCE.** Maintenance of the litter, hoisting slings, flotation equipment, and chest pad consists of minor repairs, replacement, and cleaning. To maintain equipment, complete the following steps:

- Repairs for aluminum litters are limited to removal of surface corrosion and application of primer to rework areas. Cracked welds or cracked tube members are cause for replacement.

<b>WARNINGS</b>
No weld repairs shall be attempted on aluminum litters.
Aluminum litters shall be marked "NOT TO BE USED FOR HOISTING OR HIGH-LINE OPERATIONS."

- Weld repairs for steel litters are permitted using heliarc method only. After a weld repair, litter shall be proof tested as described in paragraph 12-5.
- Replace hoisting slings that show signs of corrosion, fraying, or deterioration.
- After each use in salt water, remove flotation collar and chest pad from the litter, rinse in fresh water, and dry before reinstallation.



*Figure 12-3. Stokes litter with hoisting sling attached (flotation removed for clarity)*

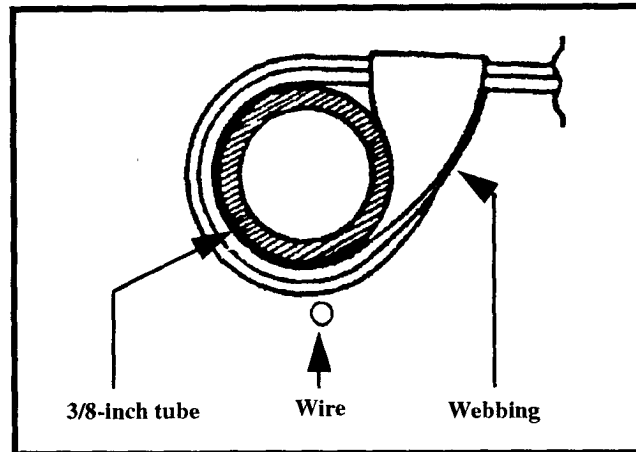


Figure 12-4. Attachment of litter restraint strap to stokes litter tubes

12-7. **PROCUREMENT.** The following are the NSNs for the litter and related items.

- Litter, Rigid Stokes, Type I, (with leg separator) (NSN 6530-00-042-8131).
- Flotation Kit Assembly (includes two flotation tubes with covers, one chest pad with cover, five restraint straps, and one five pound ballast bar) (NSN 6545-01-155-1598).
- Sling, Rescue Helicopter Hoisting Cables, PN #190 (NSN 1670-01-226-5300).
- Rope, Manila (tending line) (NSN 4020-00-289-8616).
- Litter, SAR MEDEVAC (canvas litter with no sides and comes with flotation equipment. Must also order the above mentioned sling assembly) (NSN 6530-01-187-0104).
- Slat Set (NSN-6530-01-078-0585).
- Basket, Stokes Rigid (wire mesh insert) (NSN 6530-00-926-2278).
- Flotation Tube Assemblies (includes two flotation tubes with covers) (NSN 4220-01-155-1599).
- Chest Pad Assembly (includes pad with cover and one restraint strap) (NSN 4220-01-155-1600).
- Bar, Ballast (NSN 4220-01-155-1601).
- Restraint Set, Litter Patient (NSN 6530-01-168-1130).
- Thread, Nylon, 6-Cord (NSN 8310-00-559-5211).
- Strap, Webbing (NSN 6530-00-784-4315).

## CHAPTER 13

## PERSONAL FLOTATION DEVICES

13-1. **GENERAL.** This chapter contains information about PFDs. It covers recommended use, required inspections, maintenance, and modifications for each type of PFD. This chapter describes the following PFDs:

- Standard Navy Vest-Type with Collar.
- Navy Vest-Type without Collar, Work Type.
- Coast Guard-approved Type III.
- Coast Guard-approved Type I.

13-2. **APPLICATION.** Personnel should wear PFDs aboard Army watercraft on all occasions (unless the commanding officer or master/coxswain authorizes their removal). The commanding officer or master/coxswain may waive the requirement to wear a PFD during nonhazardous operations. Generally, “nonhazardous operations” are characterized by the minimal risk of crew members falling overboard. When granting a waiver, the commanding officer or master/coxswain should consider factors such as vessel size, time required to recover a person overboard, sea and weather conditions, and the degree of mobility necessary for personnel to complete a task. Commanding officers and masters/coxswains should consider the actual probability of a crew member’s need for a PFD when deciding whether to waive this requirement.

13-3. **SELECTION CRITERIA.** The person in charge at the activity scene selects the most appropriate PFD. The following information provides a guide to PFD selection.

a. **Standard Navy Vest-Type PFD With Collar.** This is the primary PFD Army personnel use aboard watercraft when mobility is not a factor. Its use by personnel aboard Army watercraft is mandatory during such procedures as abandon ship (except aboard ships equipped with survival [exposure] suits) and general quarters. It is also mandatory for personnel on weather decks and during towing operations during heavy weather. An important feature of this PFD is its ability to hold the head of an unconscious person faceup (except when worn with hypothermia protective garments like antiexposure coveralls). Many who fall into the water from a great height may be initially stunned or injured. This type of preserver is important where such a risk is present. This PFD also allows a person to relax completely, providing extended survival time and allowing the person to assume a position to protect the body from hypothermia. The main disadvantages of this PFD are its bulk (which somewhat restricts freedom of movement) and its inherent buoyancy (about 32 pounds) which hampers egress from a capsized boat or swimming under water to avoid burning oil.

b. **Navy Vest-Type Without Collar (Work-Type) and Coast Guard-approved Type III.** These PFDs provide less flotation. They will not hold the head of an unconscious person face up to ensure survival. Their use may be appropriate when greater freedom of movement is needed and the risk of falling into the water from a great height does not exist. They are considered acceptable for use by people on floats, on staging erected on floats if safety rails are in use, and over the side on stages or boatswain’s chairs if the person is secured by a tended safety line. These PFDs may be used aboard Army watercraft in calm weather and in calm water. Their main disadvantages are

limited flotation, the tendency to ride up on the wearer, minimum buoyancy (about 16 to 18 pounds), and the conscious effort required to keep the wearer's head out of the water.

c. **Coast Guard-approved Type I PFD.** This PFD is used by passengers aboard Army watercraft. Watercraft crews should not use this vest because it severely restricts mobility. Like the standard Navy vest with collar, the Type I supports the head of an unconscious person. The Type I PFD is the easiest to put on in an emergency because it is reversible. The disadvantages of this PFD are similar to those of the standard work vest because of its inherent buoyancy (rated at a minimum of 22 pounds).

**13-4. ABANDON SHIP PROCEDURE.** The following is a guide that watercraft personnel should follow, whenever practical, when abandoning ship.

a. **Leaving the Ship.** For survival, persons abandoning ship should remain fully clothed. If possible, personnel should get away from the ship in a liferaft. Personnel should lower themselves into the water using a firmly anchored hose or line. When a choice is available, personnel shall leave the ship from the windward side and from whichever end of the ship is lower in the water. If it is necessary for personnel wearing a PFD to jump into the water, they must hold their legs together and keep their body erect. Personnel wearing a survival (exposure) suit should cover their faces with one hand, hold the crotch of the suit in place with the other, and cross their legs when entering the water. Securely fasten the PFD and keep it close to the body by folding the arms across the chest and gripping the top of the PFD with the fingers. This procedure prevents PFDs from riding up and striking the chin or neck when the wearer hits the water. Before lowering injured personnel into the water, always adjust leg straps properly.

b. **In the Water.** Survivors shall swim away from the ship as quickly as possible and, if available, climb into a liferaft. If underwater explosions occur in the vicinity, survivors shall swim or float on their backs, keeping their heads and chests as far out of the water as possible. Underwater explosions are particularly threatening to lungs, abdomen, sinuses, and eardrums.

c. **Ship Surrounded by Flames.** When the ship is entirely surrounded by burning oil and abandonment is essential, personnel shall jump feet first through the flames and swim windward under the surface of the water for as long as possible. When air in the lungs is exhausted, the swimmers should spring above the water in a vertical position, push the flames away with a circular motion of the hands, quickly take a deep breath with their back to the wind, submerge feet first in a vertical position, and swim under the surface again. Swimmers should repeat this until they are well clear of the flames.

#### **WARNING**

Discard any buoyant articles of clothing and shoes. Inherently buoyant PFDs will not permit the wearer to swim beneath the surface. Therefore, **DO NOT** wear them before leaving a ship surrounded by flames.

13-5. **EGRESS FROM A CAPSIZED BOAT.** The following is a guide that watercraft personnel should follow, whenever practical, to egress from a capsized boat.

a. **Preparation.** The most critical factor needed to survive a capsized boat is preparation. Being prepared starts with training and being familiar with the boat. Know the boat's interior. Because no light is likely to be available within a few minutes of capsizing, personnel must recognize everything by touch. Ensure all personnel aboard are familiar with the operation and location of survival equipment.

b. **Capsizing.** If one side of the boat is lifted by a heavy wave and the boat rolls, it may capsize. Brace yourself and grab something solid to hold on to. Doing so may lessen the chance of injury. Note your position and the position of others on the boat. If time is available, the master/coxswain should radio for help and secure the engines or at least place the throttles in neutral. When the hull is intact, most boats will not sink for some time. Do not panic, ample time will be available to escape if you become trapped.

#### WARNING

It is easy to become disoriented when moving through a capsized boat. Those parts of the vessel that are normally on the right are now on the left. Maintain your orientation within a capsized boat by using reference points or familiar handholds. NEVER release both hands from a handhold at the same time. When egressing, **DO NOT** let go of one familiar handhold until you have located another. **DO NOT** attempt to swim out of a capsized boat; surging water in the boat may dislodge you and disorient you.

c. **Egress Procedures.** Once capsized, most boats will not right themselves, but they will float. If trapped in or under the boat, seek out the air pocket near the inverted bottom (now the top). Gather trapped personnel in the air pocket and check their condition. Mild concussions and shock are likely. Take time to plan your escape route and make sure it is clear of obstructions. The following steps are recommended when egressing a capsized vessel:

- Gather survival equipment, especially signaling equipment. Personnel may need to temporarily remove their PFD to escape from the boat.

#### NOTE

If you need to remove your PFD to egress the boat, tie a line (if available) to the PFD so you can retrieve it later.

- Egress the boat, using familiar reference points as handholds and a hand-over-hand method to pull yourself out of the exit. If a line is available, the best swimmer should exit first and attach the line to an outside fixture for poor swimmers to follow. If no line is available, the poor

swimmers should exit first, followed shortly by the better swimmers. A poor swimmer left alone inside without a line may panic and fail to escape.

**WARNING**

Personnel should make every effort to egress the capsized vessel. Staying inside a capsized vessel is a last resort. Once outside a capsized boat, **DO NOT** attempt to reenter the vessel.

- If you cannot egress from the boat, remain calm and stay within the air pocket. Try to conserve remaining air and reduce physical activity. Get out of the water as far as possible, especially if the water is cold. Tap on the hull regularly to alert rescuers of your location. Trap air in the compartment by plugging any holes through the hull or bulkhead.
- Once outside the boat, gather survivors. Unless you see rescuers, try to locate, deploy, and board the liferaft (it is more comfortable than the hull). If no liferaft is available, stay on the hull and keep as much of your body out of the water as possible. The hull will remain afloat for a considerable time, providing a means of avoiding hypothermia and making a better target for rescuers. Put on PFDs if previously removed and retrieved.

**WARNING**

If the engine(s) are still running, remain well clear of the boat's stern.

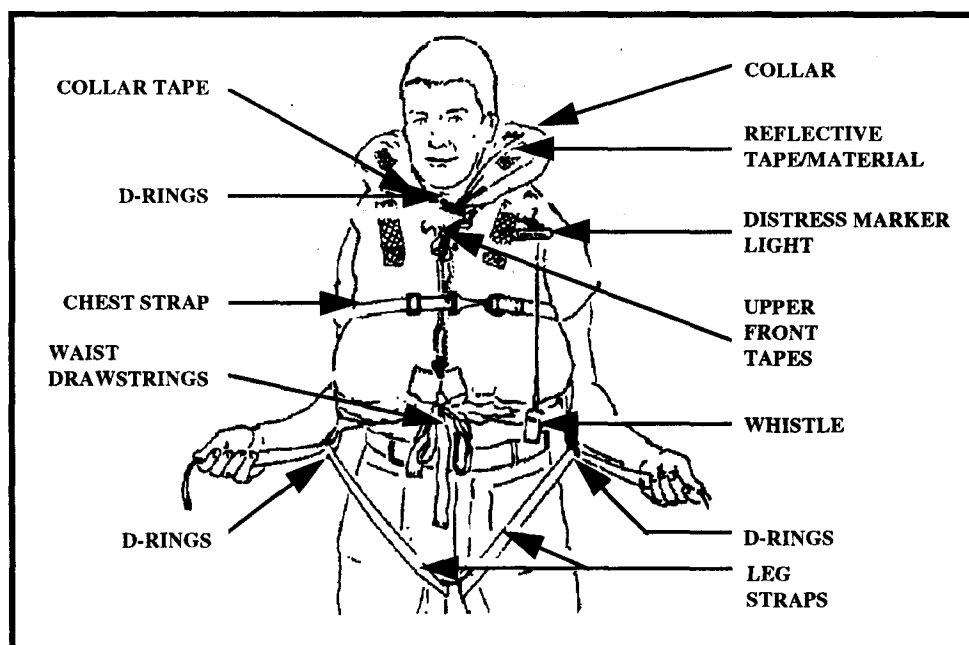
**13-6. STANDARD NAVY VEST-TYPE WITH COLLAR (INHERENTLY BUOYANT).**

This PFD provides superior flotation and functional reliability. It will support an unconscious wearer's head, face up, above the surface of the water.

**NOTE**

All PFDs placed into service will have a whistle, one distress signal light, and reflective tape/material.

a. **Configuration.** This single-unit, vest-type, sleeveless PFD consists of a cotton drill outer envelope that covers removable fibrous-glass pads (see Figure 13-1). It provides 32 pounds of buoyancy. The preservers tie and tunnel tapes allow for individual adjustment. Leg straps attached on either side of the preserver prevent it from riding upon the wearer when in the water.



*Figure 13-1. Standard Navy vest-type PFD with collar*

b. **Donning and Adjusting.** To don and adjust the Navy vest-type PFD with collar complete the following steps:

- Secure chest strap as shown in Figure 13-2, page 13-6. You should adjust the strap to make it tight when buckled.
- Grasp and extend leg straps, passing them to the rear, under the buttocks, then forward, between the legs (see Figure 13-3, page 13-7).

#### WARNING

Before lowering injured personnel into the water, always adjust the leg straps properly.

#### NOTE

If time is insufficient to properly adjust the preserver before immersion, adjust the leg straps for comfort when the wearer is in the water.

- Pass leg straps through D-rings, pulling them snug. Do not cross straps. Secure strap going under left buttock and between legs on wearer's left side. Secure strap going under right buttock and between legs on wearer's right side (see Figure 13-4, page 13-8).
- To allow for quick release of the leg straps from the D-rings, return the end through the outside D-ring (see Figure 13-5, page 13-8).
- Pull the waist drawstrings tight and secure with a bow knot.
- Pull upper front tapes snug and secure with a bow knot. Do not pass these tapes through the D-rings.
- Cross collar tapes and pass them through two metal D-rings near wearer's throat. Pull them snug, securing them with a bow knot.
- Check whistle and distress signal light for proper operation. (If distress light is the chemical type, **DO NOT** activate until required.)

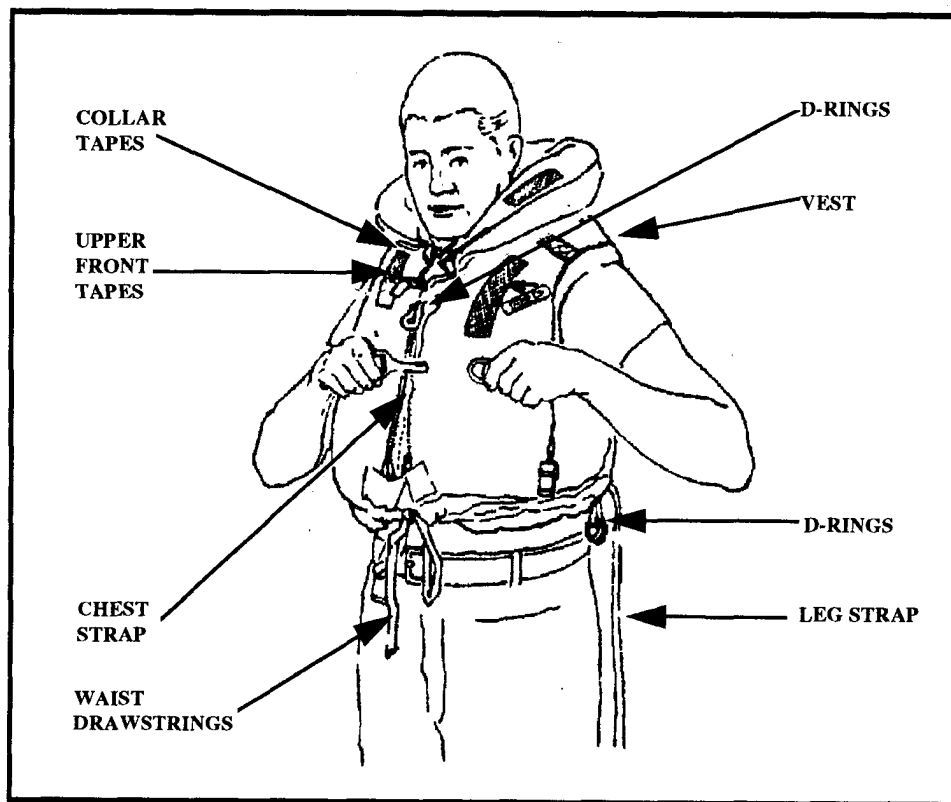


Figure 13-2. Securing the standard Navy vest-type PFD with collar

c. **Modifications.** Make the following modifications before placing the PFD into service.

- **Application of reflective tape/material.** Cut two 2 X 4-inch pieces and four 2 X 6-inch pieces of reflective taped material. Apply the 2 X 4-inch pieces to the collar and the 2 X 6-inch pieces to the front and back of the PFD as shown in Figure 13-6, page 13-9.
- **Marking.** Before placing PFDs into service, mark the PFD with the vessel's name or number.

## NOTE

Ports/harbors may use the port/harbor's name.

- **Safety harness.** Modify PFDs for use with a safety harness if required. Instances where the use of the harness and PFD may be of benefit include personnel working over the side from a great height or personnel working topside during heavy weather. The modification consists of a 3 ¾-inch-long buttonhole sewn in the back cover of the PFD to permit use of the safety harness D-ring (see Figure 13-7, page 13-9). Stow PFDs modified for use with the safety harness with the harness for future use. Units may require commercial assistance to complete this modification. Use a lockstitch conforming to FED-STD751 (Type 304). The stitch length shall be 14 to 20 stitches per inch. Tack stitching at the ends of the slit, with six to eight stitches in each tack.

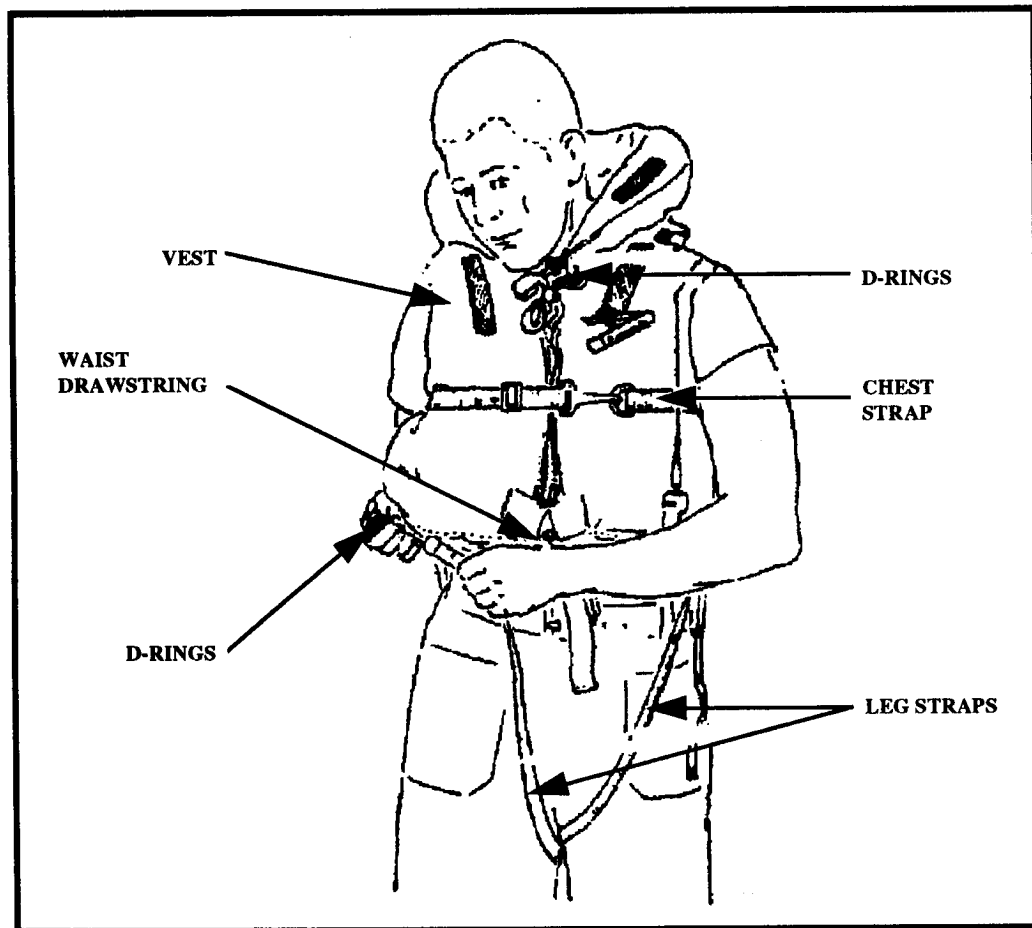
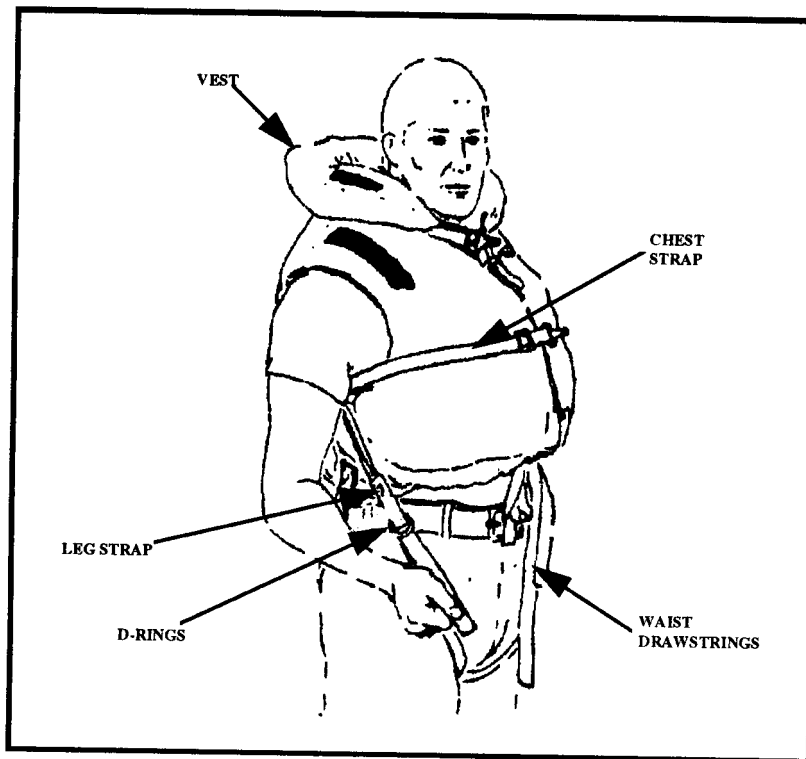
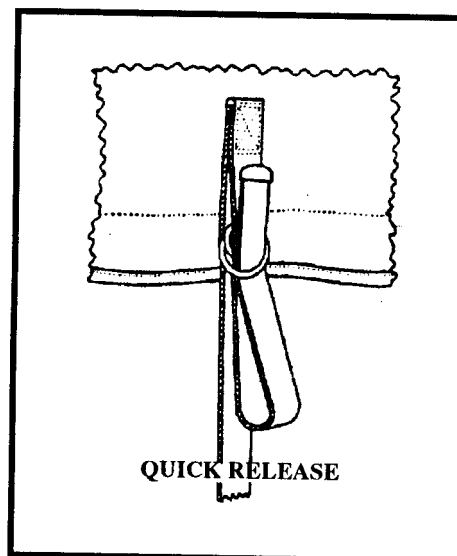


Figure 13-3. Adjusting leg straps



*Figure 13-4. Leg strap with D-rings*



*Figure 13-5. Quick release of leg strap D-rings*

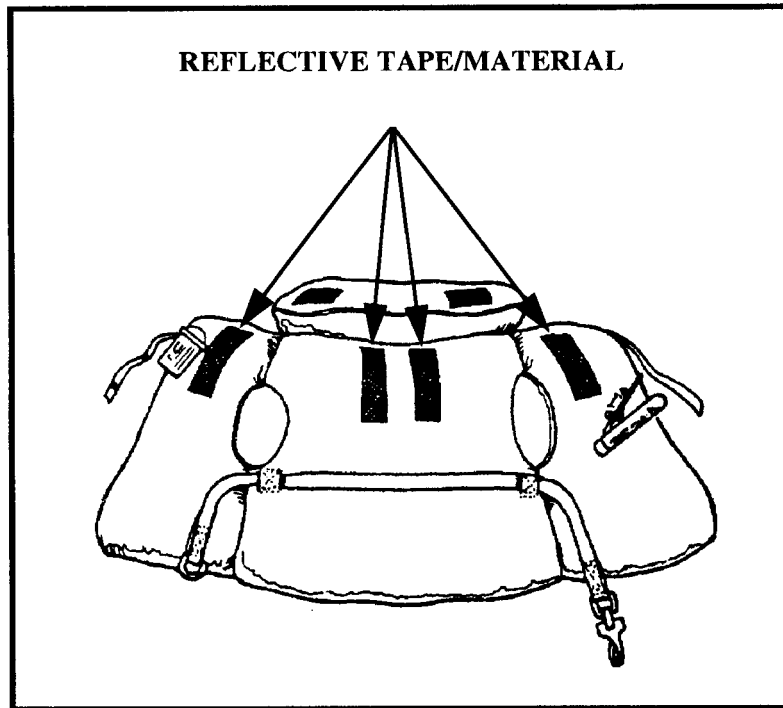


Figure 13-6. Reflective tape/material applied to Navy vest-type PFD with collar

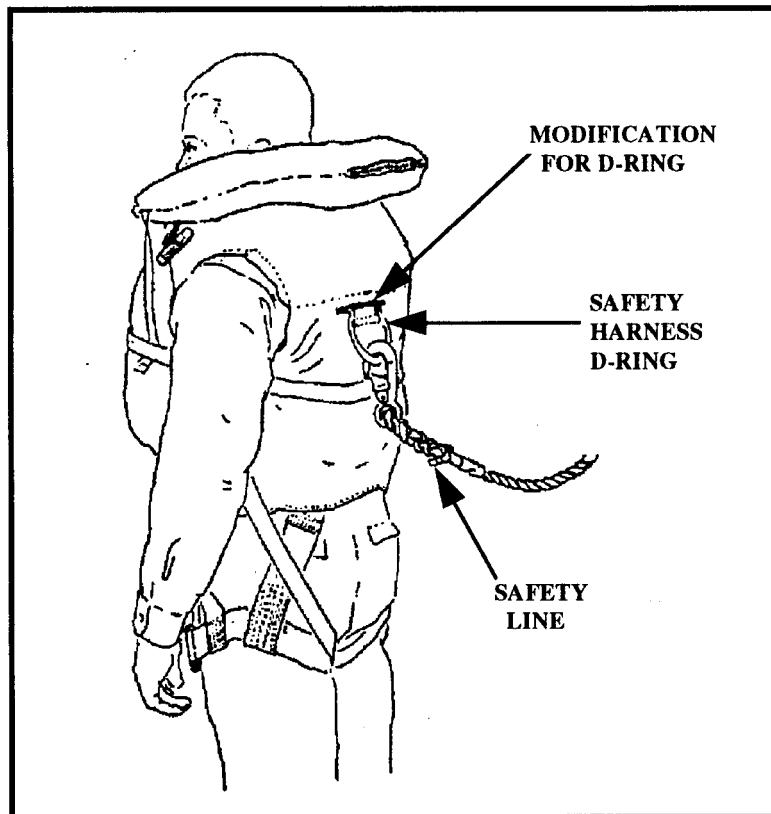


Figure 13-7. Modification of safety harness

d. **Inspection and Test Requirements.** Complete the following inspections and tests as required.

(1) **Quarterly inspection.** Complete the following steps to perform the quarterly inspection.

- Inspect the PFD for tears, rips, and missing webbing, tapes, and hardware.
- Inspect and test the whistles and distress signal lights. (**DO NOT** activate chemical light. Check for expiration date.)
- Inspect the reflective tape/material for cracking, peeling, and discoloration. Replace as necessary.

(2) **Semiannual inspection.** Complete the following steps to perform the semiannual inspection.

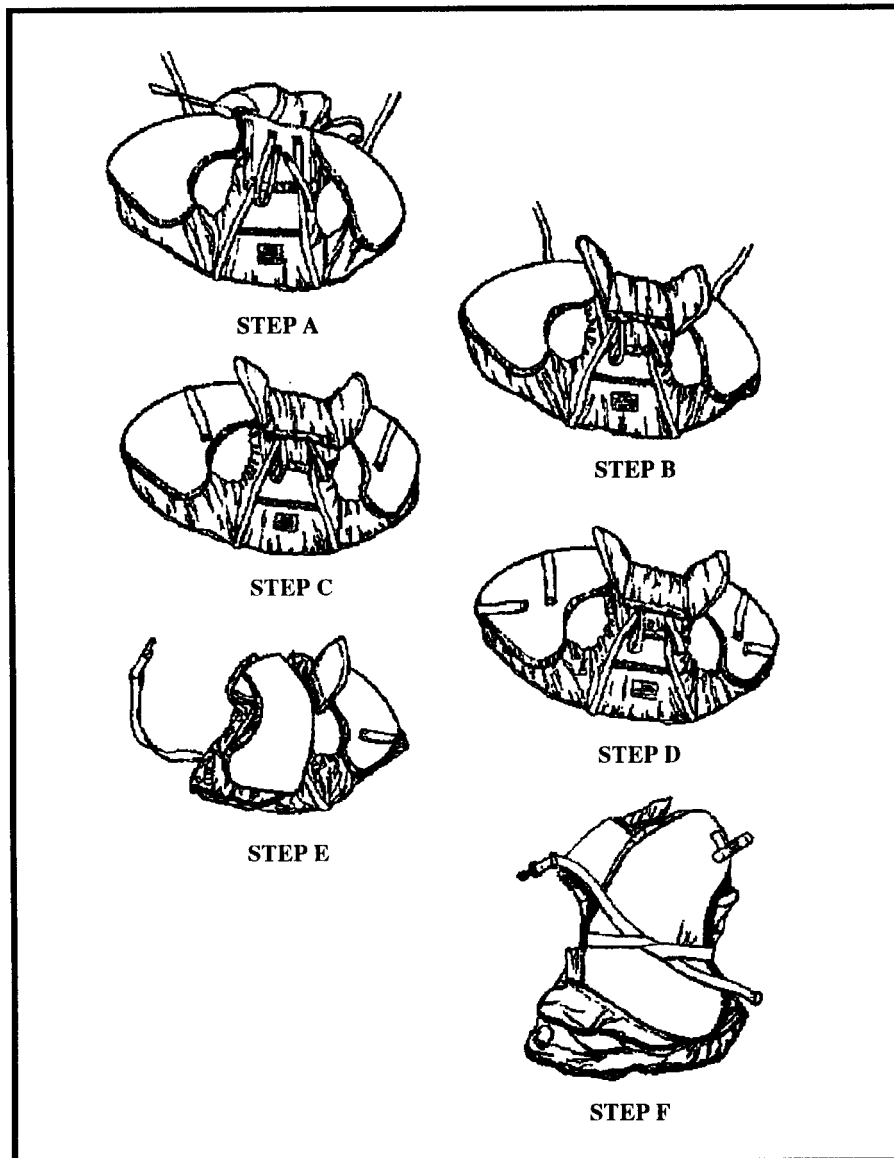
- Complete all quarterly inspection steps as described above.
- Tug sharply on all straps and ties to check for rotted fabric or broken stitching.
- Carefully remove and examine the buoyancy pads (only on preservers with pads designed for removal) for presence of water or growth of mildew within the envelop. Presence of water or mildew is cause for rejecting the PFD. Check for leaks in the plastic envelopes of the buoyancy pads by gently squeezing or compressing the pads in a bucket of water. Air bubbles rising from the pad indicate leaks. Replace the vest.

(3) **Before placing into service.** Before placing the PFD into service, perform a semiannual inspection as described in above paragraph.

e. **Cleaning.** If the cover of the PFD is soiled and requires laundering, remove and launder the flotation pads and signaling equipment.

f. **Preparation for Stowage.** To fold the standard Navy vest with collar for stowage (see Figure 13-8) perform the following:

- Lay out the vest on a flat surface with the manufacturer's label facing up. All straps should be loose (see Figure 13-8, step A).
- Fold the leg straps into the open vest (see Figure 13-8, step B).
- Fold collar tapes into vest and fold collar down (see Figure 13-8, step C).
- Fold upper chest tapes into vest (see Figure 13-8, step D).
- Fold waist drawstring into vest (see Figure 13-8, step E).
- Fold right flotation pad to the center of the vest. Fold the left pad over the right pad.
- Secure the vest using a single overhand knot in the chest strap (see Figure 13-8, step F).



*Figure 13-8. Preparing and securing the standard Navy vest for stowage*

g. **Number Required.** All watercraft will carry a standard Navy vest-type life preserver with collar, for each person on board. An additional number shall be provided for personnel on watch in the engineroom, pilothouse, and for the bow lookout. Watercraft with living/working spaces forward, separated from messing or recreational spaces aft, shall carry additional life preservers for 50 percent of the total number of persons on board. When children are on board, a suitable number of children's life preservers shall be provided.

h. **Stowage.** PFDs should be stored in a cool, dry place, because heat, moisture, and light contribute materially to the deterioration of rubber compounds, cloth, and thread. Keep all PFDs away from oil, paint, and greasy substances.

**NOTE**

The term “cool” refers to temperatures ranging from above freezing up to 100 degrees F when stored out of direct sunlight. The term “dry” refers to an area where condensation does not come in contact with stored items.

**i. Procurement.** The following are the NSNs for the standard Navy vest-type with collar and reflective tape/material.

- Standard Navy Vest-Type with Collar (NSN 4220-00-200-0538).
- Reflective Tape/Material:
  - Adhesive backed, 3 inches X 50 yards (SOLAS) (NSN 9390-01-078-8660).
  - Adhesive backed, 1 inch X 50 yards (NSN 9390-01-082-8927).

**13-7. NAVY VEST-TYPE PFD WITHOUT COLLAR, WORK TYPE.** This lightweight PFD is made from formed plastic foam and provides 17 1/2 pounds of buoyancy. Three cotton drill-covered sections assembled through a series of straps form the completed PFD. Each section contains a formed or molded pad which is 2 inches thick and notched for flexibility. This design allows the PFD to conform more closely to the shape of the body. Because this vest-type PFD is light in weight, the wearer can work in comparative comfort.

**NOTE**

All work-type PFDs placed into service will have a whistle, one distress signal light, and reflective tape/material.

**WARNING**

The work-type PFD is buoyant enough to keep the wearer afloat in calm conditions. It has no self-righting capability and will not keep an unconscious wearer's head out of the water while awaiting rescue.

**a. Donning and Adjusting.** To don and adjust the work-type PFD, complete the following steps:

- Place arms through the straps connecting the body sections. Make sure reflective tape/material are visible.
- Buckle top clasp.
- Adjust webbing belt for comfort.

- Buckle webbing belt clasp.
- Check operation of distress signal light and whistle.

## NOTE

Check distress signal light expiration date.

b. **Modifications.** Make the following modifications before placing the PFD into service.

- *Application of reflective tape/material.* Cut four 2 X 4-inch pieces of reflective tape/material. Apply reflective tape/material to the PFD as illustrated in Figure 13-9, page 13-14.

## NOTE

Remove and replace old reflective tape/material if necessary.

- *Marking.* Before placing PFDs into service, mark them with the vessel's name or number.

## NOTE

Ports/harbors may use the port/harbor's name.

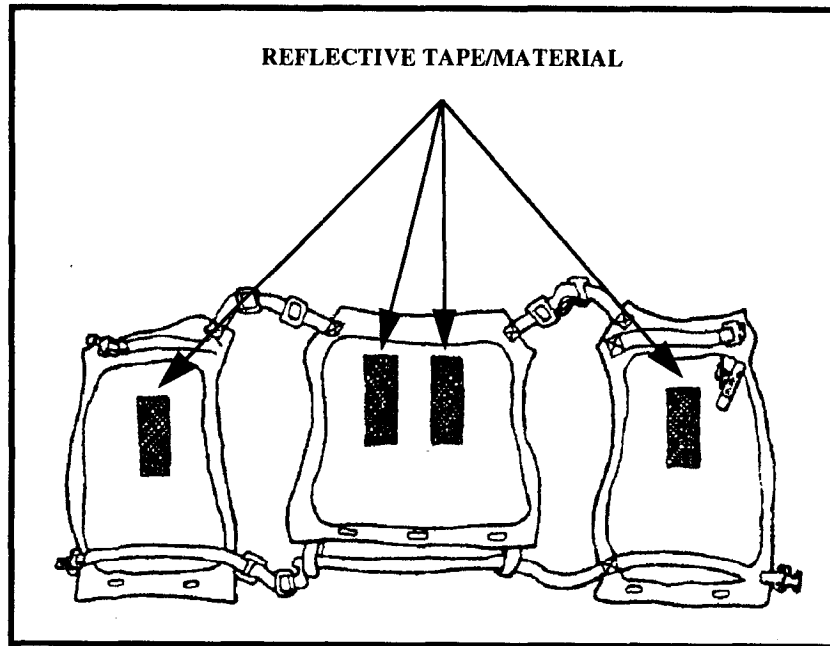
c. **Inspection and Test Requirements.** Complete the following tests and inspections as required:

(1) *Quarterly inspection.* Complete the following steps to perform the quarterly inspection.

- Inspect the PFD for tears, rips, and missing webbing, tapes, and hardware.
  - Inspect and test the whistles and distress signal lights. (**DO NOT** activate chemical light. Check for expiration date.)
  - Inspect the reflective tape/material for cracking, peeling, and discoloration.
- Replace as necessary.

(2) *Semiannual inspection.* Complete the following steps to perform the semiannual inspection.

- Complete all quarterly inspection steps as described in paragraph 13-7c(1).
- Tug sharply on all straps to check for rotted fabric or broken stitching.
- Carefully remove and examine the buoyancy pads (only on PFDs with removable pads). Check for general deterioration of the pads. Reject any that show signs of significant deterioration.



*Figure 13-9. Reflective tape/material applied to Navy vest-type PFD without collar, work type*

(3) **Before placing into service.** Before placing the PFD into service, perform a semiannual inspection as described in paragraph 13-7c(2).

d. **Cleaning.** If the cover of the PFD is soiled and requires laundering, remove and launder the flotation pads and signaling equipment.

e. **Stowage.** PFDs should be stored in a cool, dry place, because heat, moisture, and light contribute materially to the deterioration of rubber compounds, cloth, and thread. Keep all PFDs away from oil, paint, and greasy substances.

#### NOTE

The term “cool” refers to temperatures ranging from above freezing up to 100 degrees F when stored out of direct sunlight. The term “dry” refers to an area where condensation does not come in contact with stored items.

f. **Procurement.** Navy vest-type PFD without collar, work type (NSN 4220-00-276-8926).

**13-8. COAST GUARD-APPROVED TYPE III PFD (INHERENTLY BUOYANT).** The main advantage of this PFD is its wearability, ease of donning, simple construction, and neat appearance. The disadvantages are limited flotation (no righting moment) and minimum buoyancy (about 16 pounds). Wear this PFD only when you require greater freedom of movement and the mission and environment are less hostile.

**NOTES**

All PFDs placed into service shall have a whistle, a distress signal light, and reflective tape/material.

Type III PFDs are not universally sized. Two or three different sizes are required to fit adults properly.

a. **Application.** Coast Guard-approved Type III PFDs may be used as a substitute for the work-type preserve.

**WARNING**

When required, personnel WILL NOT use PFDs in place of hypothermia protective clothing.

b. **Modifications.** Perform the following modifications before placing the PFD into service and as required thereafter.

- *Application of reflective tape/material.* Cut two 2-inch pieces of reflective tape/material. Apply the reflective tape/material to the PFD as illustrated in Figure 13-10, page 13-16.

**NOTES**

Many manufacturers offer the addition of reflective tape/material as an option with a new PFD.

Remove and replace old reflective tape/material if necessary.

- *Marking.* Before placing Type III PFDs into service, mark them with the vessel's name or number.

NOTE

Ports/harbors may use the port/harbor's name.

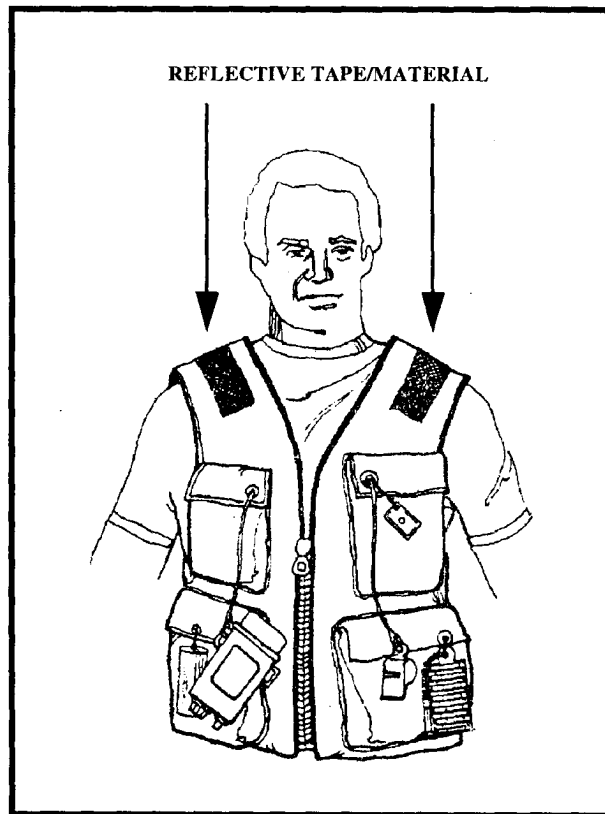


Figure 13-10. Reflective tape/material applied to Coast Guard-approved type III PFD

c. **Procurement.** Procure Type III PFDs only with commander's approval.

**13-9. COAST GUARD-APPROVED TYPE I PFD.** This PFD (see Figure 13-11, page 13-18) is a one-piece, reversible device intended primarily for use by passengers carried aboard Army watercraft. This vest is not recommended for use by boat crews because it severely restricts mobility. Like the standard Navy vest with collar, this PFD will support the head of an unconscious person. This PFD is also the easiest to don in an emergency because it is reversible. The disadvantages of this PFD are similar to those of the work vest because of its inherent buoyancy (rated at a minimum of 22 pounds).

NOTE

All PFDs placed into service will have a whistle, a distress signal light, and reflective tape/material.

a. **Configuration.** This PFD (see Figure 13-11) consists of three sections of unicellular foam contained in a fabric envelope with a neck hole and a body slit in front to accommodate donning. It is fitted with an adjustable body strap.

b. **Donning and Adjustment.** To don and adjust the Coast Guard-approved Type I PFD, complete the following steps:

- Grasp the PFD at the lower part of head opening. Pull outward to expand opening.
- Slip head through opening.
- Pass body strap around back and fasten at front of vest. Adjust strap for a snug fit.

c. **Modifications.** Make the following modifications before placing the PFD into service and as required thereafter.

- *Addition of reflective tape/material.* Cut four 2 X 6-inch pieces of reflective tape/material. Apply the reflective tape/material as shown in Figure 13-11.

#### NOTES

Since Coast Guard-approved Type I PFDs are reversible, apply reflective tape/material to both sides of the PFD.

Many manufacturers offer the addition of reflective tape/material as an option for a new PFD.

- *Marking.* Before placing PFDs into service, mark them with the vessel's name or number.

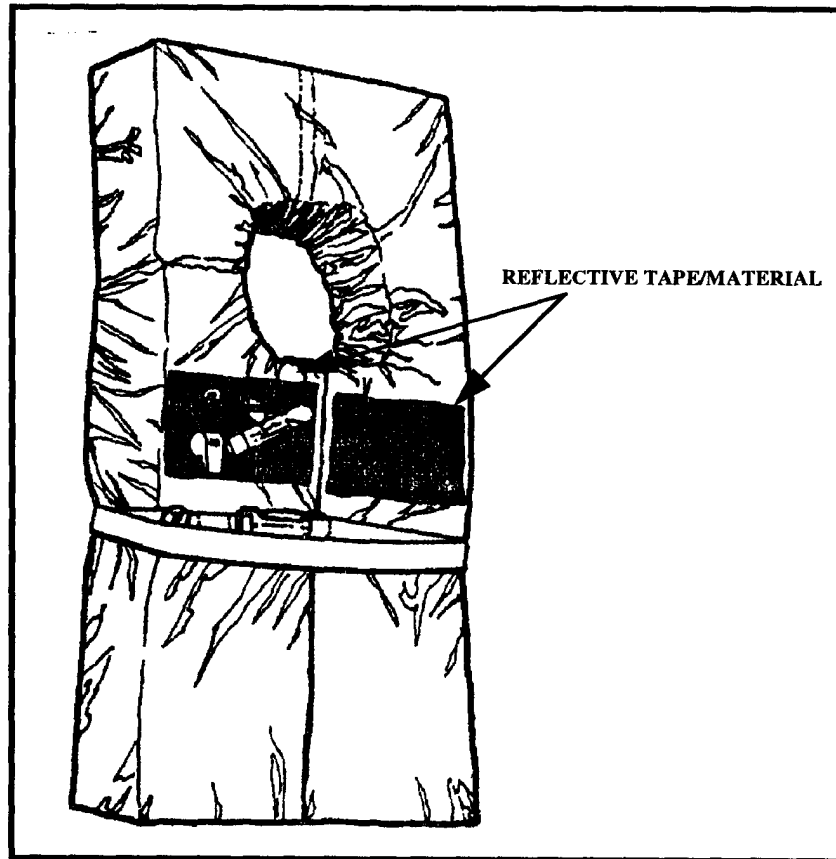
#### NOTE

Ports/harbors may use the port/harbor's name.

d. **Inspection and Test Requirements.** Complete the following tests and inspections as required.

(1) **Quarterly inspection.** Complete the following steps to perform the quarterly inspection.

- Inspect the PFD for tears, rips, and missing webbing, tapes, and hardware.
- Inspect and test the whistles and distress signal lights. (**DO NOT** activate chemical light. Check for expiration date.)
- Inspect the reflective tape/material for cracking, peeling, and discoloration. Replace as necessary.



*Figure 13-11. Coast Guard-approved type I PFD (standard cloth covered) (typical)*

(2) **Semiannual inspection.** Complete the following steps to perform the semiannual inspection.

- Complete all quarterly inspection steps as described in paragraph 13-9d(l).
- Tug sharply on all straps to check for rotted fabric or broken stitching.
- Carefully remove and examine the buoyancy pads (only on preservers with pads designed for removal) for presence of water or growth of mildew within the envelop. Presence of water or mildew is cause for rejecting the PFD. Check for leaks in the plastic envelopes of the buoyancy pads by gently squeezing or compressing the pads in a bucket of water. Air bubbles rising from the pad indicate leaks. Replace the vest.

(3) **Before placing into service.** Before placing the PFD into service, perform a quarterly inspection as described in paragraph 13-9d(l).

e. **Cleaning.** The outer cover of the PFD may be cleaned with a mild soap and fresh water, followed by a thorough rinse in fresh water. Make sure PFDs are dried thoroughly before stowage.

f. **Stowage.** PFDs should be stored in a cool, dry place, because heat, moisture, and light contribute materially to the deterioration of rubber compounds, cloth, and thread. Keep all PFDs away from oil, paint, and greasy substances.

## NOTE

The term “cool” refers to temperatures ranging from above freezing up to 100 degrees F when stored out of direct sunlight. The term “dry” refers to an area where condensation does not come in contact with stored items.

g. **Procurement.** Units shall only procure PFDs approved by the Coast Guard under 46 CFR 160.055.

## NOTE

Verify PFD approval under 46 CFR 160,055 by observing the Coast Guard approval number found on the PFD. “US Coast Guard Approval No. 160.055/111/0” is a typical approval number.

## CHAPTER 14

### PERSONNEL MARKER LIGHT

14-1. **GENERAL.** The PML (see Figure 14-1, page 14-2) is a chemical light developed for use on PFDs and hypothermia protective garments (survival suit). It is used to attract the attention of search and rescue aircraft, ships, or ground parties. Once activated it provides light for approximately 8 hours. The PML is equipped with a pin-type clip and should be attached to the PFD front left shoulder.

#### NOTE

The PML is the only chemical light authorized for use and is intended to replace one-cell flashlights as they go out of service.

14-2. **OPERATING INSTRUCTIONS.** To activate the PML, firmly squeeze lever against light tube, breaking sealing band and ampules inside light. Slide protective sleeve from PML.

14-3. **INSPECTION.** PMLs that have been placed into service shall be inspected during normal inspection cycle of equipment, such as PFD and hypothermia protective garment, to which it is attached. Do the following to inspect the PML:

#### NOTE

Protective sleeve must be kept in place to protect against accidentally breaking glass ampule and to protect against deterioration of chemical by ultraviolet light.

- Inspect sealing band on protective sleeve for security.
- Check expiration date stamped on sealing band. Replace PMLs three years from date of manufacture.
- Examine safety-pin-type clip for deformity. If pin is deformed, replace the PML. Ensure safety pin is in the closed position.
- Discard expended or out of date PML's IAW unit HAZMAT/Environmental SOP.

14-4. **PROCUREMENT.** Order the personnel marker light by NSN 6260-01-086-8077.



*Figure 14-1. Personnel marker light*

## CHAPTER 15

## SIGNAL WHISTLE

15-1. **GENERAL.** The signal whistle emits an audible signal to rescue ships or personnel. One each whistle shall be attached to each PFD and to each hypothermia protective garment (survival suit).

**NOTE**

Life jacket, work vest, antiexposure suit, and survival suits include a whistle attached to the zipper.

15-2. **CONFIGURATION.** The signal whistle (see Figure 15-1, page 15-2) is made of plastic with a lanyard attached for easy access and to prevent loss.

15-3. **APPLICATION.** The signal whistle is used to attract attention of rescue ships or personnel in foggy weather or at night. Whistle range is 1,000 yards.

15-4. **INSPECTION.** Signal whistles shall be inspected during the normal inspection cycle of the equipment (such as the PFD or hypothermia protective garment) to which it is attached. Do the following to inspect the signal whistle:

- Ensure side discs of whistle are neither loose nor missing. Check whistle for cracks and damaged ball. Replace damaged or defective whistles.
- Blow whistle normally (regular exhalation), then with forced exhalation. Replace the whistle if it fails to emit a highly audible sound.

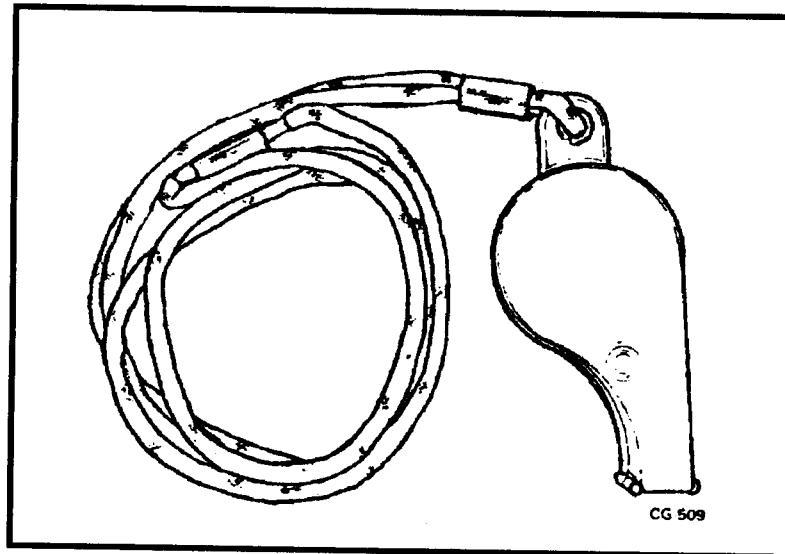
**NOTE**

The signal whistle must be tethered to the PFD or hypothermia protective garment. Nylon cord shall be seared at both ends to prevent fraying.

- Attach the whistle to a grommet installed on the garment using a 36-inch length of Type I nylon cord. A bowline knot should be used to secure the ends of the cord to the whistle and the grommet.

15-5. **PROCUREMENT.** Order the following items by their appropriate NSN.

- Signal Whistle (NSN 8465-00-254-8803).
- Type I Nylon Cord (NSN 4020-00-240-2145).



*Figure 15-1. Signal whistle*

## CHAPTER 16

### RING BUOY

16-1. **GENERAL.** The standard ring buoy (see Figure 16-1, page 16-2), is a 30-inch diameter, inherently buoyant, plastic buoy. Ring buoys are intended to be used when a person falls overboard. A ring buoy with either a floating distress marker and/or self-activating smoke signal attached shall be readily available on each side of the watercraft. Other life ring buoys must have a 90-foot, orange, buoyant, polypropylene retrieving line attached. All ring buoys will have reflective tape/material attached.

16-2. **NUMBER REQUIRED.** The minimum number of 30-inch ring buoys and the minimum number of which shall have distress markers, smoke signals, or retrieving lines, shall be in accordance with Table 16-1, page 16-3.

#### NOTE

Marine smoke/flame location marker will be attached to the ring buoy with distress marker light located on the port and starboard bridge wing.

16-3. **INSPECTION.** Inspect ring buoys every 6 months by completing the following steps:

- Inspect ring buoy for general condition of inherently buoyant material, such as holes, cracks, rips, and so forth.
- Inspect condition of lifeline, replace as required.
- Inspect retrieving line for condition and security. The retrieving line shall be securely attached to the ring buoy lifeline with an eye splice. Retrieving lines shall be stowed in a loose coil and lashed in place on the ring buoy with an easily breakable cotton thread.
- Inspect the reflective tape/material for tears and missing pieces.
- Ensure that the ring buoy is orange in color (international) and stenciled with the vessel's name or number and the legend "US ARMY".
- If a ring buoy is found unserviceable, remove it from the watercraft immediately.

16-4. **MODIFICATIONS.** A ring buoy needs to be modified before use. Make the following modifications to a ring buoy when appropriate.

- To aid in locating a ring buoy at night, reflective tape/material shall be installed on each ring buoy as shown in Figure 16-2, page 16-4.
- Attach 90 feet of retrieving line, using an eye splice, to each ring buoy without a distress marker or smoke signal.

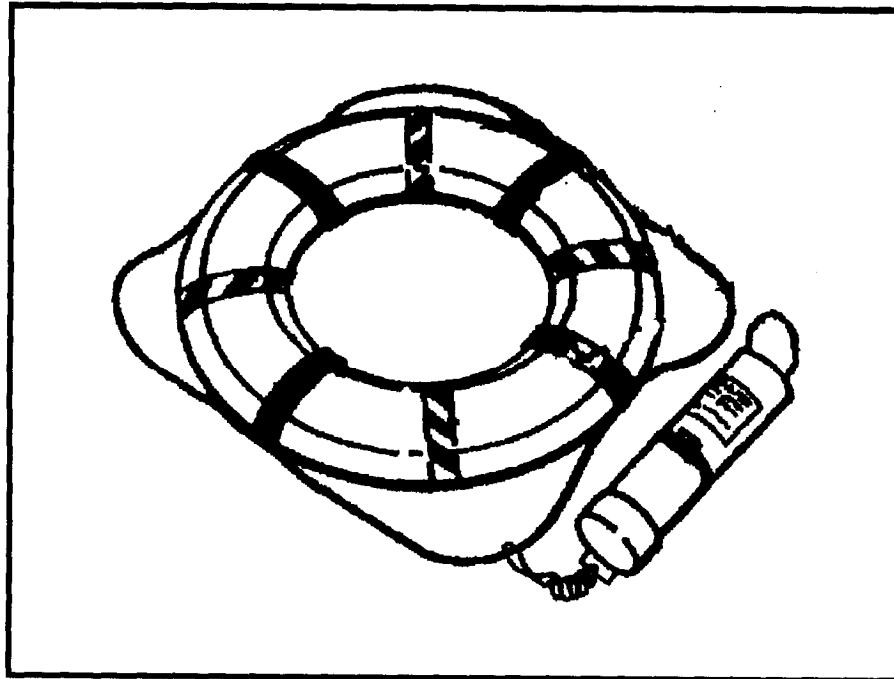
**NOTE**

Marine smoke/flame location marker will be attached to the ring buoy with distress marker light located on the port and starboard bridge wing.

- Attach a floating distress marker to each ring buoy positioned for man overboard emergency. It is attached by the halyard snap and 2 feet of 1/4-inch-diameter, yellow, polyethylene line.
- Attach a smoke signal to each ring buoy located on the port and starboard bridge wing.

16-5. **PROCUREMENT.** Order the following items by their appropriate NSN.

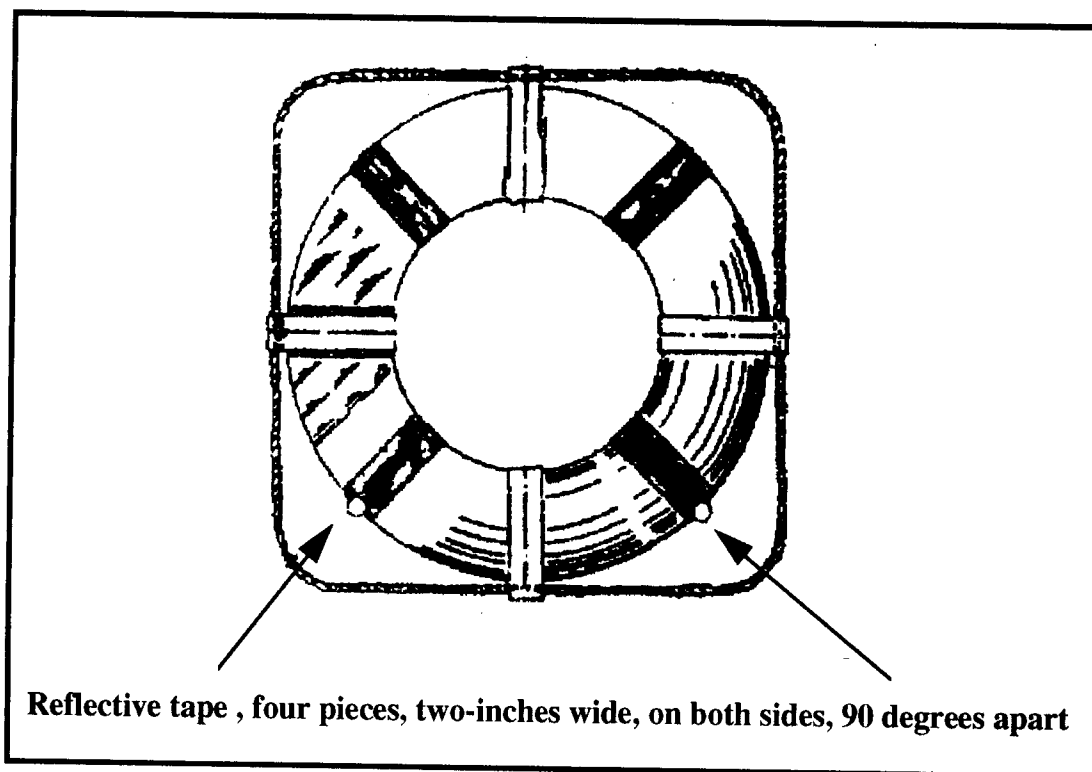
- Ring Buoy, 30 inches (NSN 4220-00-275-3157).
- Reflective Tape, Adhesive backed, 3 inches X 50 yards, silver (NSN 9390-01-078-8660).
- Ring Buoy retrieving line, orange, polypropylene, 1-inch circular, 1700# b/s, 200 yards long (NSN 4020-00-530-0698).
- Distress Marker Lanyard, yellow, polyethylene, 1/4-inch diameter, 3 strand, 1000# b/s, 200 yards long (NSN 4020-00-710-2074).
- Marker, Location Marine, Mk 58, Mod 1 (NSN 1370-01-074-0591) (DODIC 1370-L580).
- Snap, Halyard (NSN 5340-00-275-4584).



*Figure 16-1. Ring buoy (standard)*

Table 16-1. Authorized required ring buoys and attachments

Type of Watercraft	Minimum number of buoys required	Minimum number of buoys required with 90 foot line attached	Minimum number of buoys required with distress marker light attached	Minimum number of buoys required with marine smoke/flame location marker
LSV	8	2	6	2
LCU 2000	8	2	6	2
LCU 1600	6	1	5	0
LT (800 series)	6	1	5	2
LT (100 foot)	5	1	4	2
ST (65 foot)	5	1	4	0
LCM-8	3	1	2	0
LARC XV	2	1	1	0
CHI	3	1	2	0
FMS	6	2	4	0
BD	4	2	2	0
BG	2	1	1	0
Causeway Ferry	2	1	1	0



*Figure 16-2. Ring buoy with reflective tape/material*

## CHAPTER 17

## FLOATING DISTRESS MARKER

17-1. **GENERAL.** The floating distress marker(see Figure17-1, page 17-3) is a watertight, vaporproof, battery-operated flashing light normally used during darkness to mark the location of objects in the water. It is attached to ring buoys used at man overboard and lookout stations. The capacitor discharge xenon flashtube emits flashes of light at a rate of 60 +/- 10 flashes per minute for a minimum duration of 15 hours. The mounting bracket is designed to hold the light in an inverted position yet release it when a pull of 20 to 40 pounds is applied. External parts of the light, other than the lens, are international orange.

17-2. **INSPECTION.** The floating electric marker light shall be inspected before placing the light into service and every 6 months thereafter. To inspect the light, complete the following steps:

**NOTE**

Weak batteries, internal corrosion, and lack of water tightness are major reasons for failure of floating lights.

- Remove light from bracket, ensuring its easy removal.
  - Remove battery from light.
  - Inspect lens and case for interior condensation and cracks.
  - Inspect condition and security of lanyard and halyard snap hook. Replace as necessary.
  - Inspect battery compartment for corrosion or signs of battery leakage. Clean and dry all contacts.
  - Clean exterior of light using a mild soap and water solution and a soft cloth.
- Thoroughly dry exterior of light.
- Replace any cracked or broken gaskets.
  - Install a new battery.
  - Test the light by inverting it (lens up). The light should come on and flash at a rate of 60 +/- 10 flashes per minute. Test internal switch by turning light upside down (lens down); light should extinguish. If light does not flash or extinguish, replace light.

**CAUTION**

Do not keep the lamp in a lighted position more than necessary since operating life will be reduced.

- Mark date of inspection and replacement of battery on outside of light using stencil, marking pen, or plastic tape.
- Replace light in bracket with lens down.

17-3. **MAINTENANCE.** Maintenance of the floating electric marker light is limited to inspection, replacement of batteries, and cleaning.

17-4. **MODIFICATIONS.** The following describes modifications to the floating electric marker light.

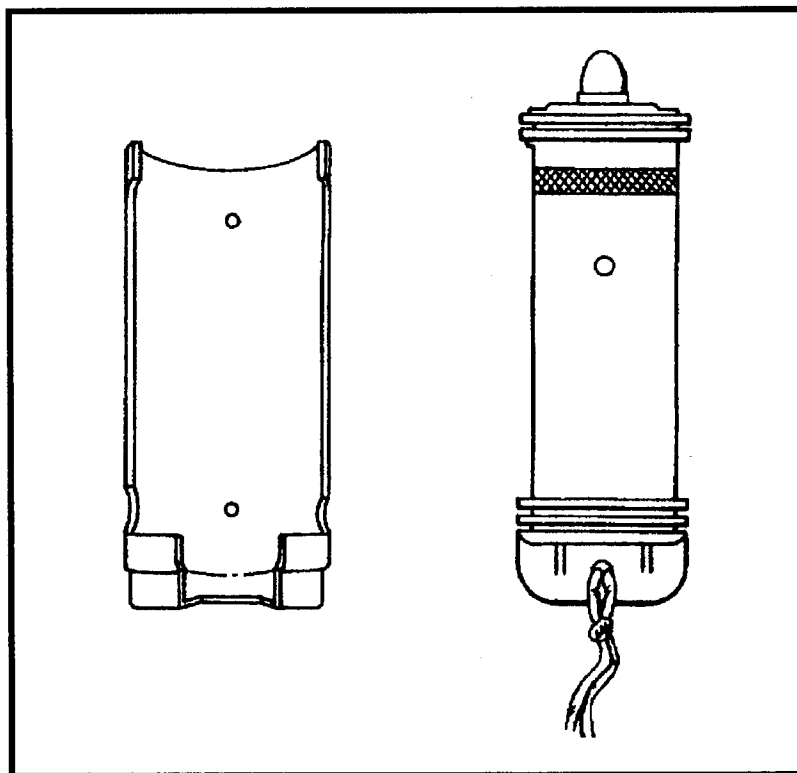
- Attach a 2-foot length of 1/4-inch polypropylene line (NSN 4020-00-710-2074) using an eye splice. Attach a halyard snap (NSN 5340-00-275 -4584) to the opposite end of the line using an eye splice. The halyard snap is used to attach the light to the ring buoy or other objects.
- To aid in locating a nonfunctional light, reflective tape (NSN 9390-01-078-8660) shall be applied to the upper body of the light. Ensure tape totally encircles the body of the light.

17-5. **PROCUREMENT.** Order the following items by their appropriate NSN.

- Light Marker, Distress (MIL-L-24532) (NSN 6230-01- 143-4778).
- Battery, 6 volt (NSN 6135-00- 100-0413).
- Distress Marker Lanyard, yellow, polyethylene, 1/4-inch diameter, 3 strand, 1000# b/s, 200 yards long (NSN 4020-00-710-2074).
- Snap, Halyard (NSN 5340-00-275-4584).
- Reflective Tape, adhesive backed, 3 inch x 50 yards, silver (NSN 9390-01-078-8660).

**NOTE**

Do not be surprised if the distress marker light you receive from supply is different from the type you ordered. You must be sure you have the right battery, otherwise the light may not work or float upright when thrown into the water.



*Figure 17-1. Floating distress marker*

## CHAPTER 18

### INFLATABLE LIFE RAFTS

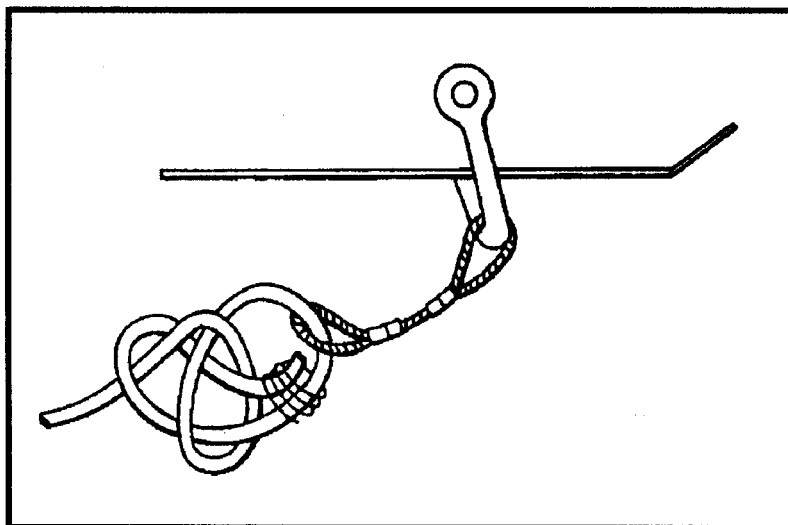
18-1. **GENERAL.** This chapter contains information about the following inflatable life rafts used on US Army watercraft. These life rafts include the following:

- Commercial, USCG approved.
- Navy Mark 5 Mod 2.
- Navy Mark 6.

18-2. **PURPOSE.** This chapter also covers inflatable life raft recertification requirements, description, location, and stowage.

18-3. **COMMERCIAL LIFE RAFTS.** Commercial life rafts must be serviced at an approved servicing facility every 12 months. The servicing facilities must be approved by the life raft manufacturer, inspected by the Coast Guard, and issued a letter of approval by the USCG Commandant. Vessel masters should give careful attention to the selection of servicing facilities for inflatable life rafts.

The painter must be connected to the ship by a weak link with a 500-pound breaking strength (see Figure 18-1). Each inflatable life raft and container will have permanently attached, a substantial nameplate of compatible material and which is embossed or imprinted with the name of the manufacturer. The nameplate must also have imprinted the approval number, the manufacturer's model and serial number, the number of persons for which the inflatable life raft is approved, lot number, the Marine Inspection Office identification letters, the date, and the letters "USCG". The raft container will also be provided with a stainless steel plate for showing a stamped record of the data of the annual inspections and the gas inflation tests described respectively.



*Figure 18-1. Weak link on a life raft (typical)*

**18-4. NAVY LIFE RAFTS.** Navy life rafts consists of the Navy Mark 5 Mod 2 and the Navy Mark 6. These life rafts are discussed below.

a. **Navy Mark 5 Mod 2.** The Navy Mark 5 Mod 2 (see Figure 18-2) is a air inflated raft stowed in a fiberglass container and designed for fast inflation in an emergency. The raft is designed to accommodate 15 people. It is equipped with a life line, attached to the outer perimeter to provide support for additional people to cling to the outside of the life raft. Boarding nets are attached to each end to facilitate boarding the raft. A rescue line is attached to the upper main tube inside the aft end of the life raft. A sea anchor is attached to one end of the life raft and a righting line is attached to a D-ring located port side amidships. Survival gear is stowed within the life raft. The life expectancy of the raft is 20 years from the date of manufacture. Those rafts that reach their life expectancy are being replaced by the Mark 6. The ultimate goal is to have Mark 6 life rafts on all US Army watercraft.

b. **Navy Mark 6.** The Mark 6 (see Figure 18-3, page 18-4) is designed for compact stowage aboard vessels for quick inflation in an emergency. It can accommodate 25 people when it becomes necessary to abandon ship. A boarding ladder is provided at the bow end entrance to facilitate boarding. Because of the size of the Mark 6, three righting lines are attached to D-rings on the hull and gunwale tubes. Also because of its size, the underside of the raft is equipped with four ballast buckets to help keep the raft from capsizing. The survival gear bag and two paddles are stowed (tied down to the floor) within the raft. Two radar reflective screens are provided within the raft to facilitate rescue by passing ships. The dimensions of the raft when inflated are 20 feet 11 inches overall length and 8 feet 10 1/2 inches overall width. When packed in its fiberglass container (same container as Mark 5 Mod 2) and complete with all survival gear and equipment, the raft weighs approximately 490 pounds.

**18-5. RECERTIFICATION AND REPAIRS.** Unlike commercial life rafts, the Navy life rafts must be recertified every 4 years. The Navy life raft is equipped with survival equipment and components which are suitable for the 4-year maintenance cycle. Upon completion of the test and recertification process, documentation is maintained on file at the repair facility and a letter of recertification is issued to the customer. Authorized repair and recertification facilities for the Navy Mark 5 Mod 2 and Mark 6 life rafts are located in the following areas:

- Norfolk Naval Shipyard, Norfolk, VA.
- Philadelphia Naval Shipyard, Philadelphia, PA.
- Long Beach Naval Shipyard, Long Beach, CA.
- Puget Sound Naval Shipyard, Bremerton, WA.
- Mare Island Naval Shipyard, Mare Island, CA.
- SIMA, Norfolk VA.
- SIMA, Mayport, FL.
- SIMA, San Diego, CA.
- SIMA, Long Beach, CA.
- SIMA, Pearl Harbor, HI.
- Naval Ship Repair Facility, Yokosuka, Japan.

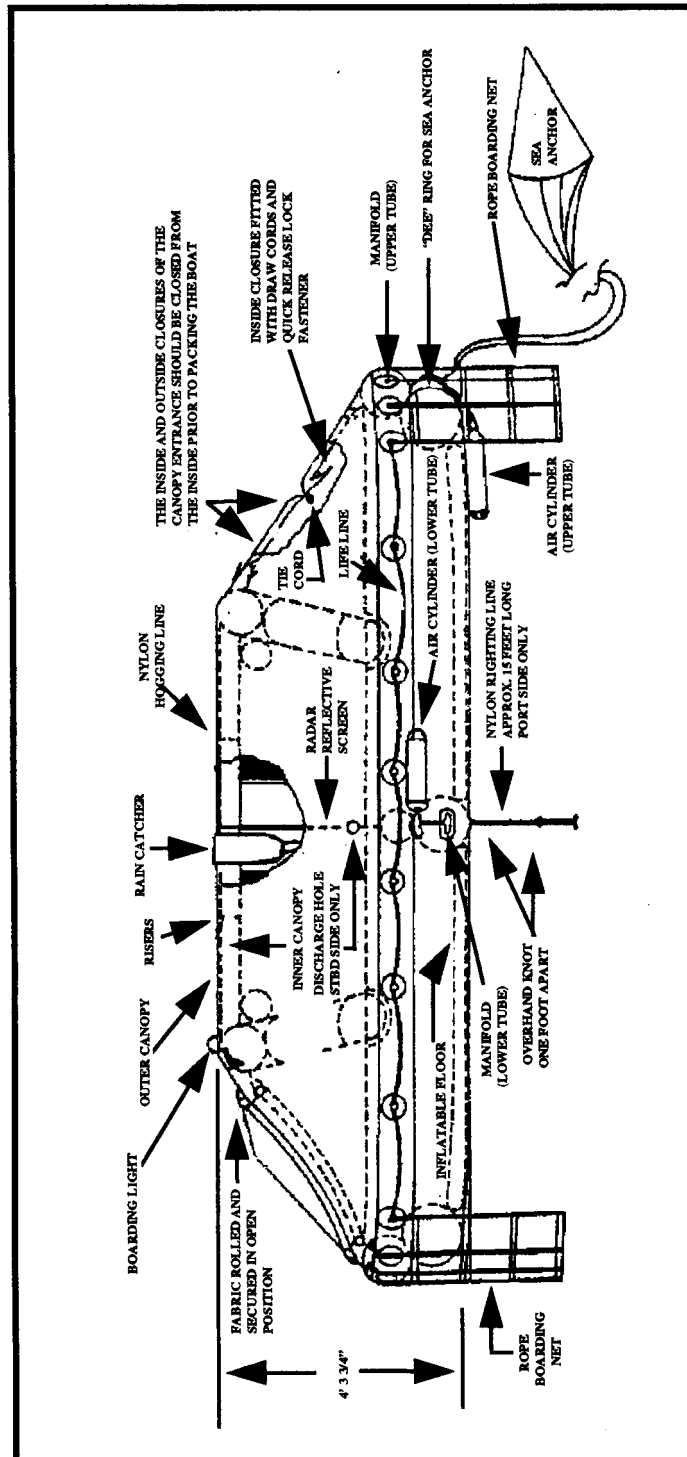


Figure 18-2. General arrangement of Mark 5 Mod 2

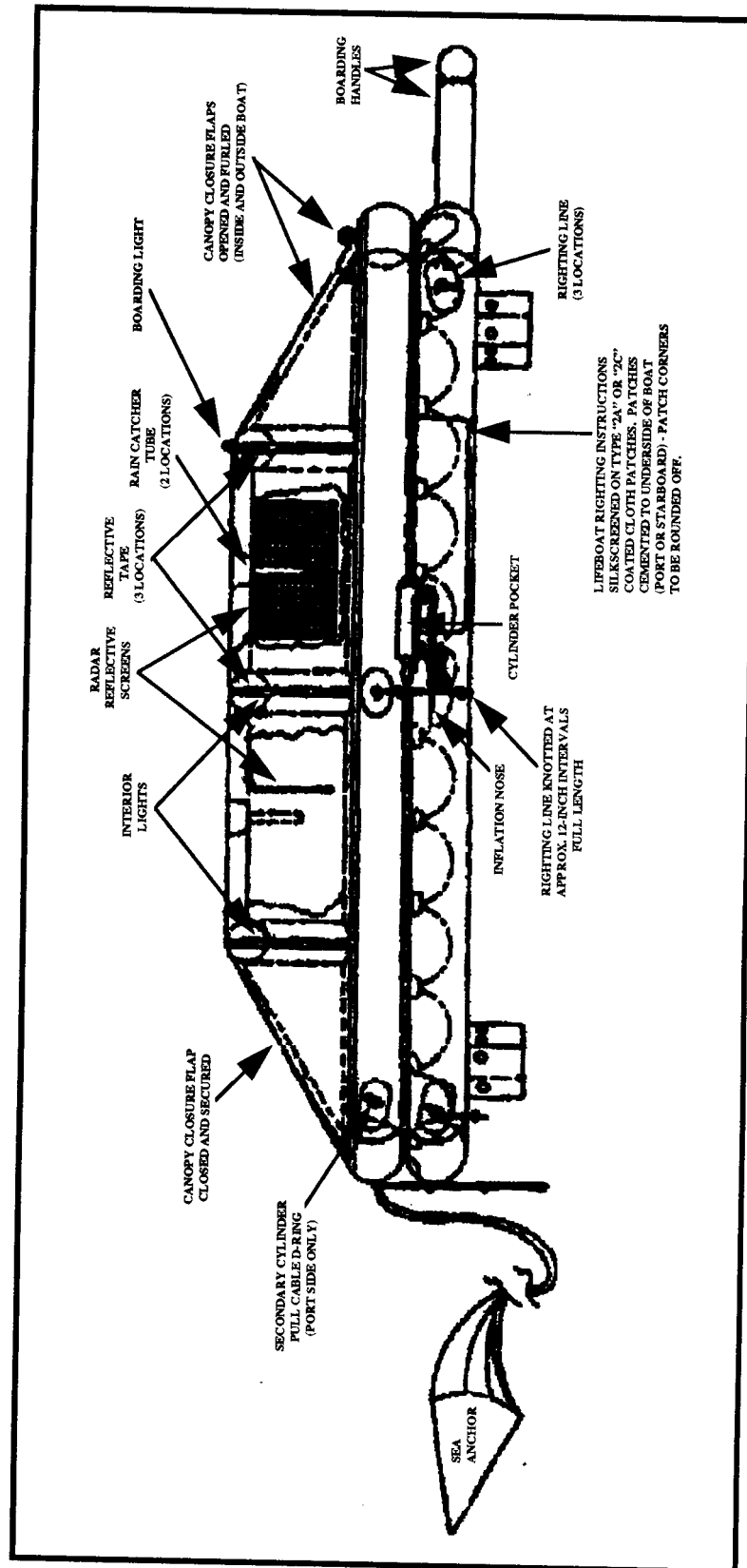


Figure 18-3. General arrangement of Mark 6

**18-6. LOCATION AND STOWAGE.** Inflatable life raft stowages should be located to provide the following:

- To permit ready manual overboard launching into the water without hitting obstructions.
- To be clear of overhead obstructions.
- To avoid the effects of heavy seas,
- To interfere as little as possible with normal shipboard activity.

They shall be located, longitudinally, where they will provide the maximum practical distribution of lifesaving facilities. Furthermore, instructions shall be plainly visible and the station lighted by the vessels emergency lighting system (see Figure 18-4, page 18-6).

**18-7. SECURING.** Equipment for securing the boats in their stowages will include a hydrostatic release assembly (see chapter on hydrostatic release devices) that permits automatic and manual release. This provides for quick release of the boat from its stowage for hand launching, or release from its stowage from hydrostatic pressure, resulting from a depth of 10 to 40 feet of seawater.

**18-8. SEA PAINTER.** When manually launching the life raft, the sea painter will be attached directly to the ship structure adjacent to the stowage.

**CAUTION**

The life raft should not be tied or lashed to the ship in any manner. This is to eliminate the possibility of it being pulled down with a sinking vessel.

**18-9. MARKINGS.** Markings on Navy life rafts shall be clearly and legibly applied in a color contrasting to its background. Use materials which are permanent for the life of the inflatable life raft. Place instructions for explaining such things as launching and inflating the raft, righting the raft, and so on, in a conspicuous lighted area near the life raft. Recertification dates are located in the container hand holds or under the black moisture band by the painter bung. Stencil the vessel's hull number or name and the life raft number on the case.

**18-10. PROCUREMENT.** Order the following by their appropriate NSN.

- Navy Mark 6 (NSN 1940-01-015-7346).
- Moisture Band, Mark 5 Mod 2 and Mark 6 Life Raft Case (NSN 5330-01-1 14-5520).

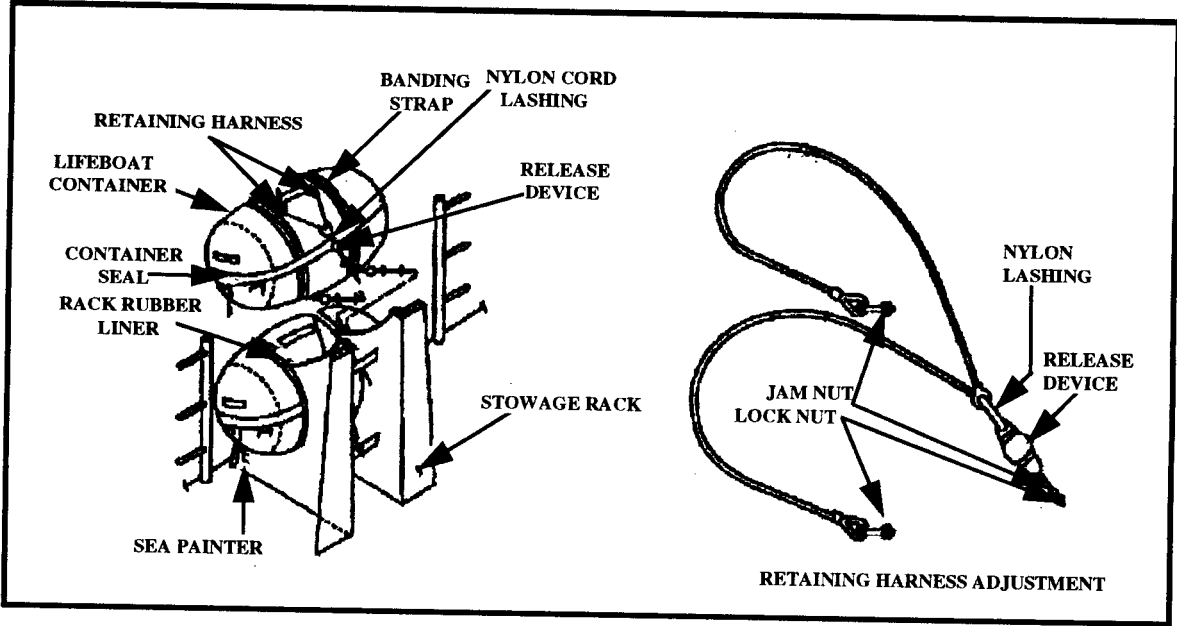


Figure 18-4. Typical stowage / typical retaining harness

## CHAPTER 19

### HYDROSTATIC RELEASE DEVICE

19-1. **GENERAL.** This chapter contains information about the two HRUs used on US watercraft. These units consists of the Navy Can Type hydrostatic release device and the Hammer H20 hydrostatic release device.

19-2. **PURPOSE.** This chapter will discuss the operation and installation of each HRU.

19-3. **NAVY CAN TYPE HYDROSTATIC RELEASE DEVICE.** The following is a description, components, and installation of the Navy Can Type hydrostatic release device (see Figure 19-1, page 19-3).

a. **Description.** This hydrostatic release device (herein called the “CAN”) consists of three components: an aluminum can with a shield, two end brackets, and a hair pin/pull ring release mechanism. The “CAN” has numerous advantages over the old diaphragm type. These advantages include the following:

- This lifetime device does not have an expiration date (which will reduce procurement cost, reduce maintenance, decrease inspection, and have no pressure test requirements).
- Components are replaceable off the shelf.

The thin walled aluminum can is designed to be crushed by the pressure of water at a depth of 25 feet plus or minus 15 feet. The wall thickness of the can is such that it can be damaged during installation or inspection. A stainless steel shield is installed around the “CAN” to prevent this type of inadvertent damage as well as damage from wave slap or gun blast overpressure. The thin walled aluminum can forms a water tight seal that is the heart of the hydrostatic release. It is designed, if the ship sinks, to be crushed by the pressure of water; thus releasing the life raft. Collapsing of the aluminum can will allow the end brackets to release the life raft from its stowage.

#### WARNING

The “CAN” type hydrostatic release device does not require a pressure test. It is designed to collapse by water pressure. Pressure testing will destroy this device.

b. **Manual Release.** A stainless steel hair pin, a pull ring, and a safety sash chain constitute the components that provide for the manual release capabilities of this hydrostatic device. By removing the hair pin, the ring pin can be easily removed with the pull ring. The sash chain connects the hair pin and the pull ring to prevent losing these pieces during scheduled inspection and maintenance.

c. **Installation.** The “CAN” type hydrostatic release device is to be installed with the end bracket having the fixed pin and the pin retained by the bolt and nut attached to the life raft foundation of the vessel. The other end bracket with the fixed pin, the hair pin, and pull ring is

attached to the retaining harness. The open end of the stainless steel shield around the can must face AFT to reduce the amount of water or air being trapped between the shield and the can. The hair pin should be installed in the end bracket facing the direction that would allow for easy removal when manually launching the raft. The retaining harness assembly (including the hydrostatic release device) is torqued between 8- and 10-foot pounds to properly secure the raft in its stowage.

19-4. **HAMMER H20 HYDROSTATIC RELEASE DEVICE.** The following is a description and installation of the hammer H20 hydrostatic release device (see Figure 19-2).

a. **Description.** The Hammer is a disposable, nonserviceable release unit. The Hammer H20 is simple to install and clearly marked with an expiration date (two years from installation). After installation, the unit remains in service without maintenance or service. The Hammer does not rely on the positive buoyancy of the liferaft to operate. It will release at all angles and needs only the required water pressure to activate.

b. **Installation.** The Hammer is simple in design. A loop of line is used to attach the retaining lashing for the raft to its cradle. This cord loop passes through the release mechanism. The glassfiber, reinforced nylon casing accommodates a pressure chamber with a membrane-activated spring loaded blade which cuts the line, releasing the liferaft. The Hammer is designed to release the raft at a depth of 15 feet.

19-5. **PROCUREMENT.** Order the following by NSN or local purchase.

- Can Type Hydrostatic Release (NSN 4220-01-279-7287).
- Hammer H20 Release Unit, MPN 6D887, Part# HA 2000 H, local purchase item.

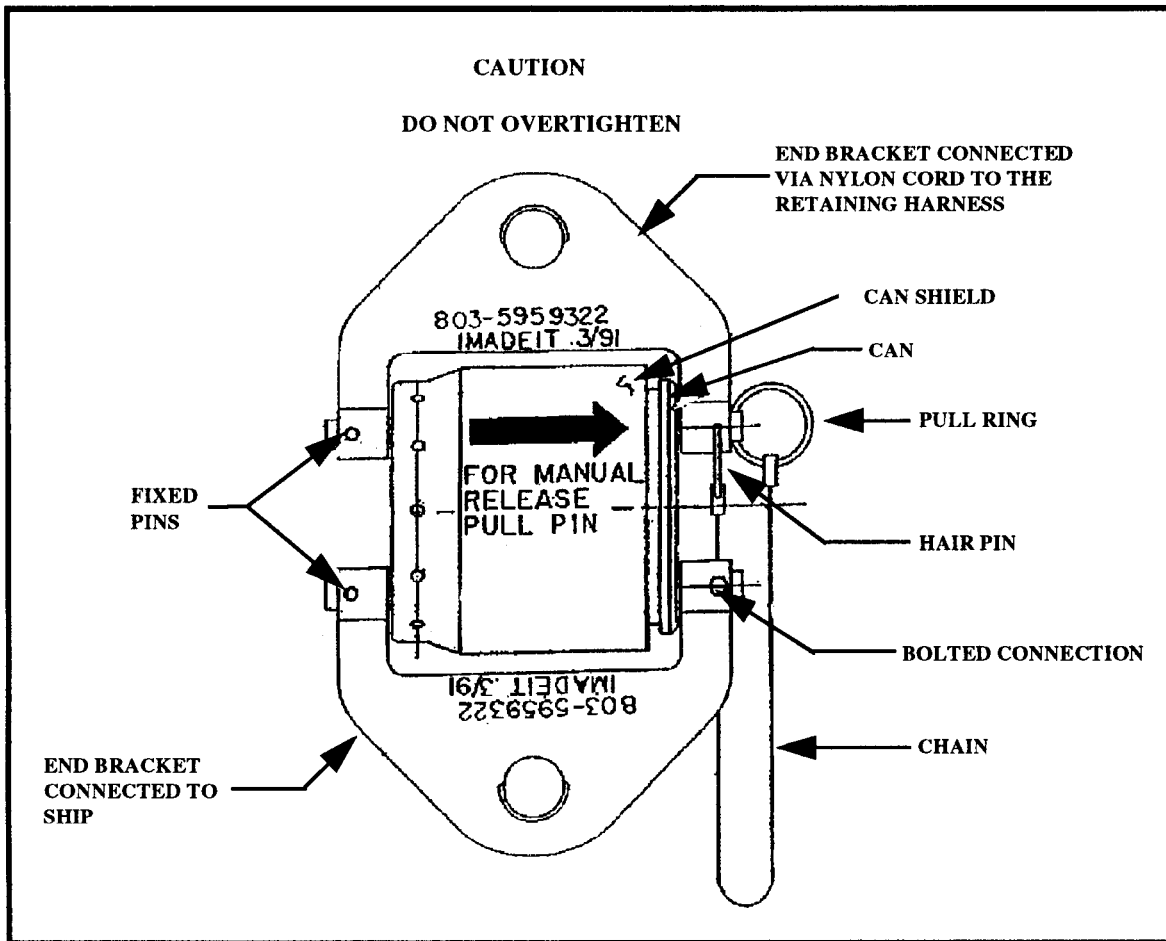


Figure 19-1. New CAN type hydrostatic release device

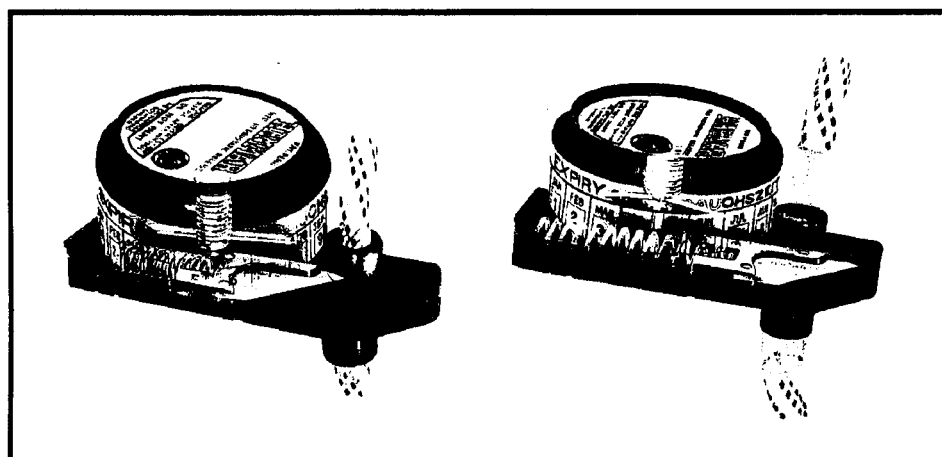


Figure 19-2. Hammer H20 in standby

Hammer H20 activated

## CHAPTER 20

### EYE/FACE WASH STATIONS

20-1. **GENERAL.** This chapter contains information about portable and plumbed eye/face wash stations.

20-2. **PURPOSE.** This chapter will cover the requirements, placement, and necessity for eye/face wash stations.

20-3. **DISCUSSION.** The Code of Federal Regulations (29 CFR 1910.151, paragraph c) states the following: "Where the eyes or body of any person may be exposed to injurious corrosive materials, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use." This requirement is based on the fact that chemical burns of the eyes need **immediate** first aid attention. Any delay in treatment will generally aggravate and intensify the injury.

Initial treatment is actively flushing out the eyes with plenty of water. Irrigation should continue for a period of 20 to 30 minutes. This amount of time is usually adequate for the more serious chemicals. Though the initial flushing of the eyes or face is good, seek medical attention as soon as possible.

20-4. **EYE/FACE WASH STATIONS.** The following units can be located at the eye/wash station.

a. **Plumbed Eye/Face Wash Units.** A plumbed eye/face wash unit (see Figure 20-1, page 20-3) is a permanently installed station that has a continuous supply of water. The supply line for plumbed units will provide an uninterrupted supply of water at approximately 30 psi. When installed, the actuation valve will be operated to determine that both eyes will be washed simultaneously at a velocity low enough not to cause injury to the user. The valve shall be designed so that the water flow remains on without requiring the use of the operator's hands. The valve shall be designed to remain activated until intentionally shut off. The valve should be simple to operate and shall go from "off" to "on" in one second or less. The valve shall be resistant to corrosion from potable water. The valve actuator will be large enough to be easily located and operated by the user. Plumbed eye/face wash units will be activated weekly to flush the line and to verify proper operation.

c. **Portable Eye/Face Wash Units.** Portable eye/face wash fountains (see Figure 20-2, page 20-3) generally are units which work on a gravity-fed system (normally holding 10 to 16 gallons of water). Self-contained units will be constructed of materials that will not corrode in the presence of the flushing fluid. There should be no sharp projections anywhere in the operating area of the unit. Nozzles shall be protected from airborne contaminants. Whatever means is used to afford such protection, its removal shall not require a separate motion by the operator when activating the unit. The unit will also be large enough to provide room to allow the eyelids to be held open with the hands while the eyes are in the stream of water. There is an anti-fungus additive for portable units to extend requirement to refilling situationally according to the manufacturer recommendations.

**NOTE**

Every effort shall be made to install permanent eye/face fountains in all areas requiring an emergency eye/face wash capability.

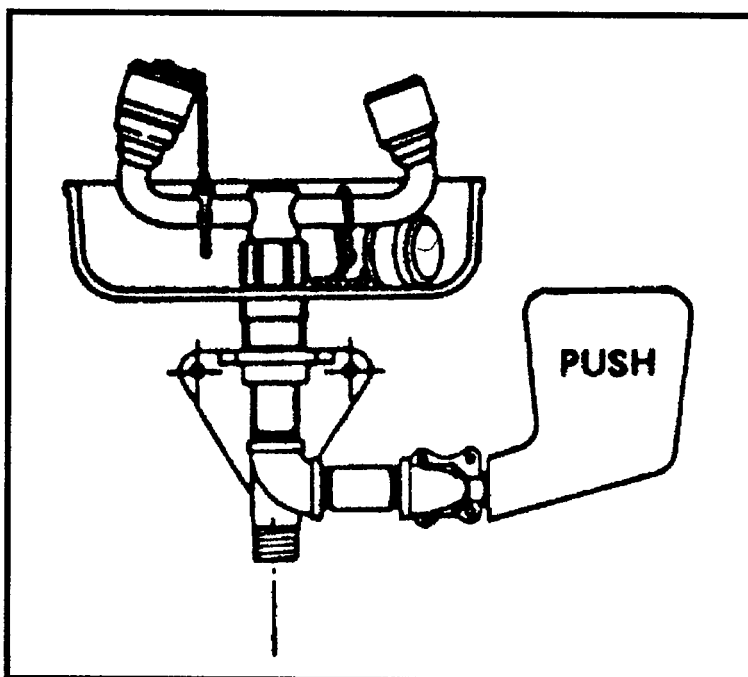
No portable eye/face wash units shall be permitted in areas where a chemical splash hazard exists and where there is a continuous source of clean water available. Portable eye/face wash fountains will be allowed in remote areas when no continuous flow of freshwater is available, when the installation of a fresh water system is not economically feasible, and when the hazard of chemical splash is minimal. The only portable fountain units that will be permitted, are those delivering a flow rate of 1.5 to 2.0 gpm for a minimum of 15 minutes duration, and capable of irrigating both eyes simultaneously.

20-5. **LOCATION.** Eye/face wash units should be in accessible locations that require no more than 10 seconds to reach and should be within a travel distance no greater than 100 feet from the hazard. Specific installation instructions include that the unit be positioned about 45 inches from the floor. Each eye/face wash station shall be identified with a highly visible sign. The area around or behind, or both, the eye/face wash station will be painted a bright color and will be well lighted. If there is a specific working area that is used for only hazardous chemicals, then the wash station would be immediately adjacent to or within 10 feet.

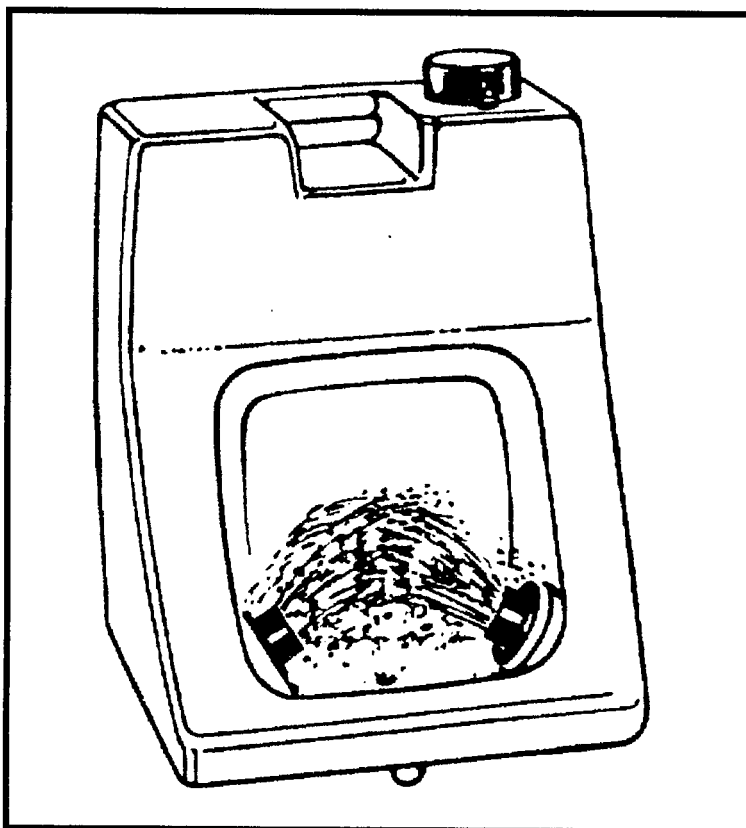
20-6. **TRAINING.** All personnel who might be exposed to chemical splash will be instructed in the proper location and use of emergency eye/face wash stations.

20-7. **PROCUREMENT.** Order the following items by their appropriate NSN.

- Fountain, Eye and Face Wash, portable, gravity-fed, 16 gallon, green plastic (NSN 4240-01-258-1245).
- Fungicide Additive, box of four (NSN 6840-01-267-4346).
- Eyewash Location Sign (NSN 9905-01-345-4521).



*Figure 20-1. Plumbed eyeface wash unit (typical)*



*Figure 20-2. Portable eyeface wash unit*

## CHAPTER 21

### LINE THROWING DEVICE

21-1. **GENERAL.** This chapter contains information about the line throwing device used on US watercraft.

21-2. **PURPOSE.** This chapter will cover the requirement, stowage, and safety precautions pertaining to the throwing device.

21-3. **SHOULDER GUN EQUIPMENT.** The shoulder gun type (herein also called the “appliance”) used onboard US Army watercraft is required by subpart 94.45 of CFR 46 to have the following equipment carried for each shoulder gun:

- Ten service projectiles.
- Twenty-five cartridges.
- Four service lines.
- One cleaning rod with brush, one can of oil, and 12 wiping patches.
- One set of instructions from the manufacturer.
- One auxiliary line that is made of one of the following:
  - Manila and is at least 500 feet long and 3 inches or more in circumference; or
  - A synthetic material and is at least 500 feet long, is certified by the manufacturer to have a minimum breaking strength of 9,000 pounds, and inhibited to resist the effects of ultraviolet rays.

#### NOTE

All equipment, except for the service lines and the auxiliary line, which may be stowed in an accessible location nearby, must be stowed with the appliance in a box or case.

21-4. **DRILLS.** It is the duty of the vessel master to drill his crew in the use of the appliance. He will also require that it to be fired at least once every 3 months. Each drill shall be recorded in the vessel’s official logbook. The service line will not be used for drill purposes. Test firing can be accomplished using the regular cartridge and projectile with any flexible line of proper size and lengths, suitably faked or laid out.

21-5. **ACCESSIBILITY.** The line throwing appliance and its equipment will be kept easily and readily accessible and ready for use. No part of this equipment will be used for any other purpose. When firing the appliance, the operating instructions and safety precautions furnished by the manufacturer shall be followed.

**WARNING**

As with any firearm or firing mechanism, the appliance should be handled with caution and only when its use is required. Misuse of this piece of equipment could cause personal injury or death.

21-6. **PROCUREMENT.** Order the following items by their appropriate NSN.

- Line Throwing Device, 45-70 Cartridge (NSN 1095-00-240-7164).
- Line Throwing Device, .22 caliber (NSN 1095-00-270-6019).

## CHAPTER 22

### SAFETY HARNESS

22-1. **GENERAL.** This chapter contains information about the safety harness, safety lanyard with dyna brake, and the working lanyard. This equipment is authorized for use by US Army watercraft personnel.

22-2. **DESCRIPTION.** The safety harness, safety lanyard with dyna brake, and working lanyard are described below.

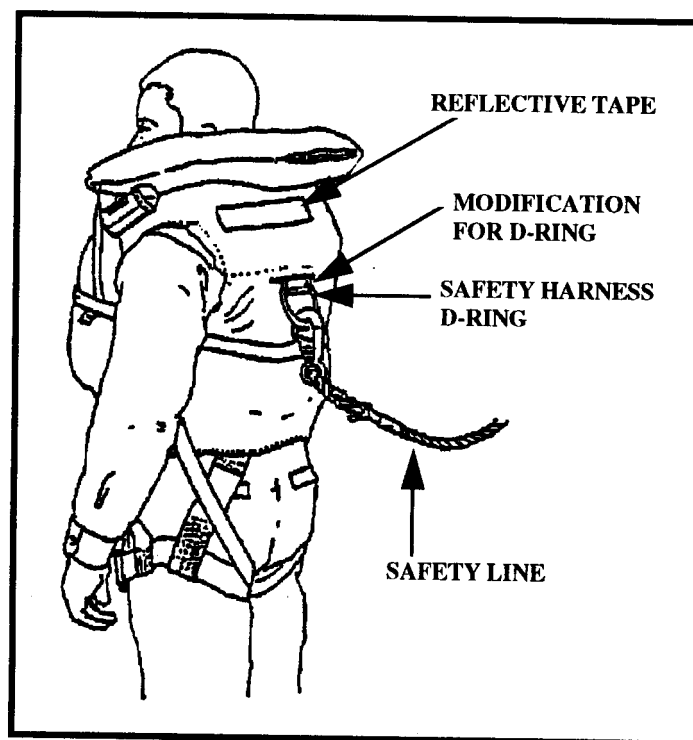
a. **Safety Harness.** The safety harness is a torso harness designed to protect the wearer from injury during a fall. These injuries can occur while working aloft or from being washed overboard while working on deck (either onboard the vessel or causeway sections) in rough seas. The harness can be used with the inherently buoyant life preserver. The vest type with collar, type 1 (also called the kapok) has been modified for the D-ring attached to your safety harness (see Figure 22-1, page 22-2).

b. **Safety Lanyard With Dyna Brake.** This lanyard is specifically designed to be used in conjunction with the safety harness while working aloft or over the side of the vessel. The safety lanyard differs from the working lanyard because of the braking system. In the event of a fall, the dyna brake is designed to soften the shock and help in preventing back injuries (see Figure 22-2, page 22-2).

c. **Working Lanyard.** The working lanyard is also designed to be used with the safety harness. The working lanyard is used primarily as a tending line for personnel working on deck in rough weather or rough seas (see Figure 22-3, page 22-3).

22-3. **PROCUREMENT.** Order the following items by their appropriate NSN.

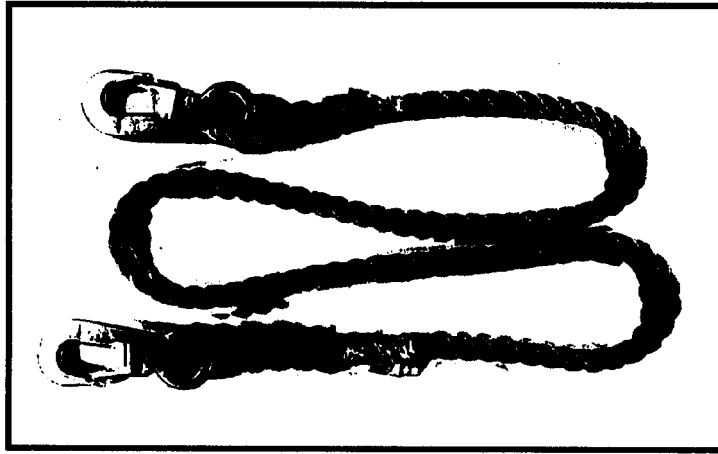
- Harness, Safety (NSN 4240-00-022-2522).
- Lanyard, Safety, with Dyna Brake (NSN 4240-00-022-2521).  
NOTE: Lanyards come with double safety hooks on each end.
- Lanyard, Safety, Working (NSN 4240-00-022-25 18).  
NOTE: Lanyards come with double safety hooks on each ends.



*Figure 22-1. Vest type life preserver used with safety harness*



*Figure 22-2. Safety lanyard with dyna brake*



*Figure 22-3. Working lanyard*

## CHAPTER 23

### SAFETY SHOE

23-1. **GENERAL.** This chapter contains information about the safety shoe. The safety shoe is authorized for wear onboard US Army watercraft.

#### NOTE

Effective 1st Qtr FY 92, CTA 50-900, Clothing and Individual Equipment, was changed to reflect the replacement of the deck and safety shoes used aboard US Army watercraft with the Navy "Molder" deck shoe.

23-2. **SHOES, MOLDER'S.** The only safety shoe authorized for use on US Army watercraft is a black oxford, plain toe, smooth upper leather, full cushion insole, and arch support. It has a neoprene oil-resistant sole and heel, with a nail-less heel construction, steel shank, steel box toe, with Goodyear welt construction.

23-3. **PROCUREMENT.** Order the safety shoe using the following nomenclature and appropriate stock number for the correct size.

- Shoes, Molder's, steel toe, slip-on:

SIZE	STOCK NUMBER	SIZE	STOCK NUMBER
4D	8430-01-112-2872	9 REG	8430-01-174-2422
6D	8430-01-112-2875	9 X-WIDE	8430-01-174-2423
7 REG	8430-01-174-2418	10 REG	8430-01-174-2424
7 X-WIDE	8430-01-174-2419	10 X-WIDE	8430-01-174-2425
8 REG	8430-01-174-2420	11 REG	8430-01-174-2426
8 X-WIDE	8430-01-174-2421	11 X-WIDE	8430-01-174-2427

## CHAPTER 24

## HEAVING/SAFETY LINE

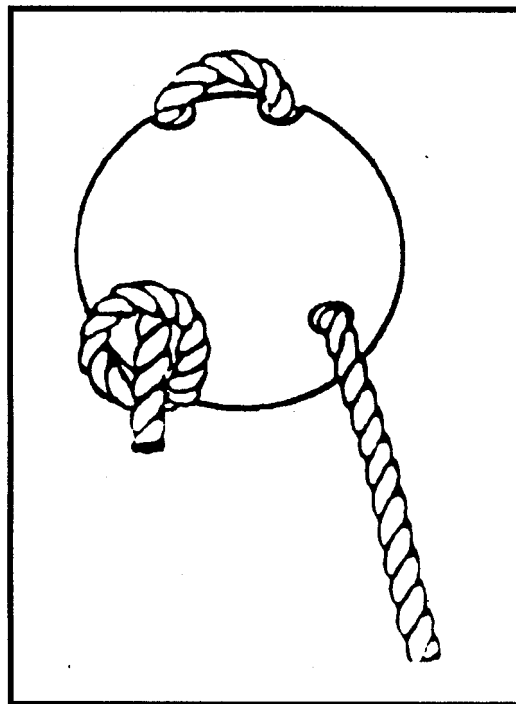
24-1. **GENERAL.** This chapter contains information about the heaving/safety line. The heaving/safety line is authorized aboard US Army watercraft. The heaving/safety line is a two-part item. One part is the weighted ball and the other part is the line itself (see Figure 24-1).

24-2. **DESCRIPTION.** The weighted ball and the line are described below.

a. **Ball, Heaving Line.** The ball is fluorescent orange in color and is approximately 4 1/4 inches in diameter. The ball weighs approximately 10 ounces with a 1/4-inch wall thickness. The ball has two 1/2-inch holes in diameter going through the center which is injection molded airtight into the ball on 1 1/2-inch centers (see Figure 24-1). It is extremely strong and durable and soft to the touch as not to harm anyone while being thrown. It will float with approximately 60 percent of its body out of water.

b. **Line, Heaving/Safety.** The line is made of polypropylene materials with ultraviolet additives. It is called 3/8-inch dual braid, and is woven with an inner and outer core and an outer braid to prevent tangling. The line is soft to the touch, but very strong with an approximately 1500# breaking strength and is 100 percent floatable. The ball maybe used as a fender for small boats. It can also be used to retrieve a person from overboard by sliding the line through the holes in the ball to make a loop.

24-3. **PROCUREMENT.** Order the heaving/safety line by the following: line, heaving/safety, with ball, 100-foot (NSN 4020-01-344-0552).



*Figure 24-1. Heaving/safety line ball*

## CHAPTER 25

## NEIL ROBERTSON STRETCHER

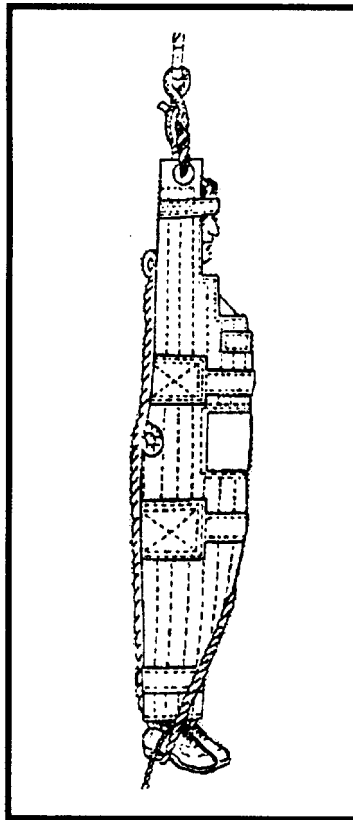
25-1. **GENERAL.** This chapter contains information about the Neil Robertson stretcher. This stretcher is authorized for use on US Army watercraft.

25-2. **PURPOSE.** This stretcher is designed for removing an injured person from engine room spaces, holds, and other compartments. This stretcher is used where access hatches are too small to permit the use of regular stretchers or litters.

25-3. **DESCRIPTION.** The Neil Robertson stretcher is made of semirigid canvas. When firmly wrapped (mummy-fashion) around the victim, it gives sufficient support so the victim may be lifted vertically (see Figure 25-1). To keep the injured person from swaying against bulkheads and hatchways while being lifted, a guideline is tied to the victim's ankles.

25-4. **STOWAGE.** Stretchers of this type should be kept onboard in appropriate places ready for use. If a Neil Robertson stretcher is not available when needed, a piece of heavy canvas, wrapped firmly around the victim, will serve somewhat the same purpose.

25-5. **PROCUREMENT.** Order the stretcher by the following: Stretcher, Neil Robertson (NSN 6530-00-783-7600).



*Figure 25-1. Neil Robertson stretcher*

## CHAPTER 26

### EMERGENCY ESCAPE BREATHING DEVICE

26-1. **GENERAL.** This chapter contains information about the Scott EEBD. This device is authorized for use onboard US Army watercraft.

#### WARNING

The EEBD is not to be confused as a fire fighting device, such as the OBA. It is to be strictly used as an emergency escape device. Improper use of this equipment may result in injury or death. Personnel should receive adequate training prior to use, including the limitations to which the equipment is subject. Personnel are reminded that there is no substitute for alertness, common sense, and self-discipline.

26-2. **DESCRIPTION.** The EEBD is a self-contained, hooded, emergency breathing device (see Figure 26-1, page 26-2) used for escape from compartments contaminated by smoke, fluorocarbon refrigerants, or other atmospheric toxic gases. The EEBD will also provide oxygen to trapped personnel awaiting rescue in contaminated atmospheres. It will also enable the wearer to escape to the weather deck of Army watercraft. The EEBD consists of a hood and a life support pack. The hood is made of a flame resistant material and a clear window for viewing. The life support pack consists of the following:

- An oxygen source in the form of a solid chemical generator which produces oxygen.
- A mechanical chemical scrubber for the removal of carbon dioxide and water vapor from the system gases.
- A venturi flow tube which acts as a pump to recirculate the gases through the closed circuit loop.

The system maintains a positive pressure inside the hood to prevent smoke and toxic gases from entering. The EEBD will operate for 15 minutes after being activated and has a shelf life of 15 years from the date of manufacture. There is a view port in the stowage case for observing a humidity indicator and the date of manufacture. If the humidity indicator has changed color from blue to clear or pink, or if the date of manufacture has expired, replace the EEBD.

26-3. **STOWAGE.** The EEBD is packaged in a vacuum sealed plastic bag and then placed in an orange, plastic stowage case. The EEBD is stowed in non-shock rated cabinets. Lead wire seals or other easily opened tamper guards may be used on the cabinets for identifying any tampering. There is also a small tamper sticker on the orange plastic case. The purpose of this sticker is to ensure that the plastic case has not been opened.

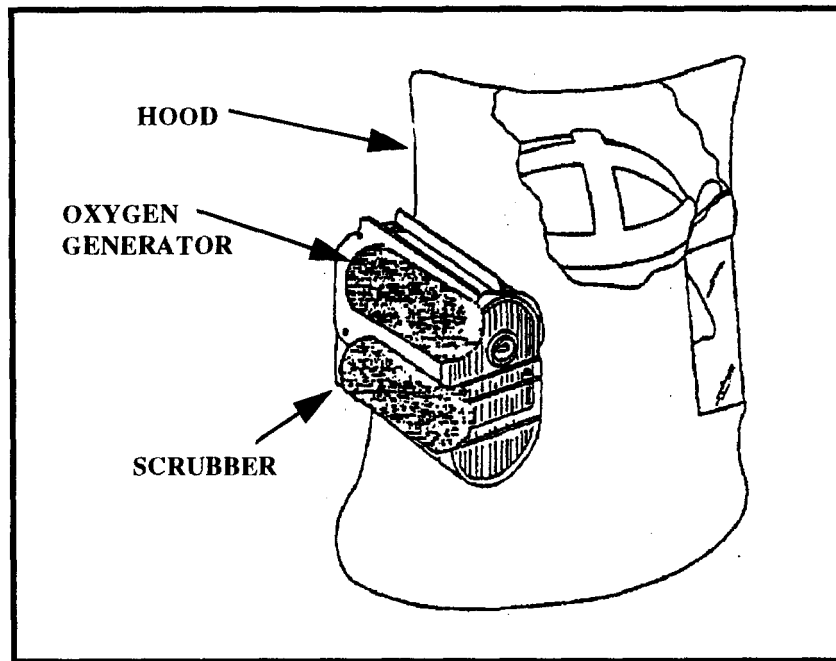


Figure 26-1. Emergency breathing device (fully donned)

**26-4. OPERATING PROCEDURES.** The following instructions will enable users to familiarize themselves with those procedures which are necessary to operate the escape device in actual in-service conditions. These instructions will also describe the capabilities and limitations of the equipment in so far as the user is concerned.

a. **Removal From Bag.** After removing the escape device from its storage container, grasp the device in one hand and the red tear strip with the other. Pull the tear strip until it is separated from the remainder of the bag and remove the device (see Figure 26-2, page 26-4).

b. **Actuating the Device.** Insert a finger into the ring with the red marker tab marked "PULL TO ACTUATE". Pull hard in the direction shown in Figure 26-3, page 26-4. The ring must separate from the device while making a "snap" sound. A slight hissing sound will be heard, indicating the escape device is working.

c. **Donning the Device.** The donning of the EEBD is quick and simple (see Figure 26-4, page 26-5). This makes it suitable for situations where there is little time to seek safety from contaminated atmospheres. To don the EEBD perform the following:

- Bend slightly from the waist.
- Insert the thumbs inside the neck seal and exert an outward pull to spread the seal.
- Bring the escape device up to the face while still bending over and place the chin into the opening of the neck seal.
- Pull the device up and over the head.
- Stand upright and pull down on the hood so that the retaining straps inside the hood create a snug fit around the top of the head.

Be sure the neck seal is in contact with the neck with no clothing or hair creating a gap so as to admit the outside atmosphere. Proceed via the nearest exit way to the crafts weather deck.

**NOTE**

Personnel wearing eyeglasses may find it easier to put the escape device on in an upright position, placing the chin in the hole and stretching it up and over the head.

**d. Removal and Disposal.** After reaching a safe outside atmosphere, grasp the escape device by the upper edge of the hood and pull forward, over the front of the head and off. Discard the escape device. Disposal of an escape device which is still hot or generating oxygen should be in an area free of fire hazards.

**WARNINGS**

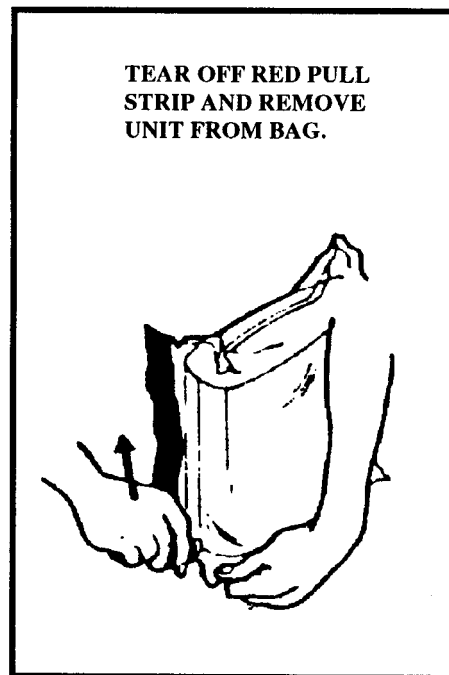
Due to the oxygen saturation of the hair, do not smoke or become exposed to fire or flames for several minutes after removing the escape device.

Once the escape device has been initiated, it cannot be turned off. As soon as the oxygen generator has been expended, the flow will automatically cease. When the hissing sound stops, the oxygen flow has stopped. If this occurs while the user is still in an undesirable atmosphere, the user should immediately put on a new device. Remember, the expended one is not producing oxygen and the wearer will suffocate if not removed.

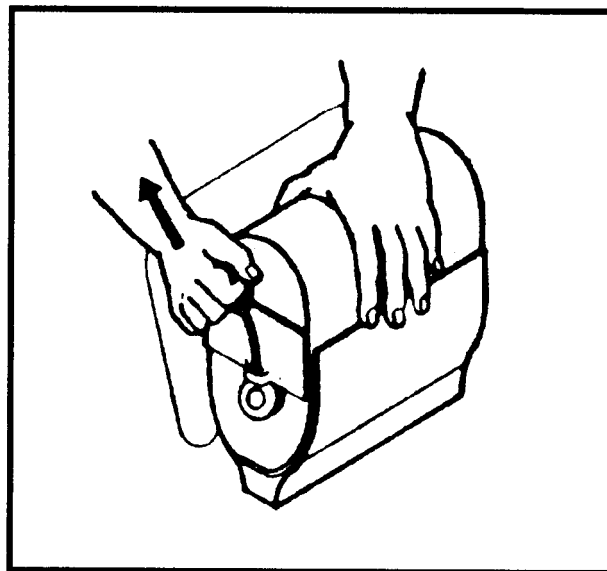
**26-5. MAINTENANCE.** No scheduled maintenance is required to be followed in order to ensure the escape device will operate when the pin is pulled. However, visually inspect the device monthly. Perform the following to conduct scheduled maintenance.

- Check integrity of tamper seal. If broken, open the storage container and check integrity of vacuum in barrier envelope. Also check that the humidity indicator has not changed from blue in color to clear or pink.
- If tamper seal is broken, check humidity indicator through the round window in the storage container to verify it has not changed from blue to clear or pink.

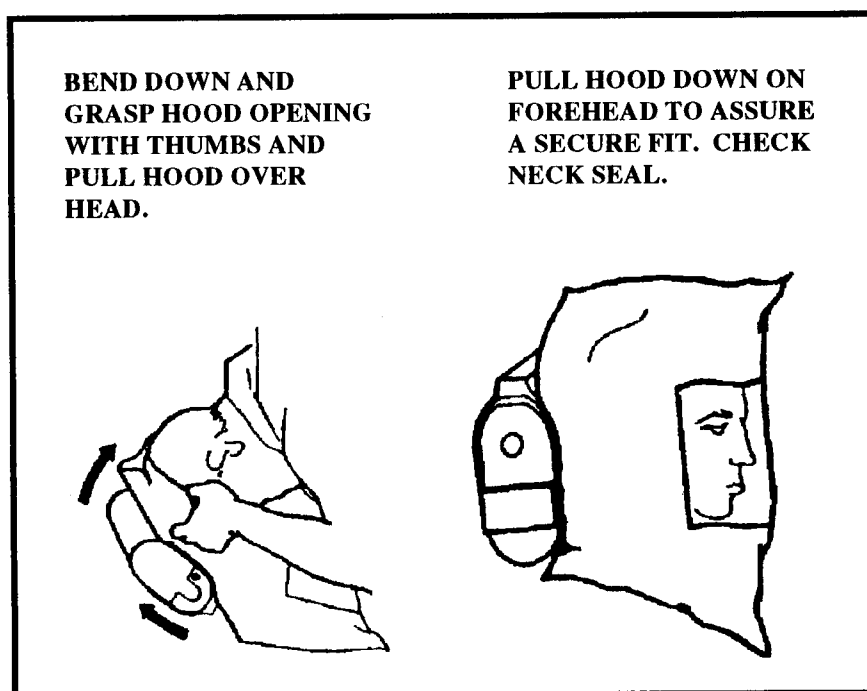
**26-6. TRAINING EEBD.** The training EEBD is a nonfunctional copy of the operational EEBD. This unit is labeled as a training unit and contained in a blue rather than orange plastic case. Stow and lock up the training EEBDs away from the operational units. This is to avoid mistakenly using a training unit during an emergency when darkness or smoke prevents seeing the labels or different color. The training unit allows personnel to remain proficient in the use of the EEBD without expending an actual EEBD unit.



*Figure 26-2. Removing unit from bag*



*Figure 26-3. Pull actuating ring to activate*



*Figure 26-4. Fully donning the EEBD*

26-7. **PROCUREMENT.** Order the following by their appropriate NSN.

- Emergency Escape Breathing Device (NSN 4240-01-116-9888, Cage Code 53655).
- Emergency Escape Breathing Device (training) (NSN 4240-01-116-9889, Cage Code 53655).
- Stowage Cabinet, Non-shock Rated (NSN 2040-01-162-3206).
- Tamper Seal Sticker (NSN 4240-01-159-1986).

**WARNING**

The EEBD has no replacement parts. It is a one-time use throw away device.

The EEBD training unit has several replacement parts, so it may be used over and over. These parts, with their NSN or part number, include the following:

- Neck Seal (NSN 4240-01-152-8776).
- Lanyard (NSN 4240-01-152-8777).
- Stowage Bag (NSN 4240-01-152-8778).
- Case Assembly (Part number 802397 -03).\*
- Tool, Reset (Part number 10005595 ).\*

\*Order part number items from: Scott Aviation, A Figgie International Company, 225 Erie Street, Lancaster, New York 14086; Telephone: (716) 686-1668.

NOTE

The replacement training unit stowage bag is equipped with drawstrings rather than a tear strip.

26-8. **DISPOSAL.** Dispose of unusable EEBDs by activating in a clean and well ventilated area, Wait until hissing noise has stopped (approximately 15 minutes). Let the EEBD cool, then follow standard procedures for disposing of similar sized solid waste. If the device does not activate for 15 minutes, totally immerse the device in a container of fresh water, then discard.

NOTE

EEBD cantsters must be disposed of IAW HAZMAT/ Environmental SOP.

## CHAPTER 27

## BURN DRESSING "WATER-JEL"

27-1. **GENERAL.** This chapter contains information on the newly federal authorized first aid bum dressing (see Figure 27-1, page 27-3). Throughout this chapter the bum dressing will be called or referred to by its commercial name "Water-Jel".

27-2. **DISCUSSION.** Water-Jel is a unique multi-use product for emergency bum care and fire protection. This patented product is designed to help save lives, increase the relief of pain and suffering, and reduce tissue damage caused by bums. Water-Jel products have been adopted into the Federal Supply System by the Defense Medical Standardization Board and approved for sale by the US Food and Drug Administration.

Water-Jel is a one-step system that combines a scientifically formulated gel and a special carrier material. The gel is biodegradable, bacteriostatic, and water soluble. Water-Jel can be carried anywhere. When placed on the bum victim, it extinguishes the flames and immediately lowers and stabilizes skin temperature, helping to ease the pain and calm the victim. Because the product is bacteriostatic, the covered wound is protected from further contamination.

In addition to providing essential burn care, Water-Jel performs other lifesaving tasks. The product is water soluble, making removal of burnt clothing and jewelry easier. Water-Jel may also be used by a rescuer to shield himself and the victim from the intense heat and flames of a fire. In its larger sizes, Water-Jel maybe used to extinguish a small tire and help provide a means of escape from larger fires.

Water-Jel comes in a variety of sizes from an 8-foot X 6-foot fire blanket to a 4-inch X 4-inch sterile bum dressing. The convenient packet or containers can be easily carried in all types of vessels and vehicles. They can also be stored in areas that are readily accessible to rescuers or bum victims.

27-3. **PROCUREMENT.** The US Army Watercraft Safety Office has developed and added the "Water-Jel" bum dressing kit to the vessels BII. The Water-Jel Kit is not available through the supply system and must be bought through open purchase. Local purchase can be made from the following:

H and H Associates, Incorporated  
P.O. Box 189  
Bena, VA 23018

The kit includes the following (see also Bum Dressing “Wet Jel” in the Appendix):

QUANTITY	UI	DIMENSIONS	TYPE
2	each	8” x 18”	Dressing
1	each	4” x 16”	Dressing
4	each	4” x 4”	Dressing
1	each	12” x 16”	Dressing
1	each	Burn-Jel Kit	Topical Dress
1	each	72” x 60”	Blankets
1	each	VCR Tape	Informational

Water-Jel maybe purchased through the supply system in bulk. The following stock numbers are available:

- Water-Jel Fire Blanket, 6’ x 5’, Four (4) per carton (NSN 65 10-01-242-2271).
- Water-Jel Bum Wrap, 3’ x 2 1/2’, Four (4) per carton (NSN 65 10-01-285-0799).
- Water-Jel Mini-wrap, 8” x 18”, Twenty (20) per carton (NSN 6510-01-239-9781).
- Water-Jel “Sterile” Bum Dressings, 4” x 4”, Sixty (60) per carton (NSN 6510-01-243-5897).
- Water-Jel “Sterile” Bum Dressings, 2” x 6” Sixty (60) per carton (NSN 6510-01-243-5896).
- Water-Jel “Sterile” Bum Dressings, 4” x 16”, Twenty-eight (28) per carton (NSN 6510-01-243-5894).

**27-4. TECHNICAL SPECIFICATIONS.** The following describes the technical aspects of Water-Jel.

- |                          |                        |
|--------------------------|------------------------|
| • Appearance             | Off White Translucent  |
| • Odor                   | Characteristic Menthol |
| • Environmental concerns | Biodegradable          |

**27-5. EXPIRATION DATES.** Bum dressings sealed in a foil package expire three years from the date of manufacture. The manufacture date is part of the lot number stamped into the edge of the package. Bum blankets and wraps in containers expire five years from the date of manufacture. The manufacture date is part of the lot number located on a white sticker fastened to the container. Lot numbers read: DAY/MONTH/YEAR.



*Figure 27-1. Containerized water-jel kits*

## CHAPTER 28

### FIRST AID KITS

28-1. **GENERAL.** This chapter contains information on first aid kits located on US Army watercraft.

28-2. **DISCUSSION.** First aid kits on Army watercraft come in several sizes pertaining to the application that they will be used. The three first aid kits listed in the Appendix are the only ones currently used aboard Army vessels.

First aid kits should be strategically placed upon the vessels that would render them most effective in case of an emergency. Before placing kits into service, they must be inspected and inventoried. The inventory checklist will be posted on the outside of the kit annotating all items that have an specific shelf life, along with the expiration date of that item. The kits should also be sealed with some type of tamper seal, but not to hinder the entry by persons in need. The kit must have an inventory conducted (at a minimum) once a year.

## CHAPTER 29

### FIRE FIGHTING

**29-1. EXTREME HEAT.** Unless removed, the heat released by a fire will raise the temperature of a compartment. Even protected firefighters will be driven from the ovenlike temperatures common to fires in enclosed spaces. As flammable materials are heated, they pyrolyze or give off combustible gases. When the self-ignition temperature of these gases is reached, the entire compartment quickly becomes engulfed in flame. This condition is known as flashover. The firefighter can use several techniques to remove heat. Cutting a hole in the bulkhead, at least one foot square, allows the hot air to escape. For best results, this hole should be in the uppermost portion of a compartment. A fire may burn its own hole through aluminum bombs and missiles creating their own vent paths. A continuous thin film of water running across a deck or down a vertical bulkhead will carry away virtually all the heat. A water spray introduced into a fire space will also cool the compartment effectively. Overhead sprinklers, if installed, are ideal for cooling.

**29-2. COMMUNICATION.** Members of the fire party give information to each other by normal voice communications. Voice amplifiers, if available, are provided to personnel on the fire fighting team. A voice amplifier is a device which attaches to a firefighter's OBA mask and projects his voice. This allows him to communicate easier with other personnel. Without a voice amplifier, a firefighter wearing an OBA must shout in order to be heard through his face mask. The scene leader uses the ship's telephone, sound powered telephone, or WIFCOM to pass information to the repair party officer. The limitations of radio equipment used in fighting major fires must be realized and accounted for and brought to the scene. The radio should be in a pocket of the firefighter's ensemble to protect it from high heat. High heat, in time, can cause a frequency shift in the unit. The WIFCOM radio will normally return to normal operation when cooled.

**29-3. FIRE SCENARIOS.** The following discusses special hazards for fire fighting in shipboard galley spaces. It also includes some useful techniques for fighting fires in these type of spaces.

**29-4. DEEP FAT FRYER FIRE.** Fires in deep fat fryers generally result from overheating of cooking oils and fats. Fires involving cooking oils and fats are class B fires. Most fires occur when personnel fail to remain at the units when operating or failing to properly secure the units after use. Factors contributing to the intensity and spread of the fires include the following:

- Delayed discovery of fire.
- Grease laden ducts and hoods.
- Splashing and overflow of burning fat by solid stream hoselines or portable extinguishers discharged directly onto the fat liquid surface.

Each galley should be provided with a Fixed Fire Suppression System, a 10-pound extinguisher, and at least one 4-foot, low velocity, water fog applicator. In the event of a fire in the fryer, sound the alarm and actuate the system and ensure that power to the fryer is secured. Concurrently, as time and personnel permit, and if accessible, close the damper in the galley exhaust by operating the damper control on the grease interceptor hood. A backup method for extinguishing deep fat fryer fires is to use the following procedure, which requires at least three men if the oil has ignited.

At first sign of overheating (white smoke), shut off fryer and place cover securely on the fryer. Leave the cover on the fryer for at least 5 minutes. This will allow the hot oil to cool down enough to prevent it from igniting. Perform the following if oil has ignited:

- Sound the alarm, secure power to fryer, and deploy a portable extinguisher to the scene.
- Play out a 1 1/2-inch hoseline with a Navy All Purpose Nozzle with a 4-foot low velocity fog applicator attached. Apply low velocity fog to the fire while simultaneously discharging the portable fire extinguisher for 3 seconds.
- Look to be sure the fire is out.
- If the oil reignites, again apply extinguisher and low velocity water fog for approximately 3 seconds. **THE POWER TO THE FRYER MUST BE OFF TO ALLOW COOLING AND PREVENT REIGNITION.**
- Check exhaust ductwork and adjacent compartments for signs of burning and initiate fire fighting in these areas if necessary.

**29-5. FIRE DRILLS AND TRAINING.** The following describes fire drills and the training associated with fire drills.

a. **Importance.** The best organization and equipment is useless without trained personnel. Properly drilled crew men will lessen confusion during fires, increase the probability of proper initial actions taken against a fire, and enhance the predictability of fire fighting responses and uses. Vital to the effort, however, is continuity of personnel. That is, people assigned to the fire fighting party should retain that position even if other shipboard duties change. All members of a fire party should be cross trained for at least one other position on the fire party in order to provide frequent rotation. Ideally, everyone on the ship should be training to serve on a fire party since they may be needed to fight a major fire or conflagration.

**NOTE**

It is also important to use the drill as a vehicle to test, inspect, and repair all fire fighting equipment.

b. **Required Features.** Effective fire drills do not happen automatically. Careless effort will result in useless drills which do not improve the crew's capability or even bad drills which train poor habits. Each fire drill should include training elements which touch on all phases of fire fighting. Also, fire drills to provide training in combatting a deep fat fryer fire are needed. These drills will ensure personnel know how and when to secure the fryer and extinguish the fire. As a fire fighting party improves, realism can be incorporated. Time compression is the most important feature to incorporate. A fire can grow from a tiny flicker to a life threatening blaze in a few minutes. Every delay in detection, notification, fire fighting, and space isolation could cost a life or another burned out compartment. Drills must be practiced at real time speed. This creates two important conditions: the urgency of the situation and the inevitable problems with donning personnel protection. Training in the use of EEBDs should be emphasized. Quickly donning the EEBD while on the run should be stressed as a way of saving time and improving the chances of survival when escaping a fire or smoke-filled space. The effects of smoke must also be included.

These effects include the loss of visibility, loss of staging areas, loss of equipment in lockers which cannot be reached, and the extra confusion caused by all the above. Cascading casualties are also common in fires, as a fire spreads or damages vital services. Realistic, effective drills shall include these effects. Machinery space fires can grow out of control in seconds. For this reason, abandon the space evacuation drills should be conducted. Such drills should emphasize the need to exit using the nearest access or escape trunk on each level and the need to don an EEBD on the run, on the way out.

c. **Critique.** Critiques after every fire drill will help ensure that the maximum learning takes place. They should examine the underlying causes for successful or failed drills. They should include a thorough discussion of the rationale for each decision made on attack points, ventilation, and so on. This is the perfect time to review the results of fire fighting equipment performance/accountability and plan any repair/procurement.

#### **29-6. MACHINERY SPACE FIRE FIGHTING DOCTRINE FOR CLASS B FIRES IN ARMY VESSELS.** The following discusses machinery space fire fighting.

a. **Damage Control/Central Control Station, Pilot-house, and Each Machinery Space.** There can be no substitute for prudent, common sense, on-the-scene decisions which may dictate variations to this guidance. Restricted maneuverability may require departure from this guidance.

b. **Purpose.** The purpose of this doctrine is to provide Army guidance for machinery space class B fire fighting procedures. It also clarifies the role that various fire fighting systems may play in such a fire. This doctrine delineates the training philosophy and procedures associated with the use and operation of ship systems in combatting machinery space fires.

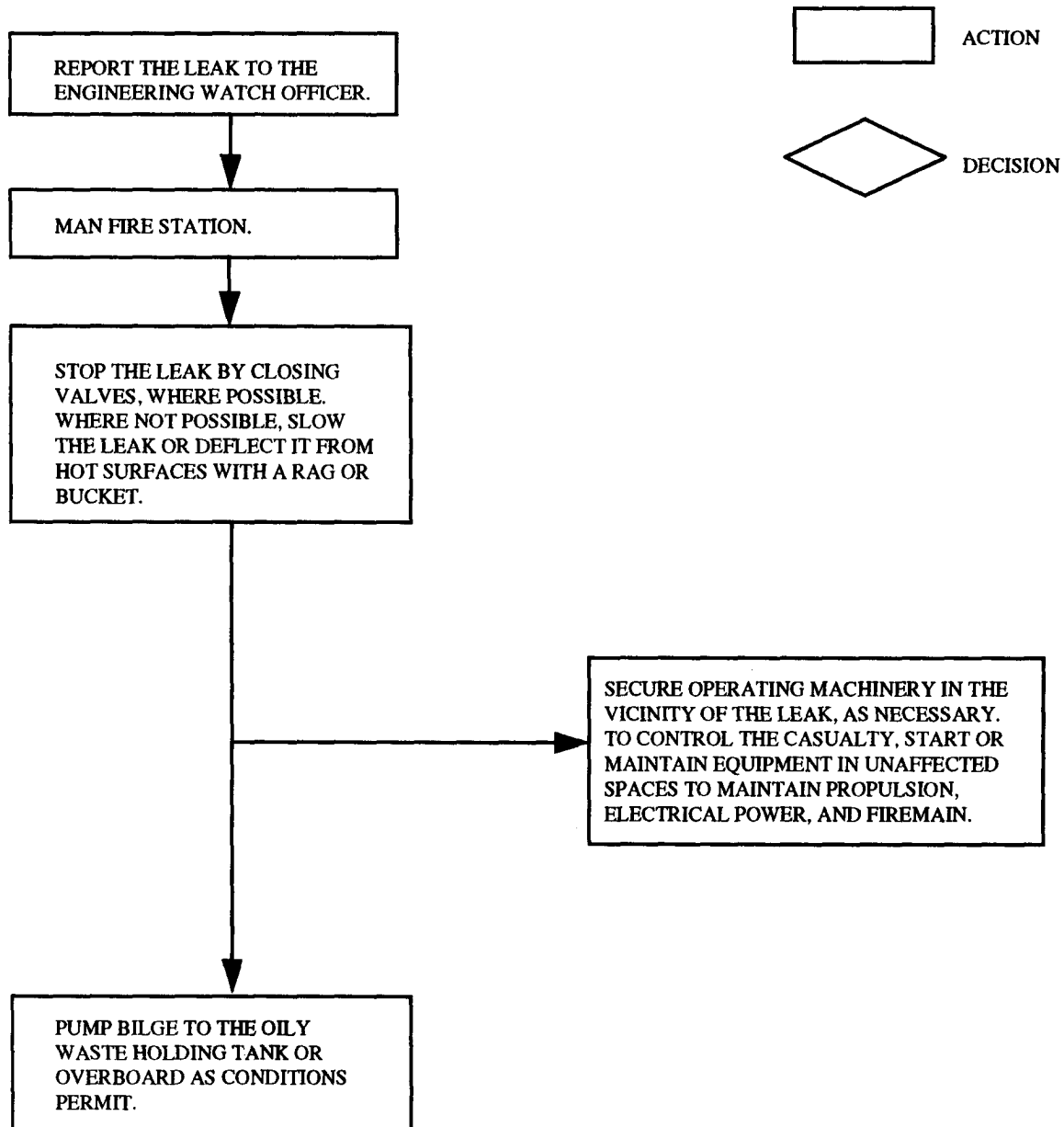
c. **Flow Charts.** The flow charts (see Figure 29-1, pages 29-4 through 29-12) traces the steps associated with procedures in the doctrine. The flow charts show the preferred sequence of events and are not intended to prevent use of alternatives when appropriate.

**29-7. INTRODUCTION.** This doctrine is structured to provide a basis for the proper actions and decisions regarding a machinery space fire and will discuss the following:

- Fire prevention.
- Fire fighting systems capabilities and limitations.
- Considerations necessary in choosing the correct fire fighting equipment.
- Actions necessary both internal and external to the affected space in the case of a major oil leak, a class B fire, and a fire which grows out of control.

It is presented in a manner to allow a ship's force to properly identify the phase of a machinery space fire and how best to deal with it. This doctrine also defines personnel responsibilities and scenarios that can easily be developed for use in individual machinery space fire doctrines on most ships, but will not be applicable in every case. The ship's machinery space fire fighting doctrine and associated equipment isolation and controls lists shall be readily available in Damage Control.

## MAJOR OIL LEAK

*Figure 29-1. Procedures in a class bravo fire (sheet 1 of 9)*

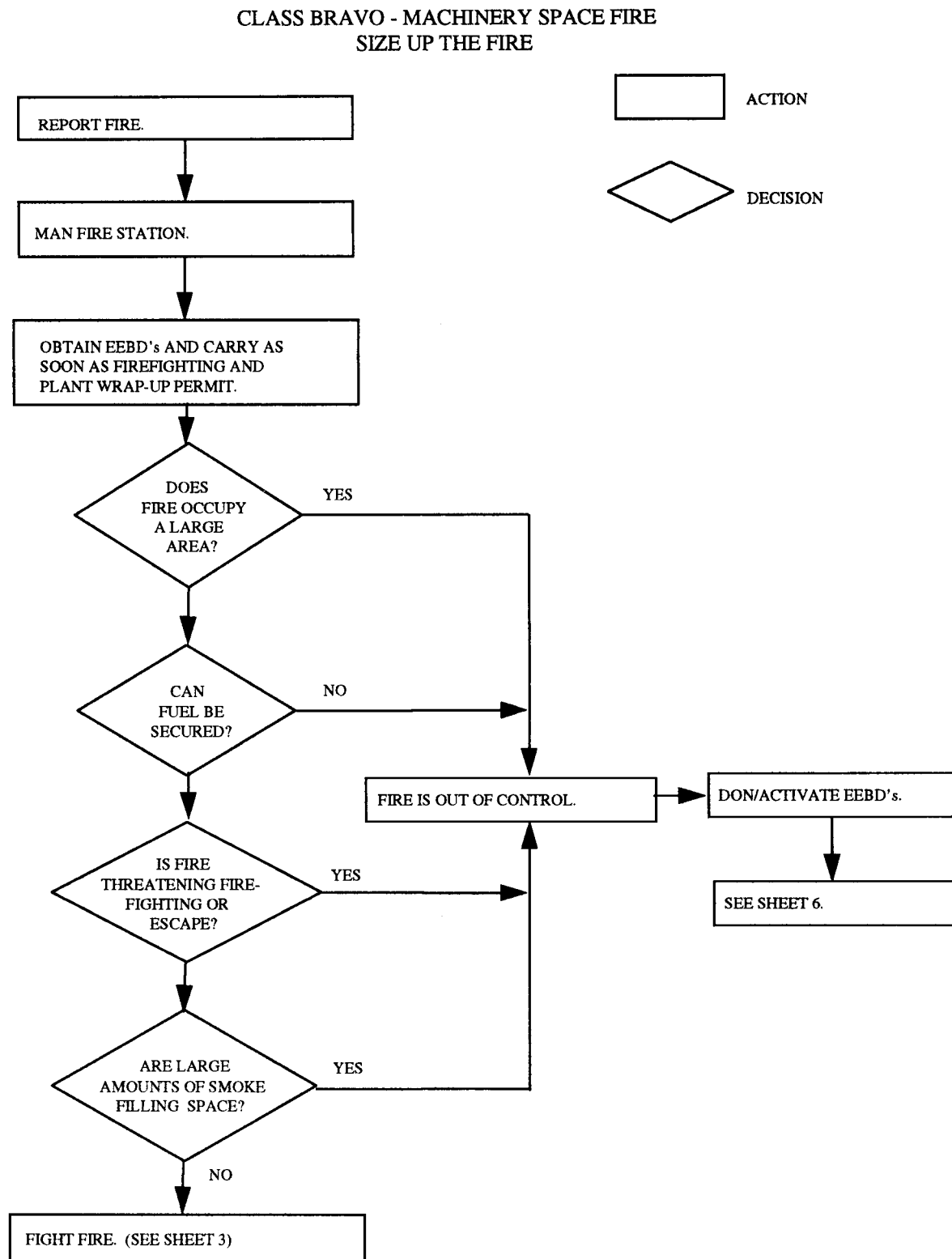


Figure 29-1. Procedures in a class bravo fire (sheet 2 of 9)

CLASS BRAVO - MACHINERY SPACE FIRE  
FIRE IS LOCALIZED

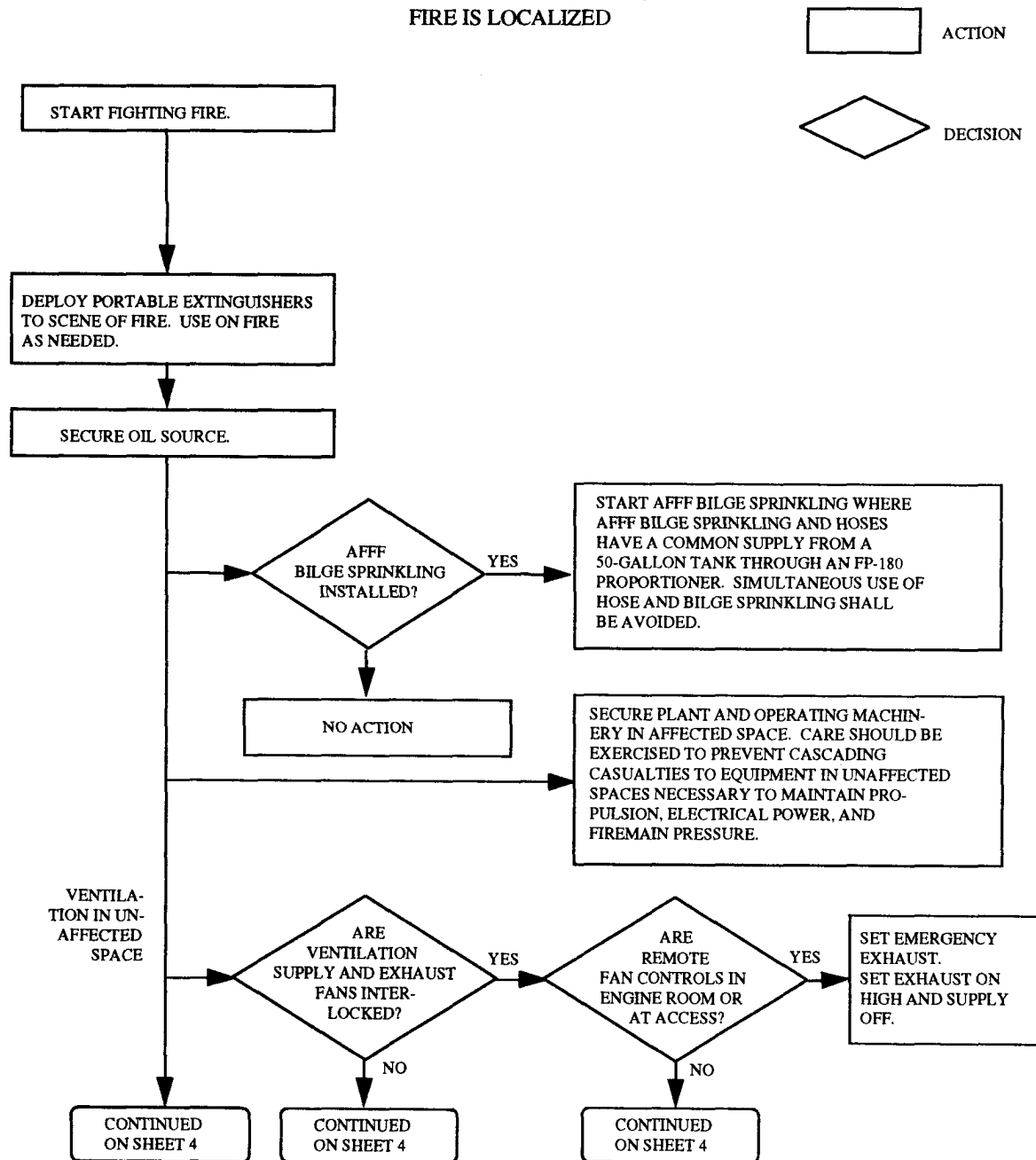


Figure 29-1. Procedures in a class bravo fire (sheet 3 of 9)

CLASS BRAVO - MACHINERY SPACE FIRE  
FIRE IS LOCALIZED (CONTINUED)

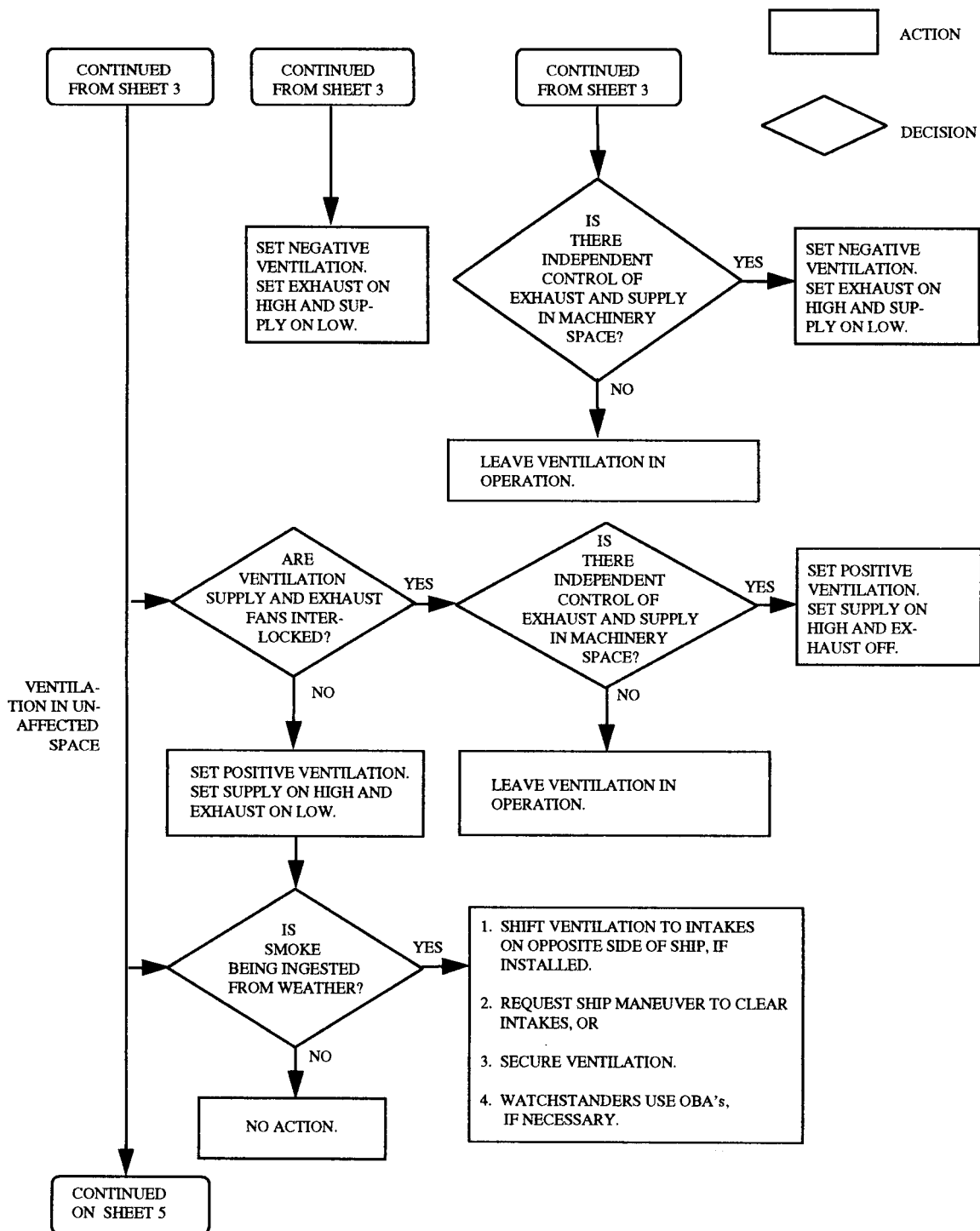


Figure 29-1. Procedures in a class bravo fire (sheet 4 of 9)

CLASS BRAVO - MACHINERY SPACE FIRE  
FIRE IS LOCALIZED (CONTINUED)

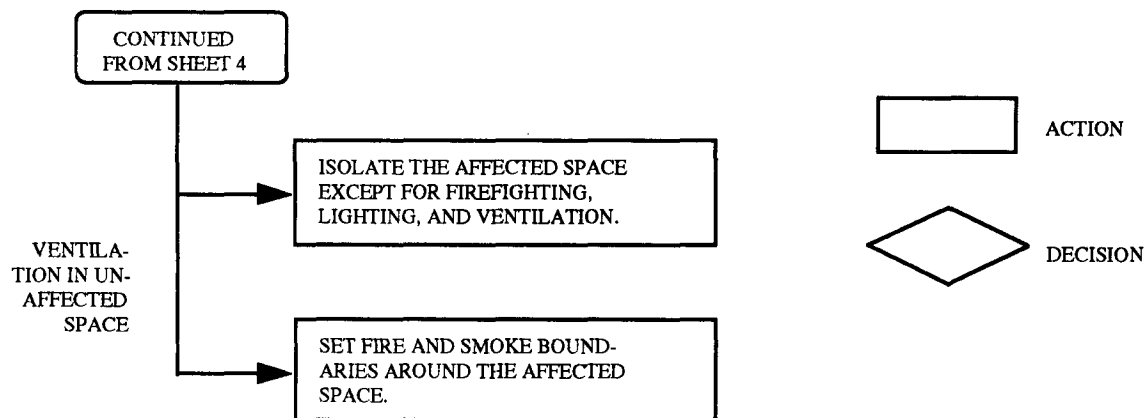
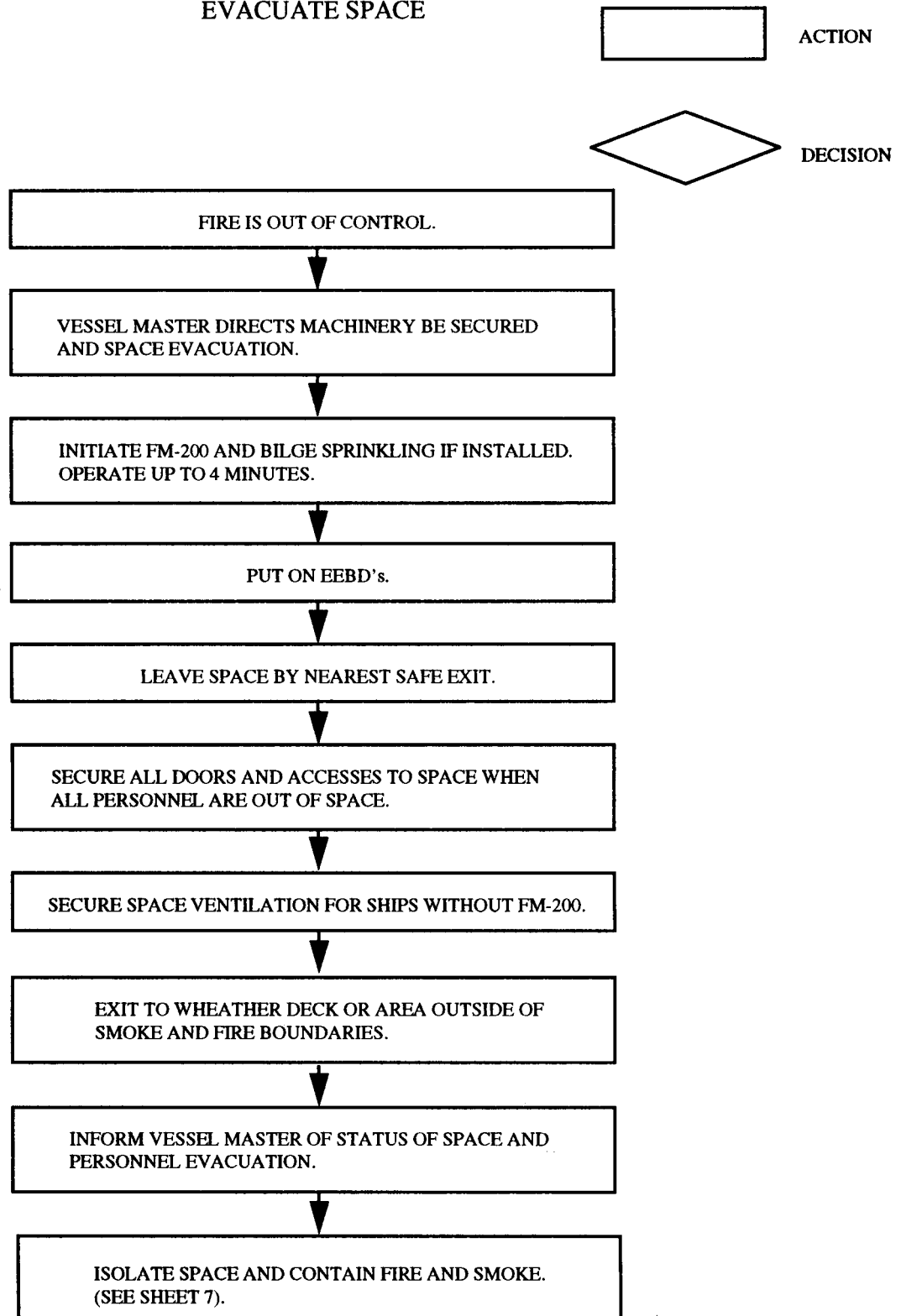


Figure 29-1. Procedures in a class bravo fire (sheet 5 of 9)

CLASS BRAVO - MACHINERY SPACE FIRE  
EVACUATE SPACE*Figure 29-1. Procedures in a class bravo fire (sheet 6 of 9)*

## CLASS BRAVO - MACHINERY SPACE FIRE

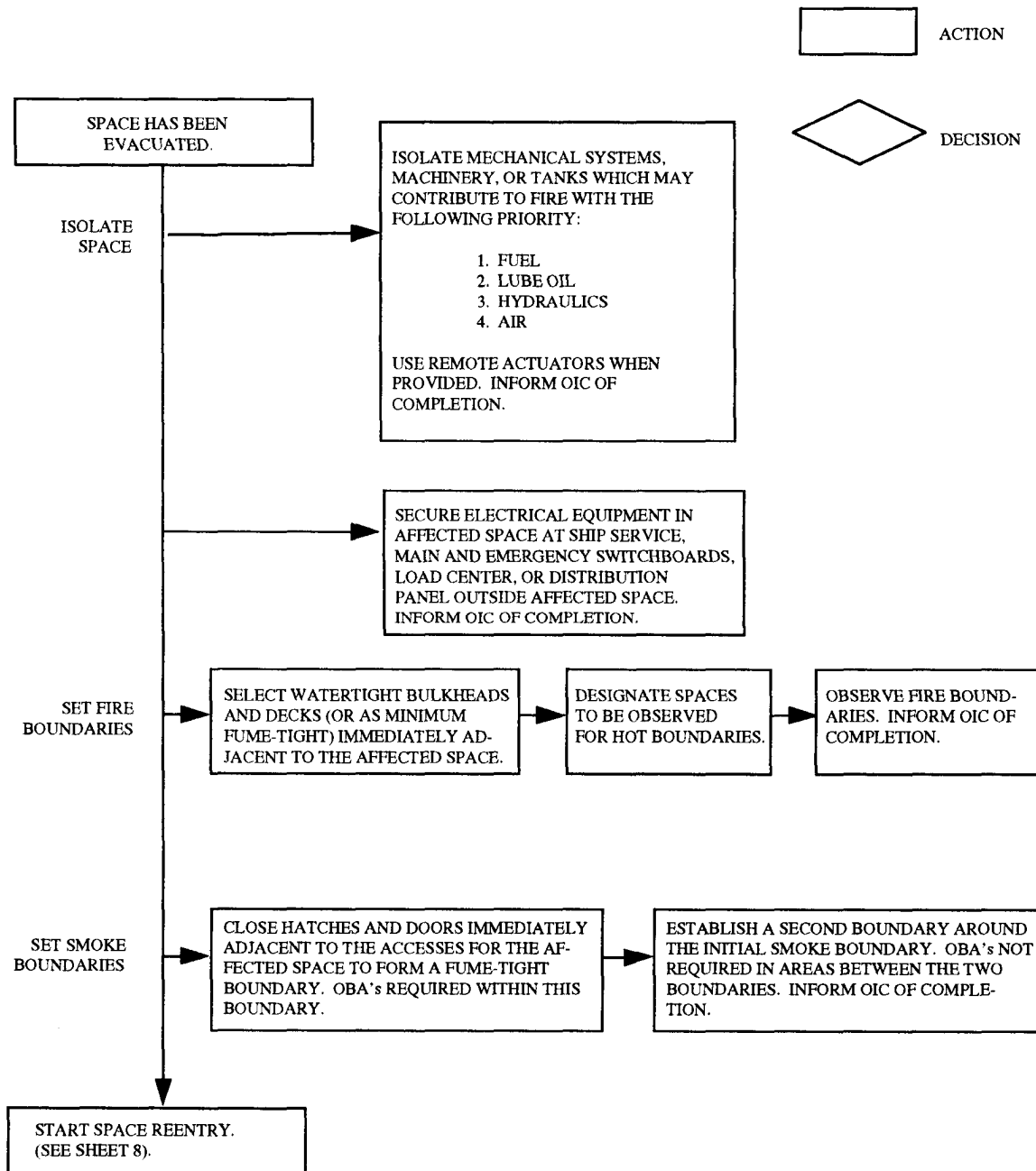
ISOLATED SPACE, ESTABLISH FIRE AND  
SMOKE BOUNDARIES

Figure 29-1. Procedures in a class bravo fire (sheet 7 of 9)

## CLASS BRAVO - MACHINERY SPACE FIRE

## MACHINERY SPACE REENTRY

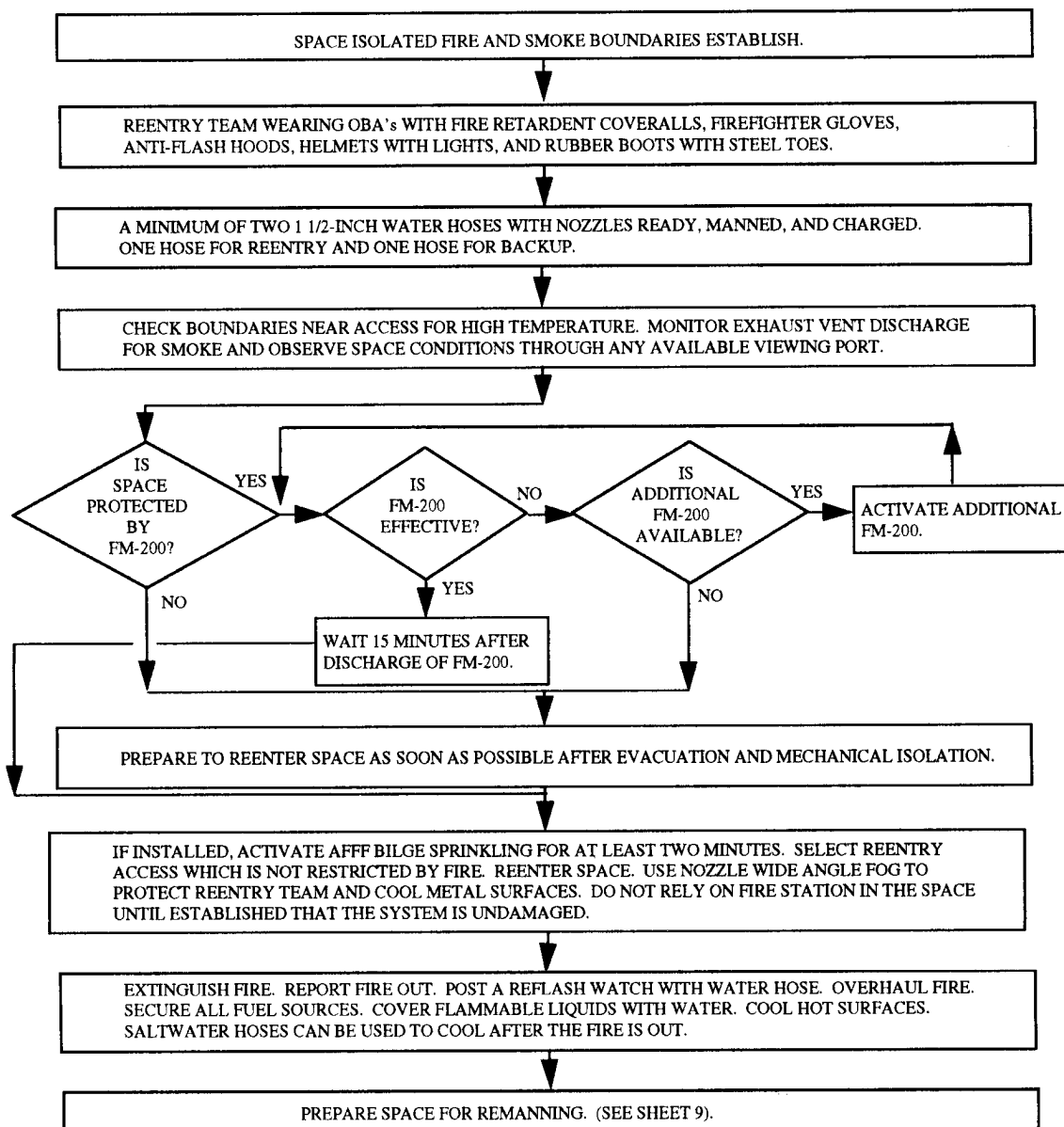
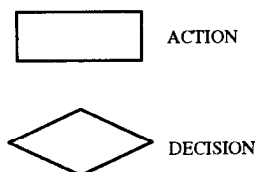


Figure 29-1. Procedures in a class bravo fire (sheet 8 of 9)

CLASS BRAVO - MACHINERY SPACE FIRE

PREPARE SPACE FOR REMANNING

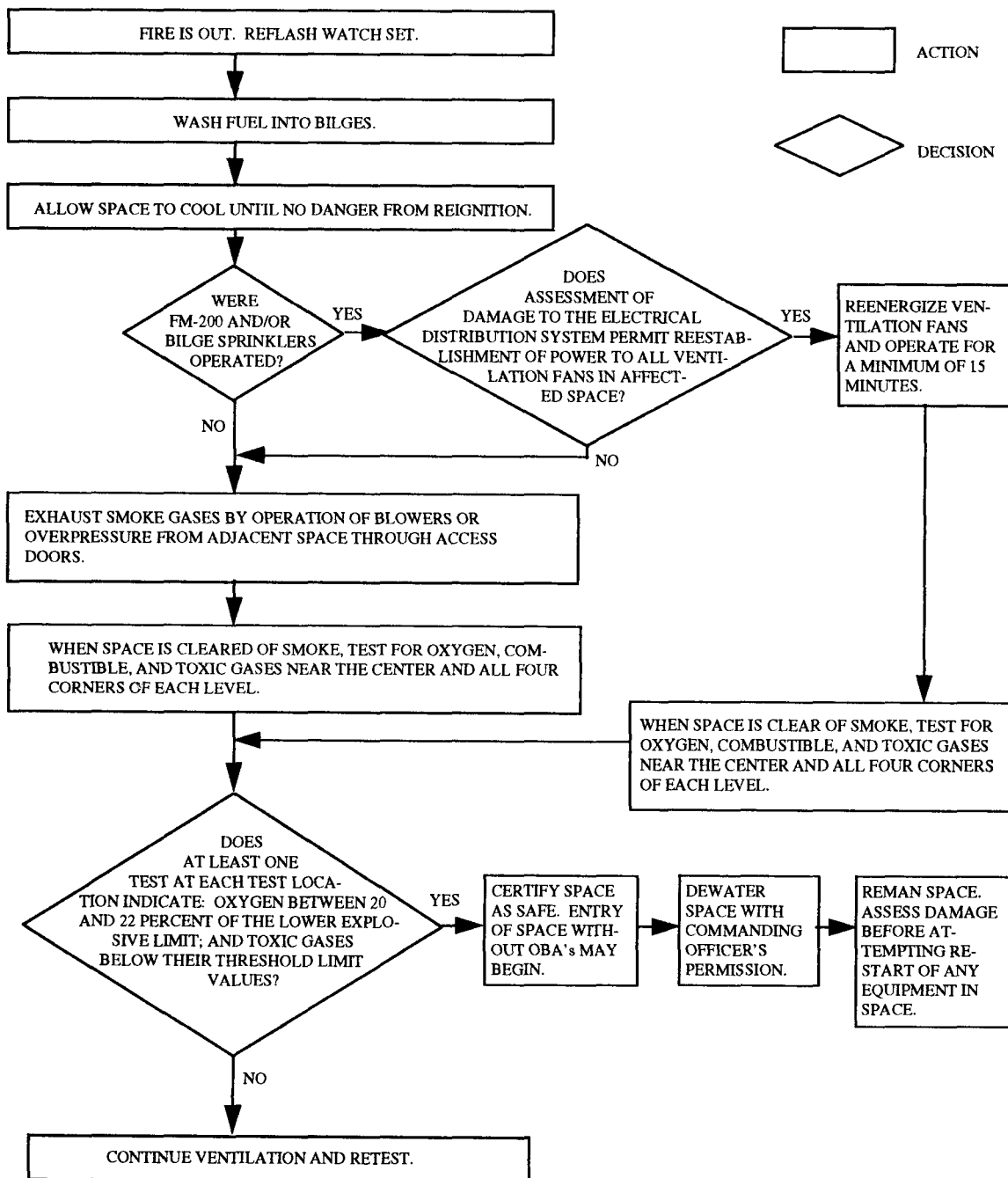


Figure 29-1. Procedures in a class bravo fire (sheet 9 of 9)

**29-8. PREVENTION.** The following eight principles shall be enforced to reduce fire hazards.

a. **Principle 1.** The Engineer Officer or his principal assistant(s), shall make regular and frequent inspections, including but not limited to the items discussed in b., e., and f. below, and report conditions to the vessel master.

b. **Principle 2.** Properly stow and protect all combustibles.

c. **Principle 3.** Test and inspect flammable systems after repairs.

d. **Principle 4.** Educate all personnel in the reduction of fire hazards and perform frequent fire drills.

e. **Principle 5.** Enforce fire prevention policies and practices. These are as follows:

(1) For main and auxiliary machinery spaces on Army vessels, maintain flange shields on those flammable liquid pipe lines for flanged joints (including simplex strainer flanged covers) and flanged valve bonnets in piping containing flammable fluid.

(2) Provide spray shields for flammable fluid piping flanged joints and flanged valve bonnets located in the direct plane of an electrical switchboard, electrical equipment enclosure, or a motor. Figure 29-2, pages 29-14 and 29-15, shows the different ways to install spray shields.

**NOTE**

A properly shielded joint will not permit an oil spray to be produced or an atomized mist to be released. Leaks will be evidenced by oil dripping from the bottom of the shield. Repair all leaks immediately.

(3) Install spray shields to cover the perimeter of the flanged joint with an overlap sufficient to achieve complete enclosure. The side overlap will extend down to cover the bolts and nuts of the bolt circles on either side of the joint. Tightly pull and securely fasten the side drawstring so the bolt circles are overlapped completely. This may not bring the shield into contact with the pipe. In cases where flanges are solidly butted against machinery, such as lube oil piping flanges mounted on reduction gear casings, tightly secure the shield to the flange by fitting a metal band or hose clamp arrangement around the shield, over the perimeter of the flanged joint. Pull the wire drawstring tight as noted.

(4) Inspect spray shields quarterly to ensure that they are tightly secured and that they are not damaged to the point where they are unable to contain oil spray. Take care to protect shields from abrasion or tearing. Shields do not require painting; avoid such practice. However, do not replace shields already painted on that basis alone.

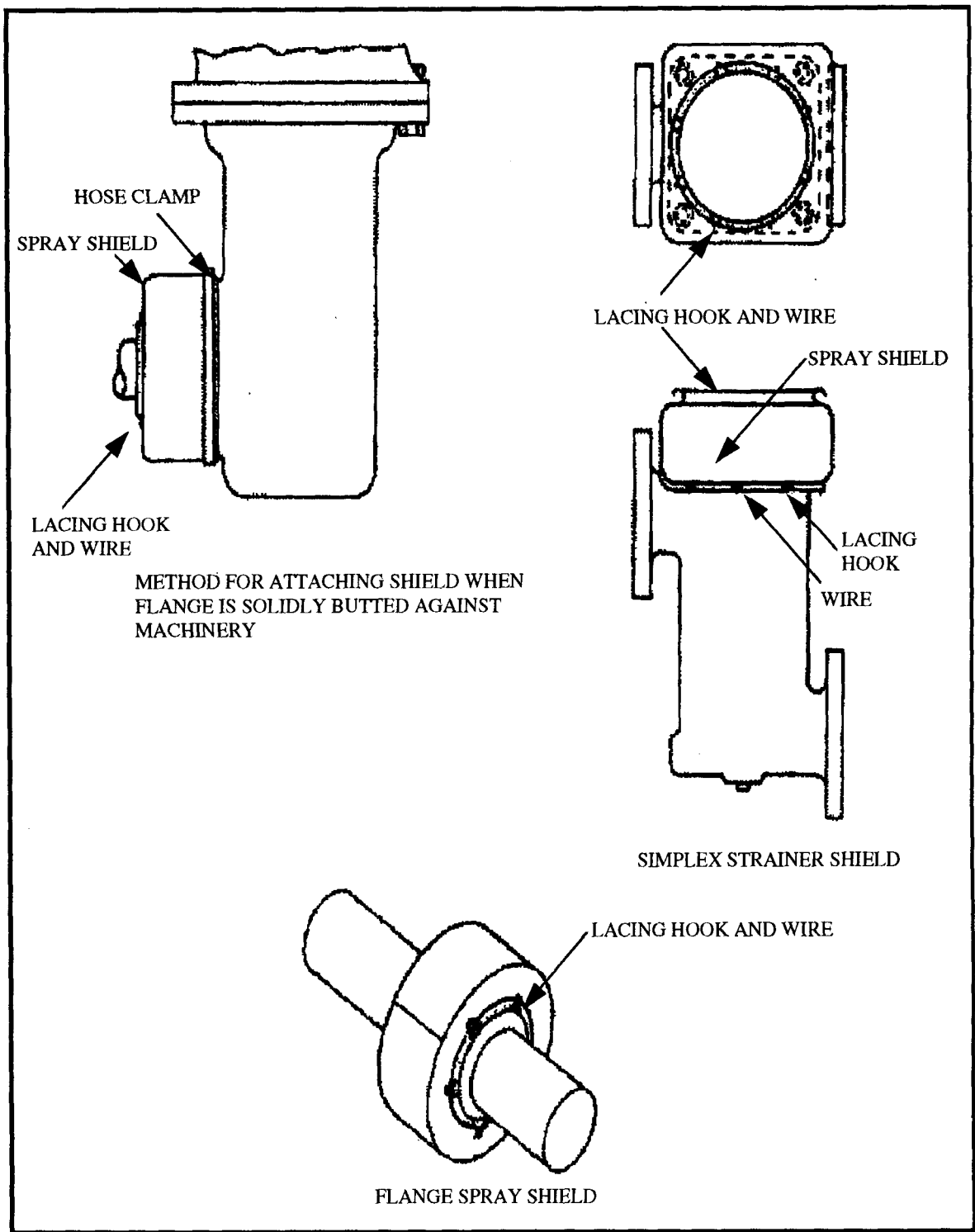


Figure 29-2. Approved spray shield installations

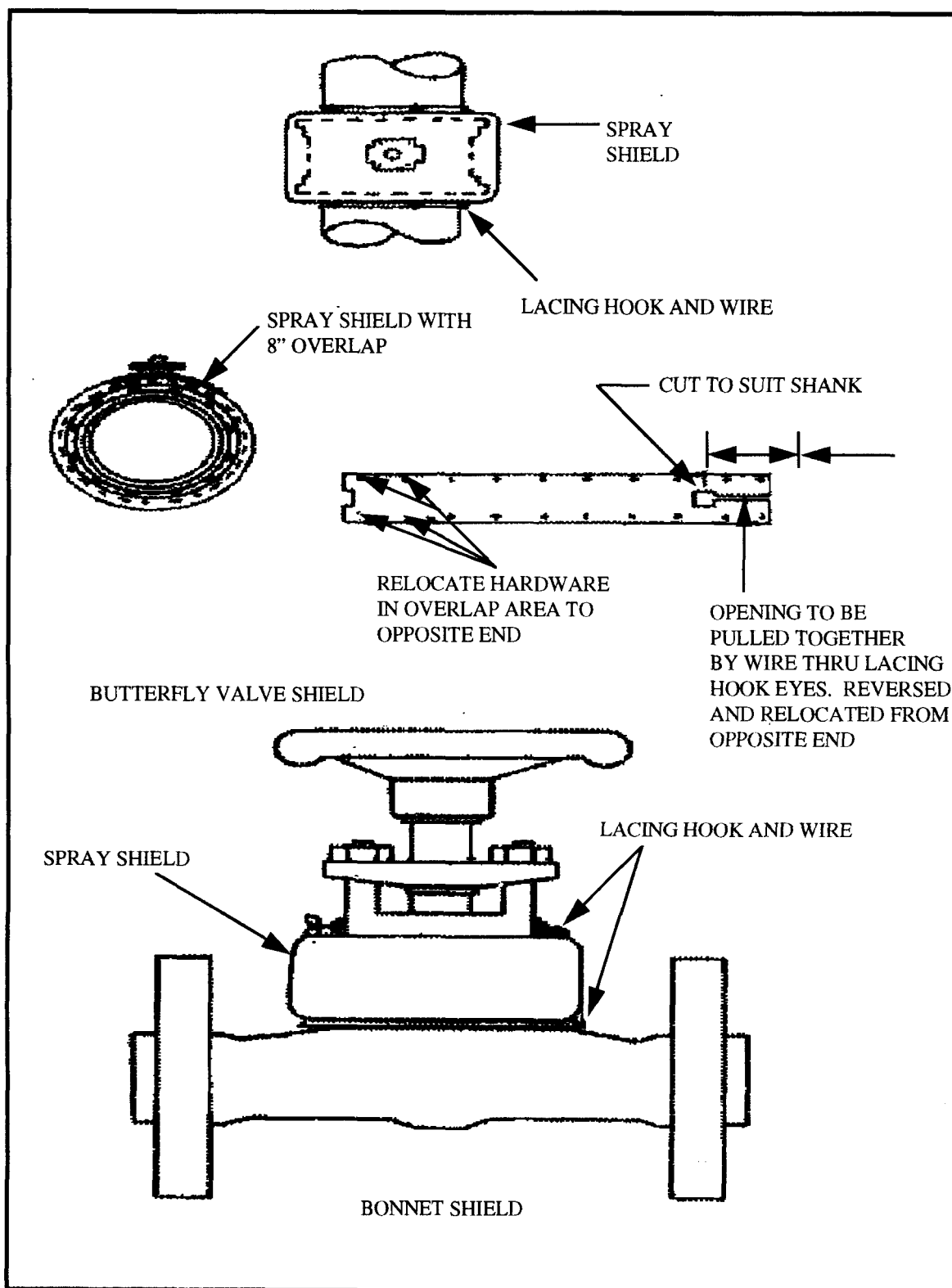


Figure 29-2. Approved spray shield installations (continued)

(5) Spray shields are “NOT” required for the following:

- Piping not subject to pump discharge pressures. For example, lube oil storage tank gravity fill lines and pump suction piping that cannot be pressurized through across connection with or as part of the operation of another system.
- Piping located in voids of cofferdams.
- Bilge pump discharge piping, except where the pump is part of a tank stripping system.
- Tank sounding tubes, air escapes, vents, and overflows.
- Gauge line piping downstream of a root valve, except for flanged connections.
- Joint located within metal shielding enclosures for duplex strainers.
- Piping on weatherdeck
- Piping below deck plates.
- Union and union-type fittings.

(6) Maintain proper covers on flammable liquid strainers and keep sounding tube caps in place and isolation valves closed. Ensure all flammable liquid sounding tubes terminating in machinery spaces are properly equipped with ball check valves, isolation valves, and sounding tube caps.

(7) Immediately stop oil leaks and repair.

(8) Wipe up spilled or leaked oil.

(9) Keep ventilation ducts free of oil residue.

(10) Keep bilge's free of oil and trash.

(11) Prevent stockpiling of excess or unauthorized flammables.

(12) Ensure uptake spaces are not used as storerooms for combustible materials.

f. **Principle 6.** Properly maintain all fire fighting equipment.

g. **Principle 7.** Operate and maintain systems and equipment according to authorized procedures.

h. **Principle 8.** Properly maintain all machinery space damage control closures and fittings.

**29-9. FIRE FIGHTING SYSTEMS CAPABILITIES AND LIMITATIONS.** All ships are provided with one or more of the fire fighting systems or equipment as described in the following paragraphs. Each has capabilities and limitations which shall be known and understood by fire fighting personnel to ensure quick and proper selection of equipment. It shall be noted that Fixed Gaseous Fire Fighting Systems are the primary fire fighting agent for extinguishing class B fires in machinery spaces except for those cases where the fire can be extinguished by handheld equipment.

a. **Water (Firemain System).** The firemain system will be kept intact so that water is available for cooling and the production of AFFF. Water is useful for cooling hot bulkheads in those spaces adjacent to the fire and extinguishing ordinary combustible (class A) fires. When a hose line attack is needed to extinguish a flammable liquid fire and AFFF is not available, high velocity water fog may be used. However, time to fight the fire will be longer, more firefighters will be needed, increased fire damage can be expected, and a greater risk of reflash will be present.

b. **Carbon Dioxide.** CO<sub>2</sub> portable extinguishers are used primarily for small electrical fires (class C) and have limited effectiveness on class B fires. Their use will be confined to class B pool fires no greater than four square feet. Successful operation requires close approach due to the extinguisher's characteristics short range (4 to 6 feet). Fixed CO<sub>2</sub> hose reels are used to extinguish electrical fires in large switchboards in nuclear and electric driven ships. Although not required on all ship types, CO<sub>2</sub> hose reels can be used if installed to extinguish fires in switchboards and generators.

c. **Aqueous Film Forming Foam.** AFFF is a surface foam produced by mixing water with AFFF concentrate. It can be applied by a separate fire plug and hose with portable foam proportioner (inline eductor), a separate fire plug drawing from a fixed tank, or from bilge sprinkling. It is effective on bilge fires to smother burning liquids, prevent large scale reflash, and for use during space reentry. When a hose line attack is made to extinguish a flammable liquid fire, AFFF shall be used unless expended or out of commission. In this event, use of water fog is acceptable.

d. **HCF-227ea (Trade Name FM-200).** The systems will be listed, fixed, total flooding, HFC-227ea fire extinguishing systems. The general arrangement with regard to actuation station locations, cylinder storage locations, alarm locations, and spaces protected by individual cylinder banks will follow the existing Halon system arrangements. The exceptions will be as follows:

- The flammable liquid storage space.
- The LSV bow thruster agent cylinders will be located inside the bow thruster spaces.
- Provide new systems to be installed for the LSV flammable liquid storage spaces.

All systems will be capable of total fire extinguishment and provide 15 minutes of reflash protection.

(1) The systems will be designed to be acceptable for marine use, compatible with existing ships systems and operational environments. The normal operating temperature range of the spaces protected will vary from 32 to 130 degrees F. Also, components will meet the requirements of NFPA 2001 for severely corrosive atmospheres.

(2) All systems will be equipped with time delays and pre-discharged alarms based on personnel evacuation time or to prepare the hazard area for discharge. Also, time delays will have the capability to be manually by passed (exception: time delays are not required for flammable liquid storage).

(3) All systems will be manually activated. Actuation will be accomplished by either mechanical or pneumatic means. Electrical actuation will not be allowed. Also, for those cylinders located within the space protected, automatic activation by a heat actuator will be provided.

(4) Natural and forced ventilation to the protected spaces will be secured during system activation. Automatic shutdown of powered ventilation and procedures for securing of natural ventilation prior to system activation will be required.

(5) All internal combustion engines located in protected spaces, which draw intake air from within the protected spaces, will be equipped with shutdown devices which are automatically actuated in the event of the fire extinguishing system activation. All internal combustion engines located in protected spaces, which draw intake air from outside the protected spaces, will be equipped with shutdown devices which are manually actuated in the event of the fire extinguishing system activation (Note: The latter applies to the Large Tugs).

(6) All agent storage cylinders will be securely supported and rigidly fastened and be equipped with pressure gauges and magnetic liquid level indicators.

(7) System designs will be based on watercraft being fully operational, as opposed to cold iron. Maintenance and training requirements will include winterization, lay-up, and re-activation procedures.

(8) System installation will permit normal operations required in walking and working areas without undue interferences. A clear headroom of 6 feet 3 inches is required in all walking and working spaces.

(9) System details. Design concentration, total flooding quantity, and discharge rate for fire extinguishing agent will be based on the following:

- The minimum amount of agent concentration supplied by each system for fire extinguishment will be based on cup burner extinguishment concentration plus a 40 percent safety factor at 20 degrees C (68 degrees F). In no case will the design concentration exceed the LOAEL of 10.5 percent at the highest ambient temperature expected in the hazard areas at 54 degrees C (130 degrees F). Cup burner extinguishment concentration will be based on the class B flammable liquid used in the hazard area protected requiring the highest extinguishment concentration, using cup burner test apparatus and procedures as identified in NFPA 2001, "Clean Agent Fire Extinguishing Systems."

- The total flooding quantity required will be calculated in accordance with NFPA 2001, Section 3-5.

- The system will discharge within 10 seconds, in accordance with NFPA 2001, Section 3-8.1.2.

In addition to the applicable requirements of NFPA2001, the system will incorporate the following features specific to Army watercraft.

- *Alarms, audible.* All protected spaces will be equipped with pre-discharge alarms (audible and visual). The alarms will be conspicuously marked in accordance with 46 CFR 97.37-9. The audible alarm will sound for the required duration prior to release of the agent into the space. The audible alarm will be sirens powered only by the agent released. Also install an electric alarm bell outside each protected space. The bell will be activated by means of a pressure switch actuated by the release of agent. This alarm bell will sound continuously until manually reset. The alarm bells will be powered by the watercraft's emergency power source (refer to 46 CFR,

Subchapter J, Subpart 110 and 111). This is to warn the ship's personnel that the system has been deployed. For engine room spaces, the sirens must be audible above the sounds of operating machinery and be audible in the control room (where applicable), as well as in the machinery space.

- *Alarms, visual.* All protected spaces will be equipped with visual alarms.

The visual alarms will be an amber strobe light activated by means of a pressure switch actuated by the release of agent. Multiple spaces protected within a compartment will require a strobe light for each space. Lights will be powered by the watercraft's emergency power source (refer to 46 CFR, Subchapter J, Subpart 110 and 111). Paint lockers are not required to have visual alarms.

- *Time delays.* All systems will be fitted with an approved time delay so that the alarms will operate before the agent is released into the space. Also, time delays will have the capability to be manually by-passed. Paint lockers are not required to have time delays.

- *Controls and valves.* Controls and valves for operation of the system will not be located in any space that might be cut off due to a fire in any space protected (exception: paint lockers). The following describes actuation control stations and their use.

- Two independent manual actuation control stations are to be provided, one of them being positioned at the cylinder storage location and the other in a readily accessible position as convenient as practical to the main escape from the space. Also, for standardization, provide a third remote manual actuation station outside on the main deck for the main propulsion engine rooms, as presently located on the majority of watercraft. These actuation control stations will be mounted in one corrosion-resistant watertight enclosure, capable of withstanding heavy sea conditions and will be quick-acting to open. Placard directions will be mounted on the inside cover.

- Systems will be actuated from the actuation stations by two control levers. One control lever operates the stop valve to the space and the other control lever is a separate control that releases the agent. These controls will be in individual pull boxes clearly identified for the particular space. Actuation stations will be conspicuously mounted to facilitate operation in an emergency. Actuation stations will be standardized (same manufacturers) throughout the fleet (exception: paint lockers will be actuated by one control lever releasing the agent (break glass, pull lever)).

- All systems will be manually controlled. For systems where the cylinders are stored within the protected space, the system will be fitted with an automatic heat actuator device. This device, in the event of an undetected fire in the protected space, will allow the system to safely release the contents of the cylinders into the protected space. These spaces will also have two independent manual-operated releases as previously specified.

- *Piping.* The distribution lines to the various spaces will be designed as required to allow for no more than a 10 second discharge of the total flooding agent quantity at the required flow rate and concentration throughout the space protected. Piping used in fixed fire fighting systems will conform to the requirements of 46 CFR, Part 56 and NFPA 2001, Appendix A. Calculations for placement of nozzles to provide uniform distribution will be submitted using an acceptable method as explained in NFPA 2001, Section 3-2 and Appendix A-3.1.2. Observe the following when using piping and related components.

- All ferrous metal piping, valves, and fittings will be protected inside and outside against corrosion.

- All pipes, valves, and fittings will be fixed and securely supported.

- Drains and dirt traps will be fitted and located to be easily accessible, where necessary.

- Piping cannot be used for any other purpose.
- Piping passing through living quarters will not have any drains or other openings.
- Existing Halon piping can be reused if it meets or exceeds FM-200 system design and installation requirements.
- Use of new piping in conjunction with reuse of existing Halon piping must be compatible.
- All piping will be routed as directly as practical with a sufficient amount of take down joints to provide for removal, inspection, servicing, and replacement of equipment. Where possible, piping will be routed to avoid cutting of the ship's structure.
- Without the use of excessive fitting or bend radius and without creating undue interferences, route all FM-200 piping as close to the overhead as practical.
- Any newly installed cable pull piping is to be standard weight galvanized steel piping. Use of corner pulleys at all changes in direction is required. Pipe bends or offsets will not be accepted.

- *Enclosure openings.* All protected spaces of the subject US Army watercraft will be relatively airtight according to NFPA2001, Section 4-4. For spaces with force-air ventilation, provisions will be made for automatic shutdown of powered ventilation upon activation of the system. Where natural ventilation is provided, provisions will be made to easily and effectively shut off ventilation. Where necessary, excessively tight compartments such as small paint lockers, and so on, will be provided with suitable means for relieving excessive pressure accumulating within the compartment when the agent is released and allowing for proper agent progressive mixing within the protected space atmosphere as discussed in NFPA 2001, Appendix A-3-5.1.

- *Test requirements.* Upon installation of piping and before installation of cylinders, all piping will be cleaned, blown out, and subjected to a hydrostatic leak test of 1 1/2 times the maximum system working pressure (refer to 46 CFR, Subpart 56.97). Each installed system will be subject to installation and functional testing as required in the Statement of Work, to include the following testing:

- Manual and automatic actuation control stations.
- Remote and automatic shutdown devices.
- All audible and visual activation alarms.

In addition to the above tests, first article systems may be subject to cold agent discharge tests at the governments discretion, as required under Option 1, to verify the following:

- Discharge time.
- Agent uniform dispersion.
- Agent concentration.
- Leakage rate and hold time.

- *Markings for fire and emergency equipment.* All system warning placards will be of the phenolic type. Markings will be permanently attached displaying red lettering, at least one half inch in height, on a white background. System piping will be marked in accordance with TB 43-0144. The distribution line valves of all extinguishing systems will be plainly and permanently marked indicating the spaces served. Complete and simple instructions for operation of

system will be posted in a conspicuous place at or near the pull boxes, stop valve controls, and in the cylinder storage rooms. Systems where cylinders are stored outside of the protected space will include a schematic of the system and instructions for alternate method of discharge should the manual release or stop valve fail. The discharge and pre-discharge alarms will be conspicuously identified in red letters at least 2 inches high, as follows:

**“WHEN ALARM SOUNDS - VACATE AT ONCE. HFC-227EA  
or trade name (FM-200) BEING RELEASED”**

The control cabinets or spaces containing valves or manifolds will be conspicuously identified in red letters at least 2 inches high. Example: “HFC-227EA or trade name (FM-200) FIRE APPARATUS.”

**e. Water Washdown Systems for Use Onboard US Army Watercraft.** This specification states the performance and installation requirements for a fixed, hydrogen fluoride mitigation, water washdown system providing general overhead area coverage, to be installed in machinery, and auxiliary machinery spaces (refer to Table 2 of the SOW) onboard US Army watercraft. The purpose of this system is to aid in removal of the hydrogen fluoride acid gas by-products from the atmosphere generated as a result of agent decomposition from contact with hot surfaces and flame, and to quickly reduce compartment temperature after activation of the gaseous fire extinguishing system in order to expedite ventilation of the space.

The systems will be installed complete with all piping, fittings, valves, strainers, nozzles, brackets, supports, and penetrations. System configurations will be standardized between those watercraft with fire main systems having emergency fire pumps outside the spaces protected (LSV, LCU-2000, and LARGE TUG) and for those watercraft relying on a portable P-250 pumping source (LCU-1600 and ROWPU). System manufacture's components will be standardized throughout the fleet. Those systems supplied by the fire main emergency fire pump will be cross connected to the fire main. Those systems relying on a P-250 pumping source will use a deck connection outside on the main deck. The installed system will comply with applicable requirements of Title 46 CFR, Subchapter F (Marine Engineering).

Technical manuals (design, installation, operation, and maintenance manuals) will include, at a minimum, the system as-built design drawings, operational procedures specific to that watercraft design application, installation procedures, maintenance procedures, safety procedures, manufactures recommended test and inspection requirements, and illustrated parts breakdowns.

**29-10. CONSIDERATIONS NECESSARY IN CHOOSING CORRECT FIRE FIGHTING EQUIPMENT.** The proper choice of fire fighting equipment should be based on an on-the-scene estimate of the situation. This estimate should be done quickly and should consider the volume of flammable liquid released and its form (atomized or spilled); the area occupied by the flammable liquid (confined or unconfined); the ability to quickly secure the oil source; and how rapidly flame, heat, and smoke are threatening fire fighting and escape. The following general guidelines are provided for consideration when selecting the proper class B fire fighting equipment.

**a. Small Pool Fires (Less Than 10 Square Feet).** Use readily accessible portable extinguishers, AFFF hose reel. CO2 portable extinguishers will not be used on fires greater than 4 square feet.

b. **Oil Spray Fires.** An oil spray fire resulting from the ignition of atomized flammable liquids should not be attacked. Loss experience and fire testing have demonstrated that a pressurized release of a flammable liquid can create a fire that is unapproachable. Life threatening conditions created by extreme heat, smoke, and toxic gases can occur, especially on the upper level, in as little as 60 seconds. Under such conditions, the only prudent action, time permitting, is to secure the propulsion plant, don EEBDs, and evacuate. Oil spray fires may occur around fuel and lube oil strainers, recently repaired flanges and valves, and flexible line failures. An oil spray fire can grow out of control within seconds. Such fires are commonly fueled by an oil source which cannot be quickly and completely secured, including those fires with a fuel source from an oil tank sounding tube terminating in a machinery space, and will most likely grow out of control thereby requiring space evacuation. Fires which spread to overhead insulation and cables, or which produce sufficient products of combustion (flame, heat, smoke, and gases) can also force space evacuation.

29-11. **MAJOR OIL LEAK SCENARIO.** Any major flammable liquid leak presents an immediate hazard which should be dealt with quickly to reduce the threat of fire. An oil leak which forms a spray can ignite when it comes in contact with any hot surface or equipment capable of arcing. Rapid securing of the oil source and the use of AFFF to cover liquid surfaces will greatly reduce the risk of fire. The following general guidelines are provided for dealing with a major oil leak.

a. **Report the Leak.** The leak should be reported immediately to the EOW.

b. **Man Foam Proportioning Station.** Man the machinery space fire stations upon notification of major oil leak in the space.

c. **Secure the Source.** The leak should be stopped as quickly as possible. This can be done locally or remotely by closing system cutout valves or shutdown valves, therefore isolating the leak. Even the application of a rag or bucket can significantly reduce the flow of oil and deflect it away from hot surfaces.

d. **Apply Aqueous Film Forming Foam.** Activate the AFFF hose reel, and use AFFF to remove oil accumulation on deckplates or bulkheads and wash oil into the bilge. Water may also be used. Rags that have been used for cleanup shall be placed in a suitable container. Discharge water spray into the bilge to prevent ignition of the oil.

e. **Concurrent Action.** As time and personnel permit, the following concurrent actions should be accomplished.

(1) Secure operating machinery as necessary in the vicinity of the leak to control the casualty. Start or maintain equipment in unaffected spaces to maintain propulsion, electrical power, and firemain pressure.

(2) Remove the oil. Pump bilge to the oily waste holding tank or overboard as conditions permit.

29-12. **CLASS BRAVO FIRE SCENARIO.** A class B fire can result from any pooled oil and can quickly develop from an oil spray or atomized fuel. The following guidelines are provided for a class B fire.

a. **Report the Fire.** The fire should be reported immediately to the Space Supervisor to allow for concurrent actions. When fire or smoke is reported, and as soon as fire fighting and plant securing efforts allow, personnel in the space should obtain and carry an EEBD. EEBD's are designed for escape only and shall not be used for fire fighting purposes.

b. **Man Foam Proportioning Station.** Man the machinery space fire stations upon notification of a fire in the space.

c. **Size Up the Fire.** Assess the size and location of the fire. If the fire is localized, activate the AFFF hose reel and extinguisher (where installed) and attack the fire by advancing toward it and extinguish the bilge fire at the deck or bilge areas. One AFFF hose reel and portable extinguisher require two persons. When within 20 feet of the oil spray or leak, direct as needed to prevent reignition. Discharge AFFF to the residual fire on the deck, in the bilge, and over the surrounding area until the fire is extinguished.

d. **Secure the Oil Source.** The leak should be stopped as quickly as possible. This can be done locally or remotely by closing system cutout valves or shutdown valves, therefore isolating the leak. Even the application of a rag or bucket can significantly reduce the flow of oil and deflect it away from the hot surface.

e. **Concurrent Actions.** As time and personnel permit, the following concurrent actions should be accomplished.

(1) Deploy additional portable extinguishers to the scene of the fire.

(2) Secure the plant and operating machinery in the affected space. Start or maintain equipment in unaffected spaces to maintain propulsion, electrical power, and firemain.

(3) Set ventilation according to the following:

- *In affected machinery space:*

- Set negative ventilation (exhaust on high and supply on low).
- On ships with interlocked fans and remote controls with emergency exhaust button. Set emergency exhaust on high and supply off.
- On ships with fans interlocked through a local master switch but with independent control on controllers inside the space, set negative ventilation.
- On other ships with interlocked fans, the ventilation system shall remain operating.

- *In unaffected machinery spaces:*

- Set positive ventilation (supply on high and exhaust off). Setting positive ventilation is intended to prevent smoke on the damage control deck from entering unaffected spaces.
- On ships with fans interlocked through a local master switch inside the space but with independent control on controllers, set positive ventilation.

operating.

- On other ships with interlocked fans, the ventilation system shall remain

- If smoke is ingested into adjacent machinery spaces from the weather, shift ventilation supply to intakes on opposite side of ship, if installed, or maneuver the ship to clear the vent intakes or secure ventilation. Watchstanders may require OBA's to prevent premature evacuation of unaffected spaces because of smoke.

- Isolate the affected space with the exception of fire fighting equipment, lighting, and ventilation.

- Set fire and smoke boundaries around the affected space to prevent the spread of fire and smoke throughout the ship. The ship may want to set general quarters to facilitate the complete isolation of the affected space and the rapid establishment of fire and smoke boundaries. In setting boundaries, consideration should be given to the trade-off between impeding personnel egress versus spread of smoke to unaffected spaces.

**29-13. OUT-OF-CONTROL CLASS BRAVO FIRE SCENARIO.** A class B fire, especially one that has burned for a period of time or is fed by an unsecurable oil source, can become out of control within seconds. When this happens, operating machinery and the plant should be secured and the space evacuated. The following guidelines are also provided for consideration when faced with an out-of-control fire.

**a. Size of the Fire.** If the fire occupies a large area, is fed by an oil source which cannot be secured, or is threatening fire fighting and escape, the space should be evacuated. Even a small fire, if not extinguished rapidly, can generate large volumes of smoke and toxic gases that can force a space to be evacuated.

**b. Evacuation.** Once the decision is made by the OIC to evacuate the space, the fixed firefighting system will be activated, if installed, and all personnel should don their EEBD and exit the nearest safe access. To prevent running the system dry, operate the system no longer than 4 minutes. Never operate the system when the concentrate level in the tank sight glass is not visible. Immediate manning of the AFFF proportioner is essential to expedite tank replenishment. Access doors, hatches, and scuttles shall be secured when all personnel are out of the space. At this time, ventilation shall be secured for ships without the fixed firefighting system. The escapees should congregate at a safe, predetermined location outside the space, where EEBD's can be removed and a muster taken. A safe location is outside fire and smoke boundaries or a weather deck. Notify the OIC that the following actions were taken.

- (1) Lighting to space has remained on.

- (2) Ventilation to the space has been shut down.

- (3) Fixed firefighting system has been activated, if installed.

- (4) The space is evacuated and all personnel are accounted for.

- (5) The Space Supervisor has completed briefing the OIC on the location of the fire and plant status.

29-14. **SMOKE CONTROL.** Smoke control is comprised of the following areas.

a. **Ventilation.** The operation of ventilation systems is described where required in this doctrine. Each ship shall supplement its doctrine with a list of fans and their controls to be secured for a designated fire and buffer zone. Weather deck supply intake and exhaust discharge locations shall be listed. The location of controllers, their designation, and area served shall also be listed.

b. **Smoke Boundaries.** The use of smoke boundaries around the affected space can effectively limit the spread of smoke and provide controlled areas for the staging of fire fighting personnel. They shall be set quickly using, as a minimum, fume tight boundaries which each ship shall clearly identify. The objective of primary smoke boundaries is to first establish a buffer zone by closing those hatches and doors immediately adjacent to the access for the affected space. Smoke curtains may be used where hatches and doors may be required to remain open for fire fighting purposes. This buffer zone shall be a dead-air area. Only personnel with OBA's should enter this area once it is established. OBA's should be activated when smoke is present or when ordered by the scene leader. A second boundary shall be set around the buffer zone to check the spread of smoke and provide a safe area for fire fighting personnel without OBA's. Each ship shall supplement its doctrine with a list of designated smoke boundaries for machinery spaces.

c. **Maintaining Fire and Smoke Boundaries.** Once a machinery space has been evacuated, fire and smoke boundaries should be maintained. At the time of reentry, firefighters may encounter a backdraft explosion as accesses to the affected space are opened and hot fire gases are relieved onto the damage control deck. Firefighters should use caution to position themselves to the side of the access when the door, hatch, or scuttle is initially opened.

29-15. **SPACE ISOLATION.** The complete isolation of the affected space, with the exception of lighting, is necessary to prevent a fire from intensifying due to the addition of flammable liquids and oxygen, and to reduce the electrical hazards. Each ship shall supplement its doctrine with a list of local and remote controls (valves, switchboards, circuit breakers, and so forth), for rapid space isolation. The designation, location, function, and area served by each control shall be provided. The following areas shall be considered when isolating the space.

a. **Mechanical.** Every effort shall be made to secure and isolate those systems, machinery, and tanks that have the potential to feed or otherwise contribute to the intensity of the fire. These include, in priority, those systems where action should first be taken.

- Fuel transfer, service and stripping pumps, and centrifugal purifiers.
- Fuel systems, storage, and service tanks.
- Lube oil pumps and centrifuge purifiers.
- Hydraulic systems.
- Lube oil tanks.
- Air compressors.

When initiating action to secure and isolate the foregoing, the following factors shall be considered.

• Not all of the above have remote securing or isolation capability. As such, much local securing or isolating shall be accomplished as soon as possible together with the start of fire fighting actions. As a minimum, local securing of systems shall include tank and bulkhead

boundaries. Familiarity with location and type of local securing and isolating capabilities, and casualty control procedures such as those contained in the applicable propulsion plant manuals is required.

- Where remote capability is provided for any of the above, it is most likely located within or immediately adjacent to the access to EOS and at the access to the machinery space on the damage control deck. Ensure system isolation by visual or operational verification of all remote actuators.

- Care shall be exercised to prevent cascading casualties to equipment in unaffected spaces necessary to maintain propulsion, electrical power, and firemain pressure. Air systems, air compressors, and fuel tanks located close to space boundaries are of particular concern. Communication with other machinery spaces is essential to reduce the potential for casualties.

b. **Electrical.** Complete electrical isolation will be very difficult due to the sheer number of cables within and transiting any given space. To the extent possible, all electrical equipment, with the exception of lighting, shall be secured outside the affected space at the ship's service, and emergency switchboards, load center, or distribution panel. The switches, circuit breakers, and fuses necessary to do this shall be clearly identified.

c. **Fire Boundaries.** Fire boundaries shall be established around the affected space to contain the fire and ensure designation of adjacent spaces to be observed for hot bulkheads. These boundaries are generally the watertight bulkheads and decks immediately adjacent to the affected space. The minimum degree of tightness for a fire boundary is fume tight. The ship may set general quarters to rapidly establish fire boundaries. Each ship shall supplement its doctrine with a list of designated fire boundaries for machinery spaces.

d. **Fuel Tanks.** Transfer of fuel to a safe location to remove fuel tank contents puts the empty fuel tank at maximum risk to fire. Therefore, transfer of fuel from the fire area should not be attempted. Pressing up the vapor space in a fuel tank with seawater to protect tank contents is not recommended because experience indicates that ignition has not occurred in fuel tanks exposed to fire, conditions for ignition within the tank are highly unlikely, and no accurate method exists to verify the vapor space has been eliminated. Also, the fuel tank will become contaminated with seawater. In summary, the only action necessary to prevent tank contents from contributing to a machinery space fire is to isolate and secure the fuel system.

29-16. **PERSONNEL PROTECTION AND FIRE FIGHTING EQUIPMENT.** The proper use of personnel protection and fire fighting equipment is required to reduce the risk of injury and facilitate extinguishing the fire. Some general considerations for those individuals who enter the space are the following.

a. **Oxygen Breathing Apparatus.** An OBA (with voice amplifier if on ship's allowance list) should be worn by all personnel within buffer zone or when entering the affected space until the atmosphere is declared safe. When smoke is present, OBA activation should be ordered and reported to the OIC (see Chapter 31).

b. **Clothing.** Firefighters ensembles shall be appropriately prepositioned to be readily available to fire party personnel when the fire party is called away. Personnel required to wear the firefighter ensemble are the scene leader, nozzle men, and hose men. Support personnel such as phone talkers, plug men, electricians, and medical personnel, outside the fire boundary, shall wear battle dress uniforms, antistatic hoods, and gloves (see Chapter 30).

c. **Hoses.** As a minimum, a single attack 1 1/2-inch saltwater hose shall be used by the reentry team. The hose and nozzle provide added protection for the nozzle man and hose tenders. Before the single attack hose enters the space, a second backup attack saltwater hose should be manned and charged to render assistance. When assigned by the scene leader, each hose team will be led by an attack team leader. Sufficient distance shall be maintained between the first and second hoses to prevent maneuverability and fire fighting progress from being impaired. Inasmuch as reentering the space may be a lengthy and awkward process, saltwater hoses should therefore be used to cool access doors, hatches, and scuttles. Saltwater hoses should not enter the space where it will impair the effectiveness of the AFFF hose teams. To conserve AFFF, hoses equipped within-line eductors can discharge saltwater if pickup tubes are removed from AFFF 5-gallon cans. The eductor will continue to function with reinsertion of the pickup tube into the AFFF containers.

29-17. **REENTRY.** Reentry to a machinery space that has been evacuated because of fire is the most critical part of the fire fighting evolution and potentially the most dangerous. The primary function of the reentry team is to attack and extinguish the fire, ensure the source of oil is secured, and cool the space so ventilation may be started. The general guidelines for consideration upon reentry are as follows.

- When the fixed firefighting system has been activated.
  - If conditions in the affected space indicates that the fire has not been extinguished and continues to grow after the fixed firefighting system has been discharged, operate the second shot, where installed.
  - Reentry shall be attempted at the following times:
    - If the evidence is that the fire is extinguished, do not attempt reentry for at least 15 minutes after the discharge.
    - Feeling bulkheads for temperature nearer the desired access.
    - Monitoring exhaust vessel discharge for smoke.
    - Monitoring conditions through the EOS windows or peephole in escape trunk doors.
  - After reentry to the space, fires shall be extinguished. Reopen when the fire is out, reflash watch is set, and fire overhauled. Ensure all sources of fuel are secured and covered with AFFF. To conserve AFFF, saltwater hoses should be used to cool the space after the fire is out. It should be assumed that AFFF hose reels in the space have been damaged by the fire and they should not be relied on until it can be established that the system has not been damaged by fire.

- When FM-200 and AFFF bilge sprinkling is not installed.

- Reentry should be attempted as quickly as possible tier the space is evacuated and mechanically isolated. Electrical isolation, with the exception of lighting, shall be completed as specified in EOCC immediate actions. Electrical isolation, although ongoing, should not delay space reentry.

- Reentry should be made through the access, main door, hatch, or escape trunk, whichever is not obstructed by the fire. The conditions in the affected space should be checked before entry by feeling bulkheads for temperature near the desired access, monitoring exhaust vent discharge for smoke, and monitoring operating conditions through the EOS windows or peephole in escape trunk doors.

- Repeated efforts may be necessary to gain access to the space. The nozzleman uses the reentry hose wide-angle fog to cool metal surfaces and protect himself. It should be assumed that the hose reels in the space have been damaged by the fire and they should not be relied on for use until it can be established that the system has not been damaged by fire.

- Once inside the space; locate, extinguish, and report: fire out and set reflash watch. Report reflash watch set. Overhaul the fire. Secure and cover all flammable liquids with AFFF. Allow the space to cool. To conserve AFFF, saltwater hoses should be used to cool the space after the fire is out.

## 29-18. DESMOKING, ATMOSPHERIC TESTING, DEWATERING, AND REMANNING.

After the fire is out, the space should be made safe and ready for remanning. A reflash watch shall be posted with AFFF to quickly extinguish any fire which may reignite. The following general guidelines are provided.

a. **Desmoking.** When a flammable liquid fire has been extinguished, combustible gases may be present. Operating electric controllers to start fans may ignite these gases. Desmoking with the installed ventilation system can proceed with minimal risk when the source of fuel is secured, the space allowed to cool, all fuel washed into the bilges, and no damage sustained to the electrical distribution system. Clearing the space of smoke should commence as soon as the space has cooled sufficiently so there is no danger from reignition. Circuit breakers and other protective devices which tripped automatically shall be left in the tripped position until system damage has been assessed. Examine the electrical distribution system and if possible reestablish power to the installed ventilation fans. If fully operational, run all fans on high speed for a minimum of 15 minutes to remove smoke and toxic gases. If the installed system is partially or fully inoperable, desmoking will take longer, but can be accomplished by using portable blowers, operable installed fans, or positive pressure from adjacent spaces and opening access to the affected space. The safest way to desmoke machinery spaces on ships without the fixed firefighting system is to exhaust with portable blowers or to use positive pressure from adjacent spaces. These methods reduce the risk associated with igniting flammable liquids that have not been vapor secured with AFFF.

b. **Atmospheric Testing.** Desmoking shall precede atmospheric testing because combustible gas analyzers will not operate reliably if the sensor is exposed to excessive moisture or comes in contact with particulate found in post-fire atmosphere. When the space is clear of smoke, test for oxygen, combustible, and toxic gases. The level of oxygen shall be between 19.5 and 23.5 percent, combustible gases shall be less than 10 percent of the lower explosive limit, and all toxic gases below their PEL values before the space is certified safe for personnel without OBA's. Shipboard personnel authorized to conduct postfire atmospheric tests for the purpose of certifying the space safe for personnel are Gas Free Engineering personnel. The repair party postfire gas free

test assistant is not authorized to make safe for hot work gas free tests unless the assistant is qualified. If FM-200 has been discharged, a test for hydrogen fluoride shall also be conducted. Tests should be conducted near the center and all four corners on each level. At least one satisfactory test shall be obtained at each location tested. Instruments used shall be approved by the National Institute of Occupational Safety and Health, Mine Safety Health Administration.

c. **Remanning.** Once the space is certified as safe, remanning can begin. Operation of equipment and desolation of mechanical and electrical systems shall be considered only after a careful assessment of damage.

29-19. **PROCUREMENT.** Order the following prefabricated spray shields by their appropriate NSN and part number.

- Spray Shield, 4 inch by 30 foot (NSN 4730-00-010-0997, part no. 803-2145518-5.
- Spray Shield, 6 inch by 30 foot (NSN 4730-00-010-0988, part no. 803-2145518-6.
- Spray Shield, 7 inch by 30 foot (NSN 4730-00-010-0999, part no. 803-2145518-7.
- Spray Shield, 8 inch by 30 foot (NSN 4730-00-010-1000, part no. 803-2145518-8.
- Spray Shield, 9 inch by 20 foot (NSN 4730-00-010-6123, part no. 803-2145518-9.
- Spray Shield, 10 inch by 20 foot (NSN 4730-00-010-1001, part no. 803-2145518-10.
- Spray Shield, 11 inch by 20 foot (NSN 4730-00-010-1002, part no. 803-2145518-11.
- Spray Shield, 12 inch by 20 foot (NSN 4730-00-010-1003, part no. 803-2145518-12.

## CHAPTER 30

### FIRE FIGHTING ENSEMBLE

30-1. **GENERAL.** This chapter contains information about the fire fighting ensemble. This ensemble is authorized for use on US Army watercraft.

#### WARNING

The ensemble does not offer protection against chemical, biological, or radiological effects.

The firefighter ensemble is intended to protect the firefighter from flame (flash) exposure, heat, and falling debris.

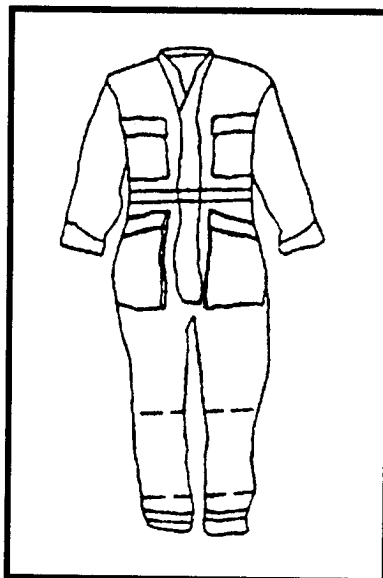
30-2. **ENSEMBLE.** The firefighter ensemble consists of the following:

- Firefighter's coveralls.
- Anti-flash hood.
- Anti-flash gloves.
- Damage control/firefighter's helmet.
- Firefighter's gloves.
- Firemen's boots.
- Stowage bag.
- Flashlight, explosion proof.
- OBA. See Chapter 31 for details.

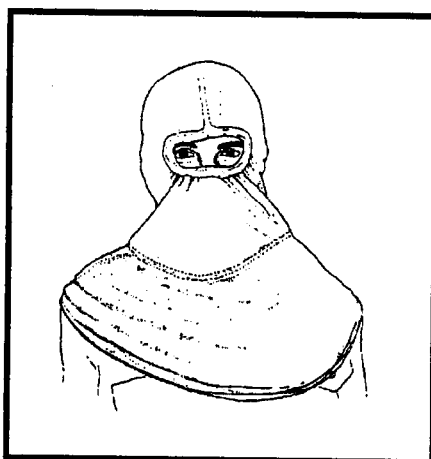
30-3. **CONSTRUCTION.** The following paragraphs provide details on the construction of the items contained in the firefighter's ensemble.

a. **Firefighter's Coveralls.** The coverall design is a one piece, jump suit style (see Figure 30-1, page 30-2). The coverall has a tough outer shell, a vapor barrier, and an inner fire retardant thermal liner. The knees, bottoms of the thigh pockets, and bottoms of the legs are reinforced with leather padding for extra protection. As an additional safety feature, the coverall has reflective markings around the upper arms, lower legs, and torso to highlight the outline of the firefighter, so he can be seen in dense smoke or dim light. The front closure and inside lower legs have brass zippers. There are bellow pockets with velcro closures on the outside of each thigh and on the front of the upper left arm. The coveralls have a corduroy faced collar with snap fasteners. The sleeves have an integral knit wristlet for wrist protection and small loops (thumb holes) on the ends of the sleeve wristlets to insert your thumbs to anchor and keep the sleeve from riding up the arm. The coveralls are available in five sizes (small through extra-large-tall).

b. **Firefighter's Anti-Flash Hood.** The firefighter's anti-flash hood provides protection to the head, neck, and face (except the eyes). The hood can be worn with the OBA. It has an elastic face closure and is available in a single size which fits all. The face portion can be pulled up over the nose for additional protection of the face (see Figure 30-2, page 30-2).



*Figure 30-1. Firefighter's coveralls*



*Figure 30-2. Firefighter's anti-flash hood*

c. **Anti-Flash Gloves.** The use of the gloves is to protect personnel from elevated air temperatures resulting in burns caused by fire. The gloves are made from fire retardant cotton and one size fits all (see Figure 30-3).

d. **Damage Control/Firefighter's Helmet.** The helmet is designed to protect the head, neck, and face from flame (flash) exposure, heat, and falling objects. The helmet shell material is heat resistant fiberglass and is provided with a face shield, chin strap, adjustable suspension, reflective markings, and a liner that covers the side of the head and neck (see Figure 30-4).

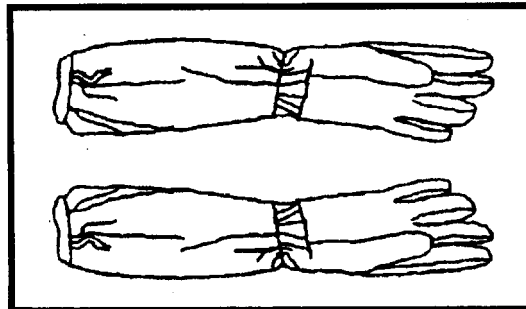
### CAUTION

Do not modify the helmet in any manner, including removing the face shield and drilling holes to attach a light. Modification will reduce the protection provided by the helmet.

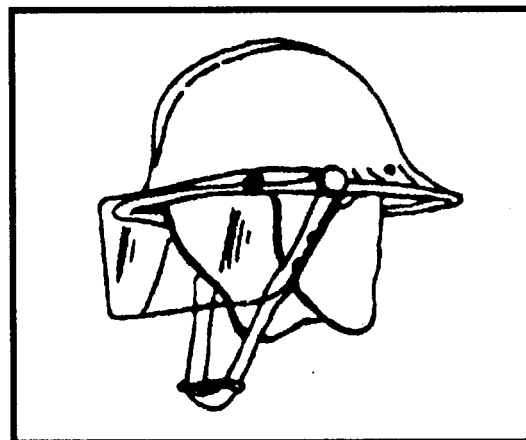
e. **Firefighter's Gloves.** The gloves protect against abrasions, short duration flame (flash) exposure, and heat. The five-finger cut, gauntlet gloves are fabricated from leather and have a waterproof vapor barrier and fire retardant liner (see Figure 30-5, page 30-4). The gauntlet provides wrist protection. The gloves are available in five sizes (extra small through extra large).

f. **Fireman's Boots.** The rubber boots have steel safety toes and puncture proof steel insoles (see Figure 30-6, page 30-4). Fireman's boots are available in two models, knee high and hip length. The US Army currently is using the knee high version. Knee high boots are worn inside the coveralls and are available in sizes 5 through 15.

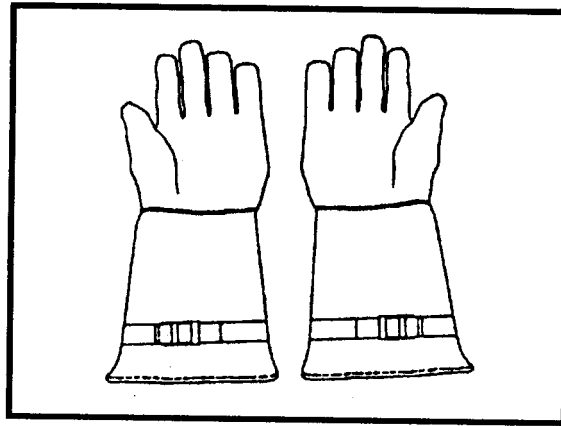
g. **Stowage Bag.** The stowage bag is provided to preassemble the ensemble for stowage. This bag is constructed of canvas duck with carrying straps (see Figure 30-7, page 30-4). In emergency situations, after removing the ensemble from the bag, the stowage bag can be used for transporting other damage control equipment to the scene. In particular, the bag can be used to move spare OBA's and canisters.



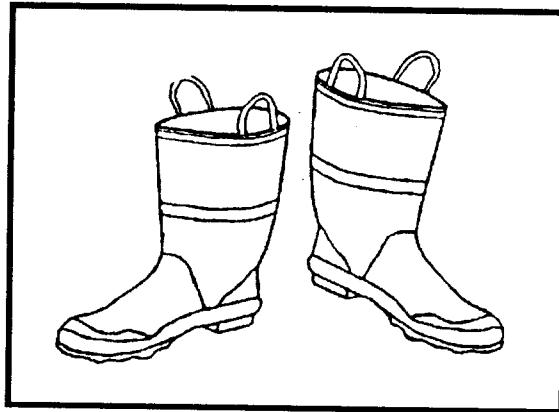
*Figure 30-3. Anti-flash gloves*



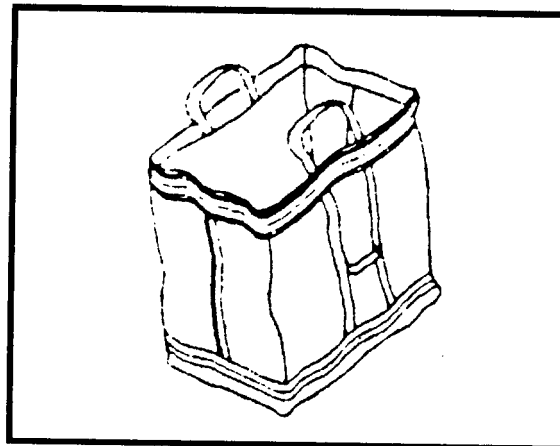
*Figure 30-4. DC/firefighter's helmet*



*Figure 30-5. Firefighter's gloves*



*Figure 30-6. Fireman's boots*



*Figure 30-7. Ensemble stowage bag*

**30-4. DONNING AND ADJUSTING.** An intricate part of the fire fighting ensemble is the type A-4 OBA. The following steps will instruct the user on how to don and adjust the fire fighting ensemble including the OBA.

- The OBA is stowed with an anti-flash hood protecting the facepiece lens. Remove the anti-flash hood from the OBA facepiece lens ring and put the hood over the face.
- Keep your pants and shirts on. Remove your shoes or boots and remove anything else that will interfere with donning the coverall, such as items in pockets. Put on the coveralls and pull them up and over your shoulders. Insert thumbs through the small loops on the ends of the sleeve wristlets to anchor and keep the sleeves over the wrists and under the gloves.
- Step into the fireman's boots. Never put on the boots before you put on the coveralls. Secure the two zippers on the bottom of the coverall legs.
- Stand up the coverall collar and ensure the anti-flash hood is fully inside the collar and down the chest as far as possible. Close the coverall front body zipper and the two collar snaps.
- Don the OBA. Do not secure the facepiece.
- Pull the anti-flash hood face opening down around your neck. Put on the OBA facepiece, tighten straps, and check for facepiece straps, with the elastic opening over your face. Secure the velcro closure on the coverall collar. Put the helmet on, secure helmet liner flap velcro fastener, and fasten the chin strap. Loosen face shield fasteners on the sides of the helmet brim and rotate the face shield over the OBA facepiece to protect the breathing apparatus from debris and water. Remove the gloves from the leg pockets and put them on. Ensure they cover the coverall wristlets (see Figure 30-8, page 30-6).

**NOTE**

Keep the OBA breathing tubes outside the coverall and helmet liner flap.

**30-5. REMOVAL OF GEAR.** To takeoff the gear, reverse the donning order. Remove the gloves, pull up the helmet face shield, loosen the helmet liner flap velcro fastener, take the helmet off, and open the coverall collar closure. Pull the anti-flash hood down around your neck and take off the OBA facepiece. Take off the OBA, pull off the anti-flash hood, step out of the boots, and remove the coveralls.

**30-6. STOWAGE.** The firefighter ensemble should be stowed in the ensemble stowage bag. The ensemble shall be preassembled and the bags located in, or near, DC lockers so that they are easily accessible. Before being stowed, ensure the ensemble is clean and dry. Stow the anti-flash hood over the facepiece of the OBA. Atypical DC stowage area is shown in Figure 30-9, page 30-6.

**WARNING**

DO NOT stow firefighter's protective clothing, OBA, and OBA canisters inside the vessel's super structure or engineroom.

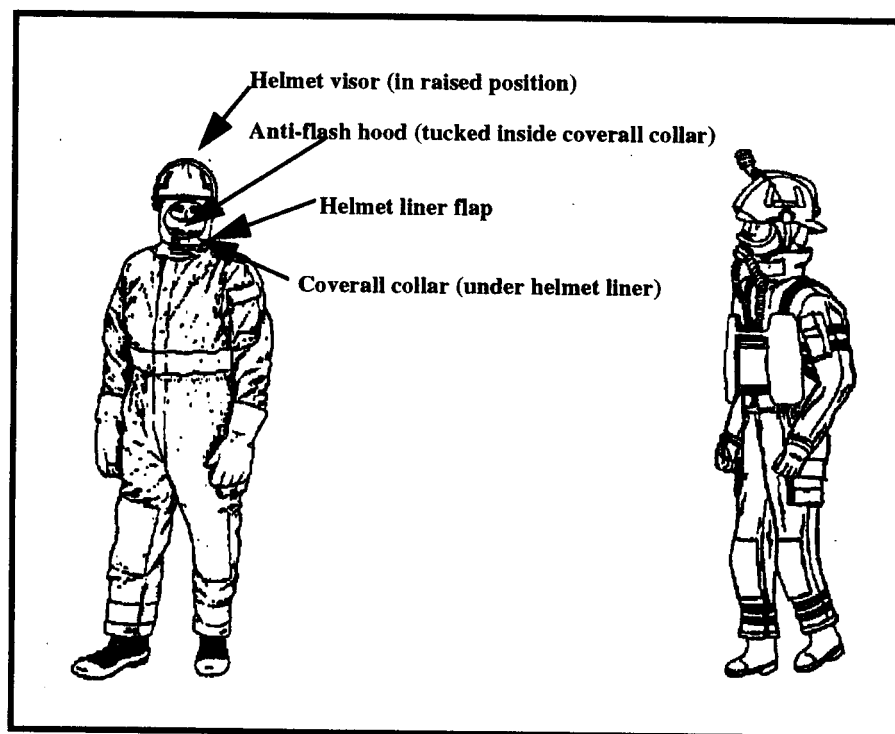


Figure 30-8. Fully donned ensemble / Fully donned with OBA

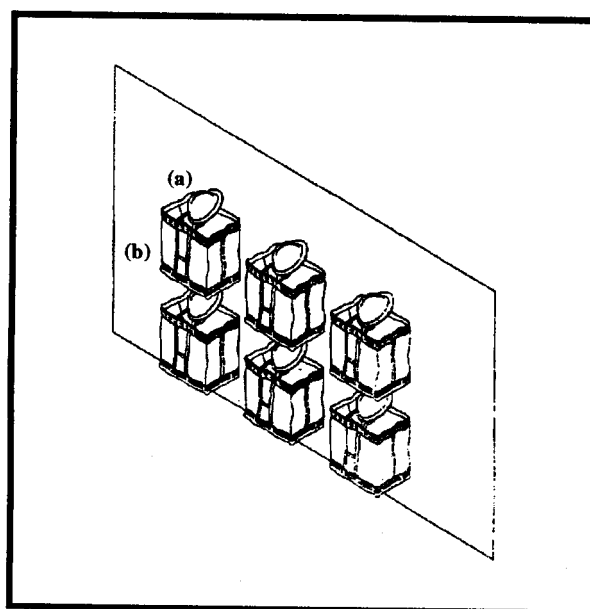


Figure 30-9. Typical DC equipment stowage area

30-7. **PROCUREMENT.** Order the following items by their appropriate NSN.

- Firefighter's Coveralls.

- Small (NSN 8415-01-300-6556).
- Medium (NSN 8415-01-300-6557).
- Large (NSN 8415-01-300-6558).
- X-Large (NSN 8415-01-300 6559).
- X-Large, Tall (NSN 8415-01-300-6560).

- Hood, Anti-flash (NSN 8415-01-268-3473). NOTE: One size fits all.
- Gloves, Anti-flash (NSN 8415-01-267-9661). NOTE: One size fits all.
- Helmet, DC/firefighter's (NSN 8415-01-271-8069). NOTE: One size fits all.  
POC for local purchase: Bullard, Model #FXA-1. Telephone (606) 234-6611.  
Lion, Model #LFH 3700-N, Style 40, RED.  
Telephone 1-800-421-2926 or (5 13) 898-1949

- Gloves, Firefighter's. NOTE: The gloves currently in the stock system are no longer authorized for procurement. However, those in service may continue to be worn for fire fighting until the need for replacement. Gloves from the commercial sources listed below are now authorized:

- Style No. G100B, Sizes: SM, MED, LG, XLG.

Lion Apparel  
3401 Park Center Drive  
Dayton, OH 45414  
(800) 421-2926

- Style No. "TEMPO PRO", Sizes: XSM thru Jumbo.

Tempo Glove Manufacturer Company  
3820 W. Wisconsin Avenue  
Milwaukee, WI 53208  
(414) 344-1100

- Style No. LWG-N, Sizes: SM, MED, LG, XLG, XXL, and Jumbo. Specific ordering info: "No. 6560" must be indicated on purchase order.

Morning Pride Manufacturer Company  
1 Innovation Court  
P.O. Box 14516  
Dayton, OH 45313-4925  
(5 13) 454-4925

- Style No. 5281, Sizes: SM, MED, LG, XLG, and Jumbo.

Shelby Specialty Gloves  
P.O. Box 171814  
Memphis, TN 38187-1814  
(800) 888-3598

- Boots, Firefighter's.
  - Size 5 (NSN 8430-00-753-5935).
  - Size 6 (NSN 8430-00-753-5936).
  - Size 7 (NSN 8430-00-753-5937).
  - Size 8 (NSN 8430-00-753-5938).
  - Size 9 (NSN 8430-00-753-5939).
  - Size 10 (NSN 8430-00-753-5940).
  - Size 11 (NSN 8430-00-753-5941).
  - Size 12 (NSN 8430-00-753-5942).
  - Size 13 (NSN 8430-00-753-5943).
  - Size 14 (NSN 8430-00-753-5944).
  - Size 15 (NSN 8430-00-753-5945).
- Bag, Canvas (NSN 8465-01-316-5706).
- Flashlight, Explosion proof, 2 cell (NSN 6230-00-269-3034).

## CHAPTER 31

### OXYGEN BREATHING APPARATUS

#### Section I. Functional Description

31-1. **INTRODUCTION.** A thorough knowledge of the OBA and its function is vital to ensure the safety of the operator. This section provides a brief description of the functional relationship that exists between the major parts and assemblies that comprise the OBA. It also discusses their interactions as they relate to forming the closed breathing system. The OBA consists of the following nine operational parts and assemblies (see Figure 31-1, page 31-2).

- Facepiece.
- Inhalation valve.
- Inhalation tube.
- Breathing bag.
- Pressure relief valve.
- Canister.
- Exhalation tube.
- Exhalation valve.
- Combination valve assembly.

The combination valve assembly is composed of the inhalation valve, the exhalation valve, a speaking diaphragm, and the valve body or housing.

31-2. **DESCRIPTION.** The following describes the operation of the OBA. The key elements of the system are also described below.

a. **Air Flow.** The facepiece (1), worn on the head, covers the face of the user and seals it from the external atmosphere. A speaking diaphragm is built into the facepiece to allow conversation while the apparatus is in use. As the user exhales, moist breath is carried down the exhalation tube (7) and into the bottom of the canister (6). It then rises upward through the chemicals in the canister, producing oxygen. This oxygen passes into the breathing bag (4) and then up through the inhalation tube (3), where it is drawn into the facepiece. The inhalation and the exhalation check valves (2 and 8), located in the combination valve assembly (9), permit flow in only one direction. The pressure relief valve (5) in the breathing bag automatically relieves excess pressure.

b. **Quick Start Canister.** The quick start canister is a chemically activated oxygen generator. It incorporates an oxygen generating candle which supplies oxygen until normal oxygen generation from the canister begins. Exhaled breath, containing moisture and CO<sub>2</sub>, enters the neck of the canister and travels to the bottom. The exhaled breath then rises up through the chemicals in the canister, losing CO<sub>2</sub> and moisture and gathering oxygen in the process. This oxygen exists through a separate opening in the neck.

c. **Facepiece.** The facepiece is made of rubber in a face seal configuration. A wide angle lens made of scratch resistant plastic provides the wearer with good visibility and reduces any

claustrophobic effects. The facepiece also contains a rubber nosecup. The combination valve assembly and speaking diaphragm are in a hard plastic housing at the bottom of the facepiece. The combination valve assembly contains the inhalation and exhalation check valves. Oxygen entering the facepiece is directed over the facepiece lens to reduce fogging. Oxygen then enters the nosecup through two check valves in the nosecup. Exhaled breath leaves the nosecup through the exhalation check valve.

d. **Timing Device.** To warn the user when the oxygen supply is running low, a timing device is attached to the OBA. The timing device consists of a timer and bell. The time is graduated in minutes and may be set for any fraction of 60 minutes. During use the time is set for 30 minutes. After the set time has expired, the bell will ring for a minimum of 10 seconds to warn the wearer to return to fresh air.

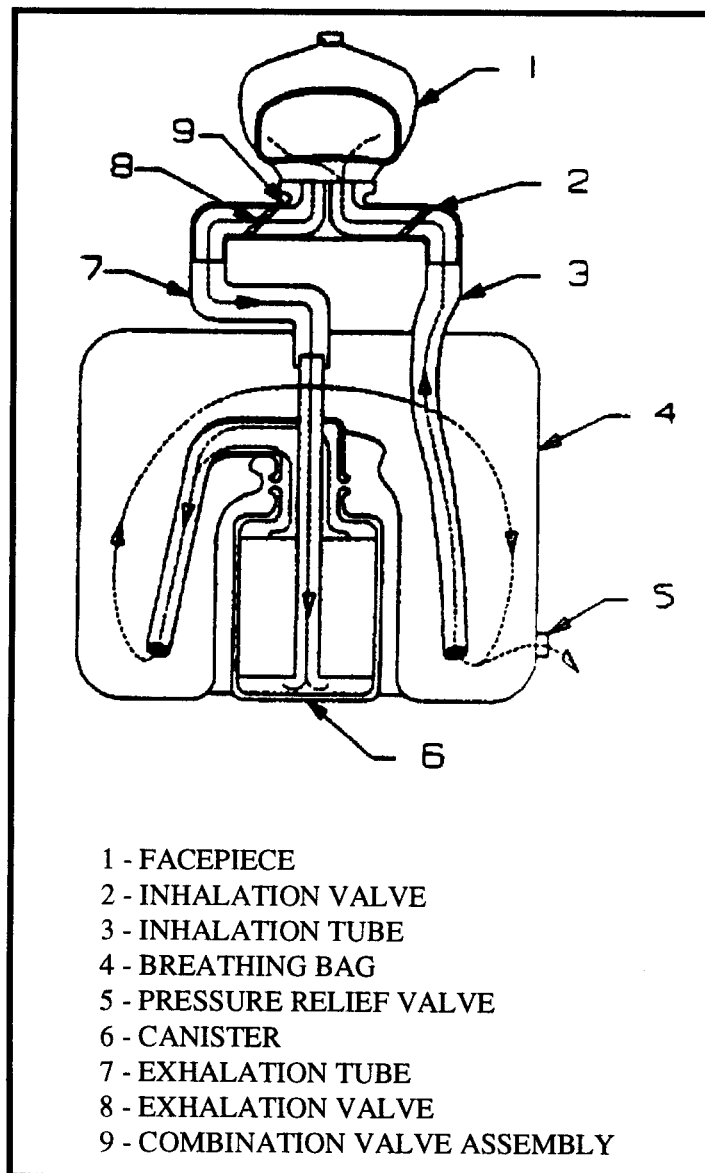


Figure 31-1. OBA operational parts and assemblies

**31-3. OBA TRAINING CANISTER KIT DESCRIPTION.** Training canister kits provide a means of instructing personnel on the use and operation of the OBA.

a. **Training Canister.** The operation of the fully assembled training canister is identical to that of the quick start canister. However, the chemical in the training canister is not the same as the chemical used in the quick start canister. The chemical in the training canister absorbs CO<sub>2</sub>, but it does not produce oxygen. The amount of chemical in the training canister is enough to absorb CO<sub>2</sub> for forty trainees not doing any work.

b. **Firing Mechanism and Candle.** An oxygen-generating candle provides the oxygen for an OBA fitted with a training canister. The replaceable candle generates a five minute supply of oxygen (10 liters), beginning within 15 seconds after the candle has been fired. The firing mechanism is located on the bottom of the canister directly beneath the candle. The firing mechanism is removable. Pulling the lanyard causes a spring loaded hammer to strike a primer and ignite the candle.

## Section II. General Information and Safety Precautions

**31-4. SAFETY PRECAUTIONS.** To ensure the safety of the wearer while using the Type A4 OBA, the safety precautions described in paragraph 31-13 shall be strictly adhered to.

**31-5. INTRODUCTION.** This section contains the operating and maintenance instructions for the OBA, Type A4. This information will ensure the safety of the operator and maintain the performance of the OBA throughout its intended service life. Procedures for the use of the OBA training canister kit and tending line are also included.

**31-6. EQUIPMENT DESCRIPTION.** The OBA (see Figure 31-2, page 31-4) is a personnel protection device which, when placed into operation, provides the wearer with an isolated, self-generating oxygen supply for 45 minutes. It is worn when the atmosphere in a space is dangerous to personnel operating in that space. The 45-minute time period provided by the OBA consists of a 30-minute arrival and on station interval along with a 15-minute supply of reserve air allotted for leaving the scene. During operation, the OBA, wearer, and canister form a closed system. Chemicals in the canister remove CO<sub>2</sub> and moisture from the user's exhausted breath and replenish it with O<sub>2</sub>. This allows the wearer to survive and work in a toxic atmosphere. The OBA will not protect the wearer from any skin absorbed hazards. A properly donned and adjusted OBA (with the bail in the upright position) is shown in Figure 31-3, page 31-5.

**31-7. ACCESSORIES.** The following describes accessories provided for OBA maintenance and operation.

a. **Wrench.** The wrench is used to remove the valve cap from the speaking diaphragm on the facepiece assembly.

b. **Spectacle Kit.** For personnel who wear eyeglasses, a spectacle kit (see Figure 31-4, page 31-5) is available for installation of prescription lenses in the facepiece. The spectacle kit consists of a retaining spring wire support, a rubber block guide, and one universal-bridge metal frame spectacle front with mounting prongs. Corrective lenses are not included. The spectacle kit

should be taken to a medical facility for installation of an individual's prescription lenses. Once the prescription lenses have been installed, the spectacle kit can only be used by that individual and shall be retained as personal glasses.

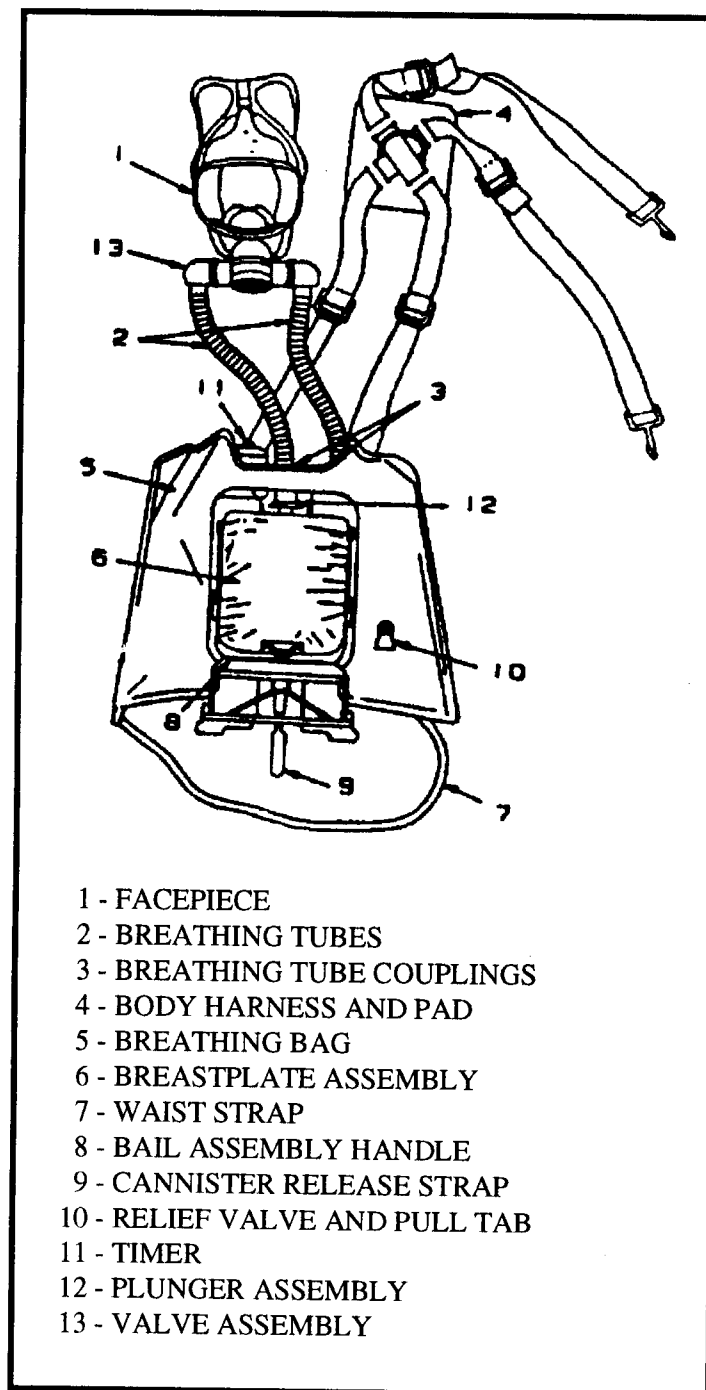
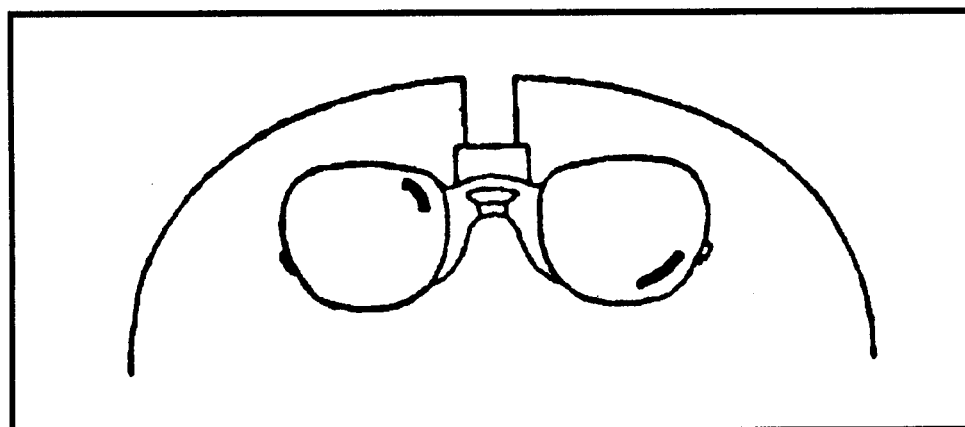


Figure 31-2. Navy type A4 OBA



*Figure 31-3. Properly donned OBA*



*Figure 31-4. Spectacle kit*

### Section III. Operation

**31-8. INTRODUCTION.** It is necessary that the wearer be thoroughly familiar with the principles of operation and the procedures and precautions for using the OBA as a personnel protection device. The procedures for operation shall be practiced frequently under the supervision of a qualified operator. The user must don the OBA prior to entering a contaminated area. During the donning procedure, the canister will be inserted, the facepiece donned and adjusted for proper seal, the bail handle raised to the operating position, the canister fired, the OBA tested for proper operation, and the timer set.

**31-9. DONNING AND ADJUSTING.** Use the following steps to don and adjust the OBA.

#### NOTE

While all of the donning and adjusting steps can be performed by the wearer, assistance will significantly speed up the process and provide additional assurance that the OBA has been properly donned and adjusted. However, since assistance may not always be available, wearers must be able to don and adjust the OBA without assistance.

- *Step 1* - Check that the bail handle is down and locked in the standby position. Do not raise the bail handle from the standby position to the operating position without first properly inserting a canister into the apparatus. Raising the bail handle without a properly inserted canister may damage both the plunger assembly and guide rods.

- *Step 2*- Attach facepiece breathing tube quick disconnect couplings (if unattached) as follows:

- Fully retract the spring loaded outer sleeve of the coupling to expose the ball bearings.
- Push the couplings firmly over the nipples (black onto black and blue onto blue).
- Release the spring loaded outer sleeves.
- To test the connection, grasp the hose at the clamp and pull lightly. If it is on correctly, the coupling will not pull off.

#### NOTE

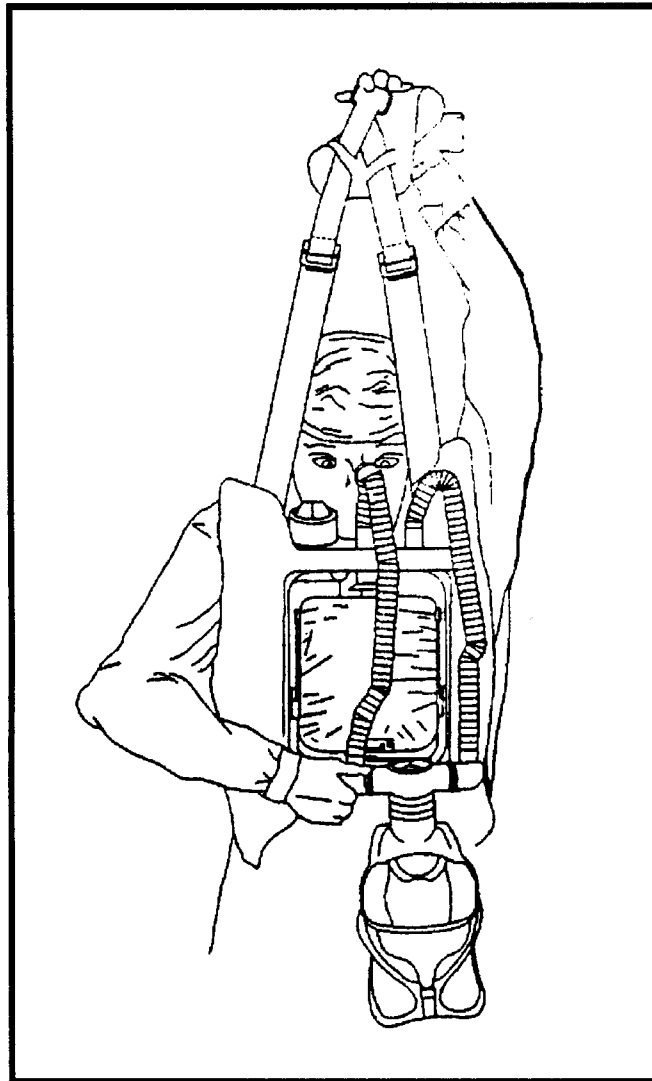
Couplings are different sizes and are color coded to ensure proper assembly. It is possible to slide the larger coupling onto the smaller nipple, but it will not latch or seal. The OBA will not function if the couplings are not properly installed.

- *Step 3*- Fully extend and straighten all body harness and waist straps. Extend the head straps and place them in front of the facepiece lens.

- *Step 4* - With one hand, grasp the facepiece by the combination valve assembly and the apparatus by the bail handle. With the other hand, grasp the body straps by the body harness and pad (see Figure 31-5). Bring the pad and harness over the head and position the OBA on the chest.

NOTE

DO NOT let the facepiece hang down by the breathing tubes.



*Figure 31-5. Lifting straps over head*

- *Step 5* - Run the underarm straps under the arms and attach the snap hooks to the rings on the top corners of the breastplate assembly.

- *Step 6* - Position breast plate so the breathing tubes are slightly below the shoulders. While the apparatus is held in position, adjust the underarm straps, then the shoulder straps until it is fitting comfortably. When adjusted correctly, the harness pad should be located in the top center of the back and head movement will not be restricted after donning the facepiece.

- *Step 7* - Place the facepiece over the head so it is out of the way.

- *Step 8* - Snap the waist strap to the bracket on the lower side corner of the breastplate. Adjust this strap to hold the apparatus snugly to the body. Wrap the excess strap under the secured part of the strap. If there is excess strap from the underarm straps, secure these under the waist strap.

**NOTE**

The waist strap can be quickly adjusted by changing the size of the waist strap loop. A nylon tie wrap attached to the loop will prevent the loop from being accidentally pulled out.

- *Step 9* - At this time, install the canister in accordance with the following procedure:

- Remove the canister tear-off cap by pulling the tab backward and downward.

Remove the metal protective disk, exposing the copper foil seal and O-ring. Discard the cap and metal disk. Inspect the copper foil seal and O-ring to ensure both are intact. Do not puncture the copper foil seal.

**WARNING**

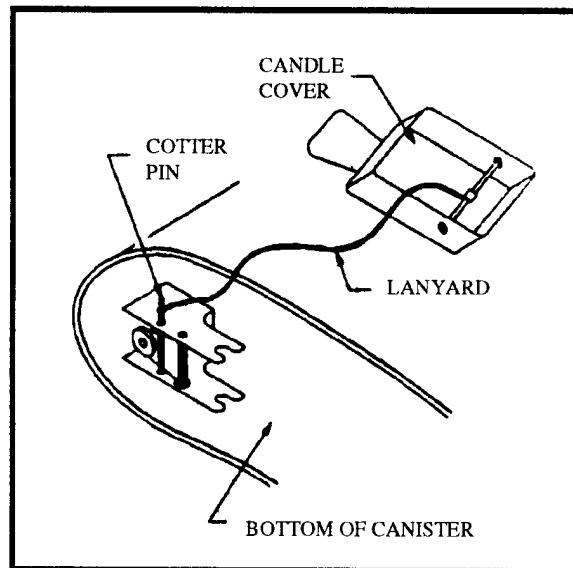
DO NOT pull the lanyard when removing the candle cover. Pulling the lanyard removes the cotter pin, which fires the candle and generates oxygen. The cotter pin and candle cover are shown in Figure 31-6. If the canister is fired while the foil seal is still in place, pressure will build in the canister, causing the foil to rupture.

- Remove the candle cover by holding the canister upside down and rotating the swivel plate 180 degrees. Pull the swivel plate up and toward the center of the canister as illustrated in Figure 31-7. Leave the cover dangling from the lanyard as illustrated in Figure 31-6. DO NOT pull the lanyard.

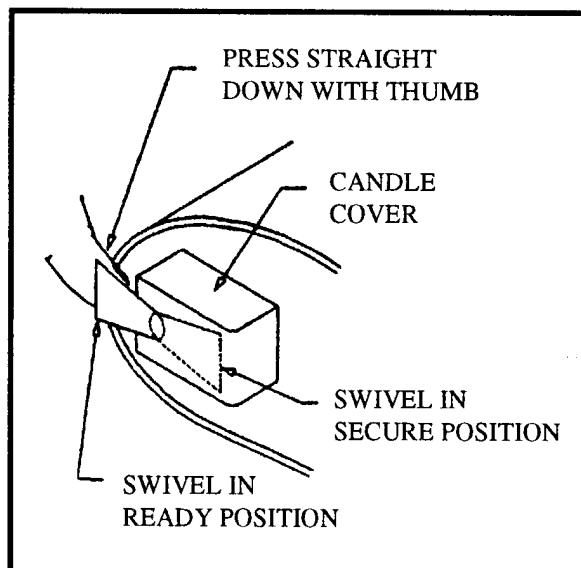
- With the bail handle locked in the standby (down) position, insert the canister upward into the guard, with the neck up and the concave, ribbed side toward the body, as illustrated in Figure 31-8, page 31-10. The canister is correctly inserted when it is firmly retained by the canister retaining mechanism. This is called the standby position and is illustrated in Figure 31-9, page 31-10.

**WARNING**

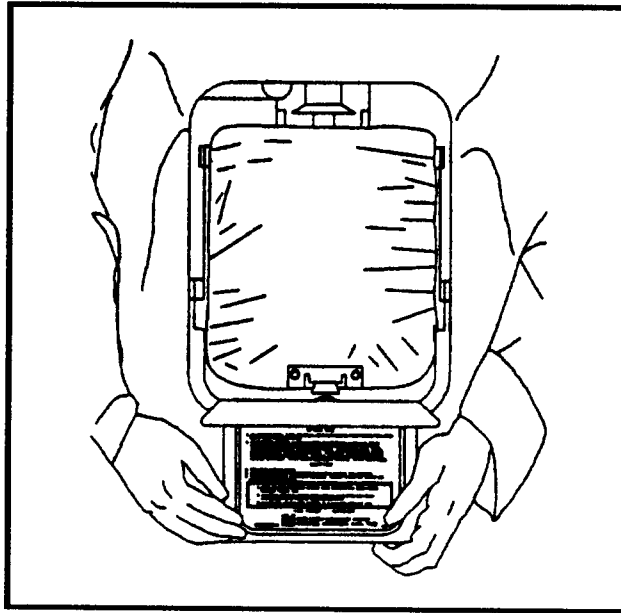
DO NOT use an OBA which pierces the foil seal in the standby position. If the copper foil seal is pierced when the canister is placed in the standby position, adjust the standby stop in accordance with chapter 6, paragraph 6-2.2 of SS600-AA-MMA-010/A-4, Technical Manual for Oxygen Breathing Apparatus Type A-4.



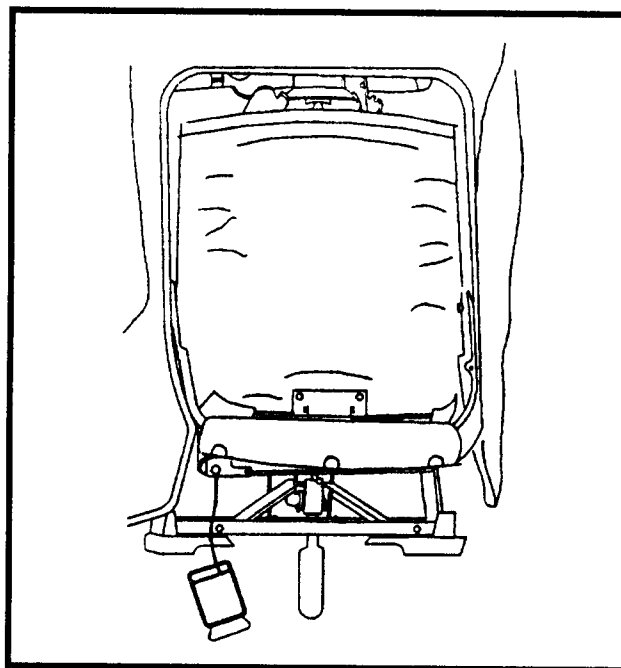
*Figure 31-6. Candle cover with lanyard*



*Figure 31-7. Candle cover with swivel base*



*Figure 31-8. Inserting canister into OBA*



*Figure 31-9. Canister held in standby position*

- *Step 10* - Don the facepiece as follows:

**WARNING**

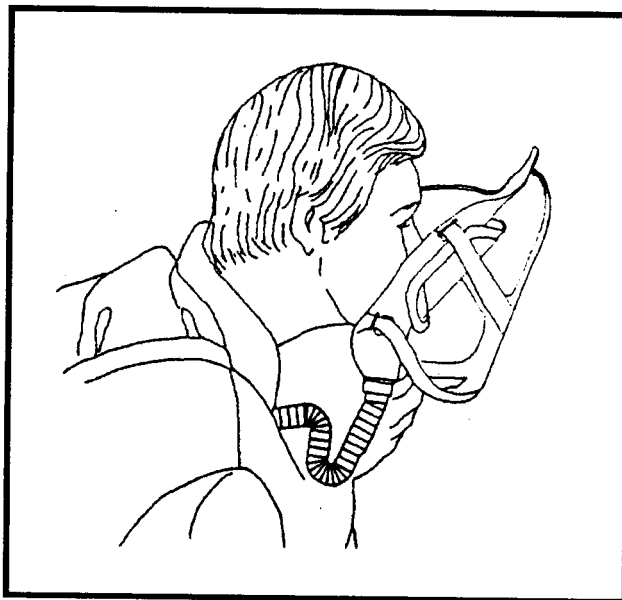
If hair is allowed to penetrate the seal between the face and mask, it may result in a loss of oxygen from the OBA and penetration of toxic fumes from the outside. The portion of the face in contact with the seal will be clean shaven to maintain an effective seal.

- Insert the chin into the chin stop in the facepiece as shown in Figure 31-10, page 31-12.
- Pull the head straps on front of the facepiece over the head and make sure that the straps are lying flat. This is illustrated in Figure 31-11, page 31-12.
- First tighten both lower straps at the same time. Next tighten both upper straps at the same time. This is illustrated in Figures 31-12 and 31-13, page 31-13. Do not tighten the forehead strap at this time.
- Place both hands on the head harness pad (on back of head) and push it down toward the neck.
- Retighten the lower and then the upper straps.
- Tighten the forehead strap if needed.

**NOTE**

When properly donned, both lower straps are tightened equally, both upper straps are tightened equally, the facepiece is centered on the face, and the head harness pad is centered squarely on the back of the head.

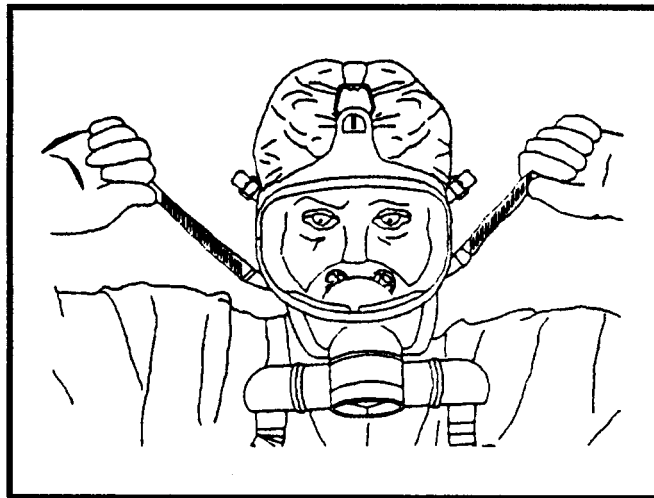
- Test the facepiece seal. To do this, squeeze the corrugated breathing tubes together tightly with one hand and inhale gently as illustrated in Figure 31-14, page 31-14. The facepiece should collapse inward and remain collapsed while breath is held. This indicates there is a gas tight seal. Hold breath for at least five seconds. If a leak is detected, readjust the head harness straps. The facepiece should be tested each time it is donned.
- Make final adjustments to all four body harness straps. The wearer should be able to look up and down without the facepiece shifting or the breathing tubes catching on the timer.
- If going into standby or ready condition, loosen the lower facepiece straps only. This allows the wearer to remove the facepiece and place it over the head out of the way until needed.



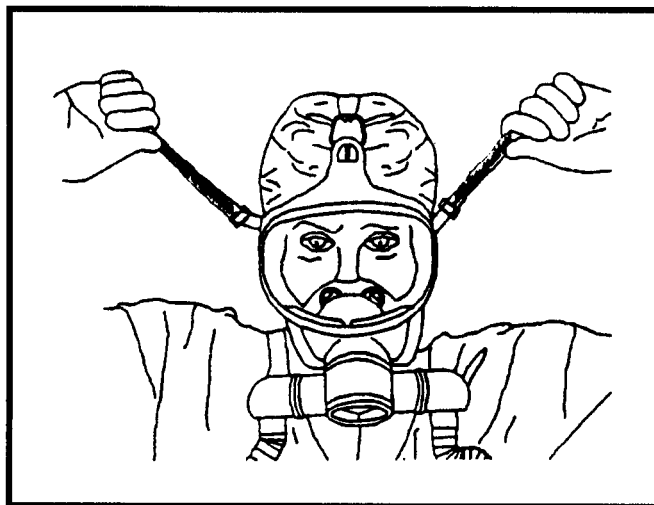
*Figure 31-10. Inserting chin into facepiece*



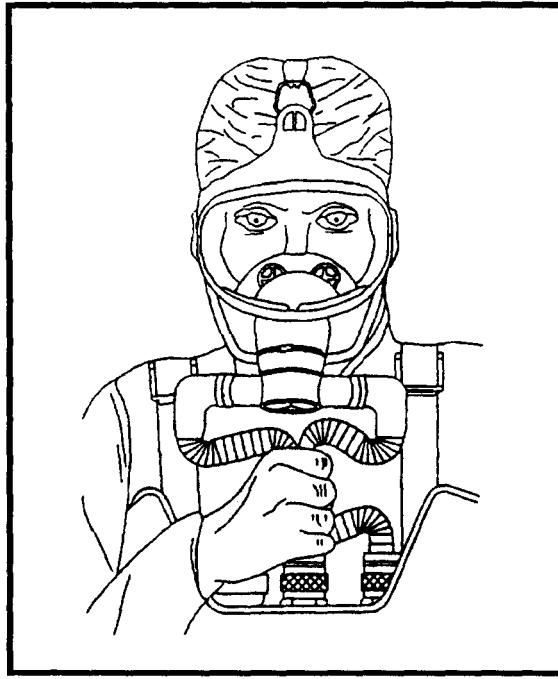
*Figure 31-11. Pulling straps over head*



*Figure 31-12. Tightening lower straps*



*Figure 31-13. Tightening upper straps*



*Figure 31-14. Testing facepiece seal*

**31-10. PLACING OBA IN OPERATION.** After the OBA has been properly donned and adjusted, use the following steps to place it in operation.

- *Step 1* - If in standby, don the facepiece and retighten the lower straps. Then retest the seal of the facepiece (see paragraph 31-9, step 10).
- *Step 2*- Using both hands, depress tabs on the bail handle to unlock the bail assembly from the bottom locked position. Swing the bail handle upward until it snaps into position. Push the bail handle forward without depressing the tabs. The handle should not move if locked in position.

**NOTE**

If the metal canister cap has not been removed, the bail handle will not swing upward into the operating position, and the plunger assembly may be damaged.

- *Step 3*- Once step 2 is completed, the canister is ready to fire. Pull the lanyard on the canister out and away from the body as shown in Figure 31-15, page 31-16. Hold the lanyard up and visually inspect it to ensure that the cotter pin has been removed from the canister candle firing mechanism. If the cotter pin is attached to the lanyard, the canister has been fired. A small amount of harmless smoke may be present when the canister is fired.

**NOTES**

Should the lanyard break, the canister can be started by pulling out the cotter pin with a pair of pliers. Assistance should be obtained to remove the cotter pin in this manner.

In the event the candle does not fire, refer to paragraph 31-10, subparagraph a. (page 31-17) for procedures on manual starting. A misfire of the candle is indicated by failure of the breathing bags to inflate.

- *Step 4* - While the candle is filling the breathing bags, depress the left breathing bag at the pull tab with the left hand as shown in Figure 31-16, page 31-16. Grasp and seal off both breathing tubes with the right hand while pressing against the right breathing bag with the right elbow at the same time as shown in Figure 31-17, page 31-17. The left bag must be compressed at the pull tab so that the relief valve does not open during this test. This procedure tests the canister, tube connectors, and breathing bags for tightness. If the bags do not remain inflated during the test, determine the cause of the leak and correct prior to use.

**WARNING**

DO NOT pull the breathing bag tab during normal operation. This will cause a loss of oxygen from the bag.

- *Step 5* - Breathe normally. The exhausted breath will cause a chemical reaction, which will generate new oxygen from the canister. There will be more oxygen in the bag than is required. Excess oxygen will vent from the bag automatically through the relief valve in the bag. If the relief valve should stick after extended stowage time, use the breathing bag pull tab to activate the relief valve. While pulling the tab, check the breathing bag with the right hand to ensure bag does not deflate completely.

**WARNING**

Once the timer bell has sounded, start leaving the contaminated atmosphere area and return to fresh air.

- *Step 6* - Once the apparatus is inflated, working, and has been leak tested, set the timer. Rotate the pointer clockwise to 60 minutes and then set the time for 20 minutes. Rotating the time to 60 minutes before setting the timer to 20 minutes is required to completely wind the timer bell.

NOTE

The pointed end of the timer handle will be pointed directly away from the wearer when the bell sounds.

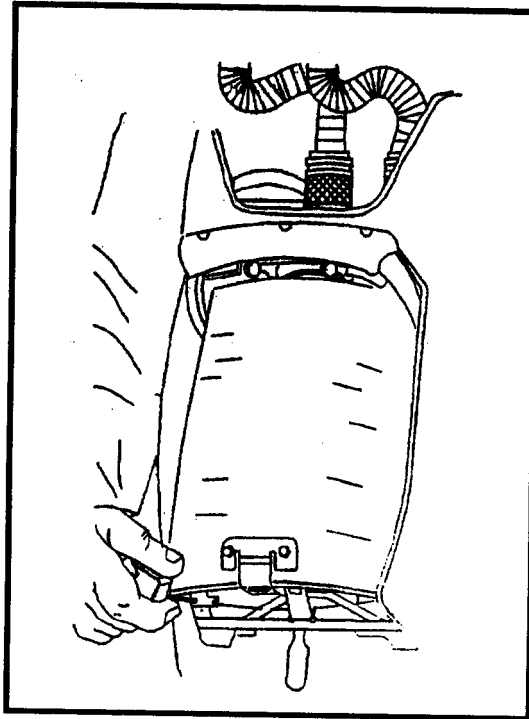


Figure 31-15. Pulling lanyard

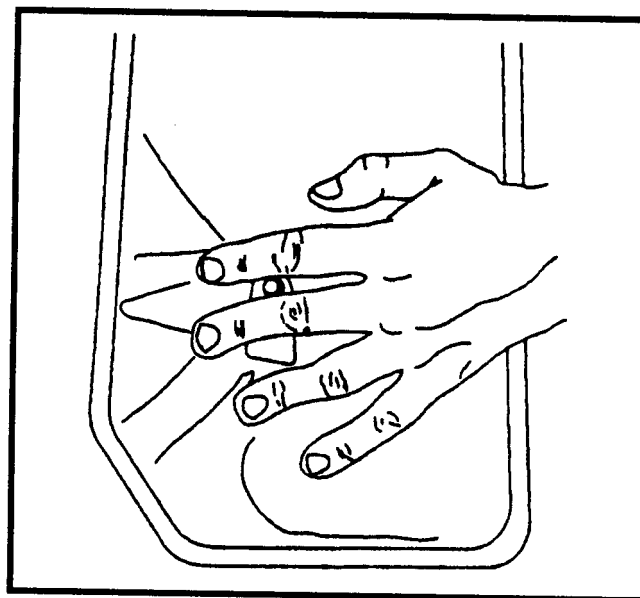


Figure 31-16. Depressing left side of breathing bag

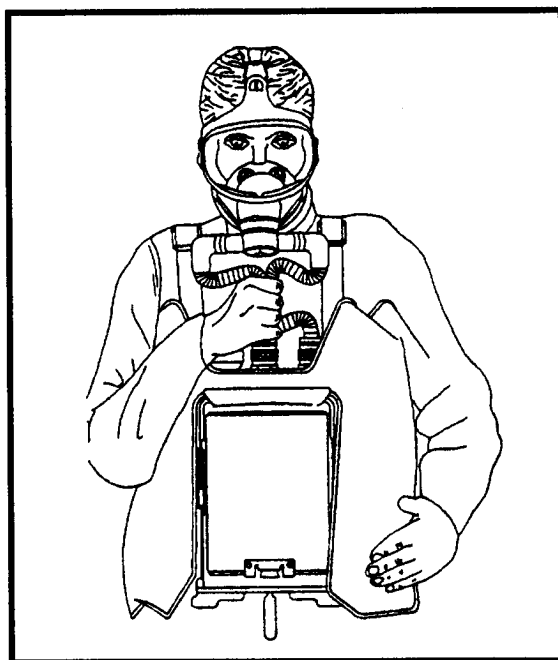


Figure 31-17. Testing OBA for leaks

a. **Canister Manual Starting.** The steps presented here are used to start canisters which have misfired. These steps will be conducted on these canisters if there is sufficient time to carry out the steps and there is a shortage of quick start canisters. Perform the following steps to manually start the OBA.

- *Step 1* - Grasp both breathing tubes with one hand and squeeze tightly.
  - *Step 2* - Work fingers from the other hand under the facepiece to break the seal.
- Then inhale to draw external air into the facepiece.
- *Step 3* - Remove fingers to reseal the facepiece. Release the breathing tubes and exhale into the facepiece. This forces air through the canister and into the breathing bags.
  - *Step 4* - Repeat steps 1, 2, and 3 until the breathing bags are fully inflated.
  - *Step 5* - Deflate the breathing bags by applying pressure on the right-hand side.

Continue this procedure until the right bag is deflated.

- *Step 6* - Reinflate and deflate the breathing bags as directed in steps 1 through 5.
- *Step 7* - Carefully feel the bottom of the canister without gloves. If it is warm, oxygen is being generated and the apparatus is ready for use. Set the timer and proceed with work. If the canister is not warm, repeat steps 1 through 5.

#### NOTE

Cold temperature and wind dissipate the heat generated by the chemical reaction and tend to slow it down. In lower temperatures, several cycles of inflating and deflating the bag may be required to start oxygen production.

b. **Canister Removal.** The following are the steps for canister removal.

**WARNING**

Expendable canisters are hot and will burn unprotected skin. DO NOT attempt to touch the canister during removal without wearing fireman's gloves. In the event the expended canister cannot be disposed of after use and must be temporarily stowed until disposal action can be taken, extreme caution must be exercised when handling and stowing the expended canister. Care will be taken to prevent the entry of any foreign substances into expended canisters (particularly grease, oil, or water). Any of these substances can cause a violent chemical reaction and may even cause the canister to explode.

- *Step 1* - If the canister has been used, loosen the lower straps and remove the facepiece. Put it over your head in the standby position. The facepiece may be left on if another canister is going to be inserted into the OBA immediately.
- *Step 2*- Unlock the bail handle by depressing the tabs. Push the bail handle down from the operating position to the standby position. Loosen the waist strap, spread your legs apart, lean upper body slightly forward, and pull the canister release tab, while keeping hands away from the falling canister. The canister should drop out. If the canister fails to fall out, shake the OBA. This should free the canister.
- *Step 3*- If the canister still fails to drop out of the apparatus, insert a thin metal rod between the inhalation and exhalation tubes. Then, pull the release tab and attempt to force the canister out. If this does not free the canister, set the OBA aside and allow the canister to cool. Then remove the canister using gloves.

**WARNING**

The leak test described in paragraph 31-10, step 4, will be performed after each fresh canister is inserted and started. If the facepiece is removed, leak test the facepiece after putting it back on (see paragraph 31-9, step 10).

c. **Canister Replacement.** Replacement of quick start canisters while the OBA is in use can be carried out indefinitely. Return to a noncontaminated atmosphere at the end of 20 minutes. Once in the noncontaminated atmosphere, replace the used canister with a fresh canister.

31-11. **REMOVING OBA.** Perform the following steps to remove the OBA.

- *Step 1* - Remove the facepiece by releasing the head straps at the buckles before pulling it off.
- *Step 2* - Place the facepiece over your head in the standby position and remove the canister.
- *Step 3* - Loosen the waist strap and unhook it.
- *Step 4* - Loosen the shoulder straps and unhook the underarm straps from the upper corners of the breastplate assembly. Grasp the facepiece and bail handle with one hand. Grasp the shoulder harness, preferably at the D-ring connector, with the other hand and lift the harness over your head.
- *Step 5* - Wipe down the OBA if it is wet or moist.
- *Step 6* - Clean the OBA after each use.

31-12. **CANISTER DISPOSAL.** The following describes the guidelines for canister disposal.

#### **WARNINGS**

Never handle opened canisters without suitable hand and eye protection (firemen's gloves and goggles). The canisters contain caustic chemicals that will injure the skin and eyes and should not be allowed to come in contact with the person. Never allow expended or unexpended chemicals to spill from the canister. These chemicals may cause combustion of any flammable materials with which they are brought into direct contact, especially if the materials are moist. Any spills will be cleaned up immediately and dumped overboard when more than 25 nautical miles from shore. When in port or within 25 nautical miles of shore, put spilled material into a double wrapped poly bag, seal, and turn into proper authorities for at-shore disposal. Use a dustpan made of metal or nonflammable materials to cleanup spills.

Use dry tools free of grease, oil, and water when puncturing canister copper foil seals.

a. **Overboard Disposal.** Dispose of canisters when the copper foil seal beneath the tear-off cap has been punctured. Jettison canisters overboard when the ship is more than 25 nautical miles from shore. Before disposal, care shall be taken to prevent any foreign substance (particularly water, oil, or grease) from entering the canisters. Do not puncture the sides or bottoms of canisters, but ensure that the tear-off caps are removed and the copper foil seals are fully punctured. This allows water into the canisters after they have been jettisoned overboard.

NOTE

If the canister tear-off cap has been removed, but the neck seal has not been damaged and the copper foil seal has not been punctured, the canister may be recapped for later use. Recap the canister with a new metal cap (NSN 9G4240-00-089-7932) (package of 10).

b. **Temporary Stowage of Used Canisters.** If the ship is within 25 nautical miles of shore perform the following steps:

- *Step 1* - Place unusable and unfired canisters in a clean metal bucket. Puncture the copper seal of the unusable or unfired canisters (if not already punctured), and then tire the candle. Set aside and let the canister produce oxygen from the candle for at least 15 minutes.
- *Step 2* - After cooling enough to be handled, recap canisters to be disposed of with a new metal cap.
- *Step 3* - Next, wrap the canister to be disposed of in double poly bags (NSN 8105-00-299-8532 or equivalent). Stow the poly bag wrapped canisters in a dry, oil-free environment until proper at-sea or shore site disposal is possible. Stowage will be carried out in a manner to protect against tearing and exposure to heat sources that could melt or ignite the bag.
- *Step 4* - If step 2 cannot be achieved, canisters will be stowed in sealed, clean, dry, oil-free metal containers. Containers will be of the open head closeable drum type with a gasket. Stow containers in a cool, oil-free space until proper at-sea or shore site disposal is possible.
- *Step 5* - Upon arrival in port, contact the department ashore responsible for hazardous waste management. Arrange for off loading of used or unusable OBA canisters.

NOTE

In an emergency, it may be necessary to dispose of expended canisters overboard when the ship is within 25 nautical miles of shore. Care will be taken not to dispose of canisters in an oily environment.

31-13. **PRECAUTIONS.** The following precautions should be followed when using the OBA and OBA quick start canister.

a. **OBA Precautions.** The following precautions are to be followed when using the OBA.

- Activate the OBA when ready to enter a compartment that has the possibility of a contaminated atmosphere. Prior to entering contaminated atmospheres, check the apparatus to make sure it is airtight in accordance with the donning and operating instructions (see paragraph 31-9, step 10 and paragraph 31-10, step 4). Ensure that the breathing bags are properly inflated before entering the compartment. If excess time is needed to fill the bag or rapid deflation after filling occurs, conduct a leak check (see paragraph 31-10, step 4). Once the apparatus is inflated, set the timer. Turn the pointer on the timer dial clockwise to 60 minutes and then turn it back to 20 minutes. Rotating the time to 60 minutes prior to setting it to 20 minutes is required to fully wind the timer bell.

**WARNING**

DO NOT use an OBA for diving. Water entering through the facepiece and exhalation tube will react violently with the chemicals in the canister.

- When properly fitted and operated, the OBA forms a closed breathing loop with the wearer's respiratory system. In an emergency, it can be worn in partially flooded compartments, however caution must be exercised. The danger of water entering through the seal at the canister neck is negligible; however, the danger of a violent chemical reaction due to water entering the canister through the facepiece and exhalation tube must be considered and guarded against. Should the water level cover or partly cover the breathing bags, breathing will be more difficult. The added buoyancy at the wearer's chest will cause difficulty in balance and create a buoyant effect similar to that of a life jacket.

- Take care to protect breathing bags, breathing tubes, and facepiece from damage. If any of these are torn or pierced while working in an unsafe atmosphere, cover damage with hand and return to fresh air immediately.

- If canister is changed in fresh air without removing the facepiece, follow the canister starting and OBA leak checking procedures before leaving fresh air.

- Never release the facepiece seal in an unsafe atmosphere, even if inhalation becomes difficult. Check the breathing tubes to see if they are kinked and restricting air flow. If a kinked tube is not the problem, return to fresh air immediately and have the OBA thoroughly checked.

- While in operation, check the timer knob frequently by feeling the pointed end. This is the best way to ensure that the timer is working and to check the remaining time, especially when there are high noise levels and poor visibility.

**WARNING**

Under no circumstances should the oxygen producing candle be saved for emergency retreat from the compartment. This practice is dangerous since candles have been known to misfire.

- When the timer bell sounds, the canister has been used for 20 minutes and the wearer will return to fresh air. The wearer will also return to fresh air if it becomes difficult to exhale or if the lens fogs up when inhaling. Remember, the approximate on-station time for an OBA canister in continuous use is 20 minutes.
- If hydrocarbon vapors are present, the OBA should not be used for more than a total exposure time of 3 hours (intermittent use only). After an exposure of 3 hours, rubber parts should be replaced. These parts include the following:
  - Facepiece assembly and head harness.
  - Corrugated breathing tubes.
  - Breathing bags.

**b. Quick Start Canister Precautions.** The following precautions are to be observed when using an OBA quick start canister.

- Canisters will be stowed in a cool dry place. Never stow canisters in the OBA. Do not remove the tear-off cap until ready to insert the canister into the OBA. Never remove and replace canisters in a contaminated atmosphere. Do not stow canisters near oil, water, or grease.
- Insert the canister into the OBA and lock the canister in the operating position before pulling the lanyard to activate the canister. Never pull the lanyard until the canister has been inserted into the OBA and is in the operating locked position. If the lanyard is pulled before the canister is inserted into the OBA or the canister is not in the operating locked position, the copper foil seal will blow out.
- Never try to reuse a canister. Once the copper foil seal is pierced and the canister has been removed from the OBA, the canister will be considered expended.
- Used canisters are very hot and should never be handled without suitable hand protection. Never allow any substance (particularly oil, water and oil mixtures, gasoline, or grease) to enter the neck of the canister. A violent reaction occurs when these substances come in contact with the oxygen producing chemicals. Never hold your face over the canister opening.
- Never handle opened canisters without suitable hand and eye protection (rubber gloves and goggles). The canisters contain caustic chemicals that will injure the skin and eyes, and should not be allowed to come in contact with the person. Never allow expended or unexpended chemicals to spill from the canister, as these will cause combustion of any flammable materials with which they are brought into direct contact, especially if the materials are moist. The spill should be cleaned up immediately and dumped overboard if more than 25 nautical miles from shore. If in port

or within 25 nautical miles of shore, store spilled material in double wrapped poly bags until proper disposal can be accomplished. Use a dustpan made of metal or nonflammable materials to clean up spills.

- Canisters should never be painted. Canister stock will be rotated to allow older canisters to be used first or for training. Canisters with paint peeling off should also be used first.

31-14. **TENDING LINE.** The following describes the tending line and its use.

a. **Description.** When the OBA is in use, a tending line is provided for the user as a precautionary measure. The OBA tending line is a 50-foot length of 3/16 inch aircraft cable with a clear plastic covering. The tending line has a stout hook at each end, which is closed with a snap catch. Either hook is used for attaching the line to the D-ring on the OBA body harness pad. The cable is pliable and will slide freely around obstructions.

b. **Use of Tending Line.** When there is only one OBA wearer in a compartment, a tending line will be used and there will be at least one additional person handling the line. The tending line is used to locate an injured person wearing the OBA. To locate the injured person, follow the tending line to their location. Personnel tending the line should wear rubber gloves and boots. If there are two or more OBA wearers in the same compartment, it is not necessary to use a tending line. OBA wearers should keep in constant touch or sight of each other.

#### **WARNING**

If at all possible, stricken personnel will not be hauled by a line attached to their waist, or suspended from their waist. This can cause internal injuries. In an emergency situation, they may be dragged a short distance along the deck if no other means of rescue is possible. If the person lacks any sort of shoulder harness, make fast a line under their arms. Have the line meet either in the front or the back.

Do not attempt to pull injured personnel out using the tending line. This may injure them even more, as well as costing valuable time. For a rescue to be effected immediately, rescue personnel standing by will have OBAs donned and in the standby position. This will enable immediate entry when canisters are fired.

c. **Tending Line Signals.** When a tending line is employed, the wearer of the OBA will remain in constant contact with the line tender. This is accomplished by the tending line signal system. Table 31-1, page 31-24 shows each signal and the corresponding meaning. The code for the signals spells OATH. This makes it simple to remember the signal system.

Table 31-1. Tending line signals

CODE	PULL	MEANING
O	1	OK
A	2	Advance
T	3	Take Up
H	4	Help

31-15. **STOWAGE.** The following describes the ways to stow the OBA.

a. **Stowage in Lockers.** Stow OBAs in damage control lockers or in specified OBA lockers located throughout the ship. Stow OBAs in areas of the damage control lockers that are cool and dry. This prevents the build-up of moisture, which causes mildew damage to the rubber facepiece, inhalation and exhalation tubes, and breathing bags. Keep all OBAs away from oil, paint, and greasy substances. These are harmful to materials used in the construction of the OBA. A properly stowed OBA in a damage control locker is laying horizontal, one high, on a shelf with the facepiece on top. An OBA may be hung only in specific OBA lockers.

b. **Stowage in Kit Bags.** OBAs may be stored in the Firemen's Utility Bag along with up to two canisters, flash hood, flash gloves, fire fighting helmet, and fire fighting gloves. The kit bags may be hung on hooks which should be installed in such a way that the bags will be out of traffic and will be easily accessible. Care must be taken that the heavy body of the OBA and other heavy items are placed in the bottom of the bag and the mask is placed on top to avoid damage to breathing tubes.

c. **Protection of Facepiece.** The facepiece may become scratched and damaged from entering and leaving tight spaces such as scutties, while the mask is in the standby position. Damage may also occur from stowing and moving the OBAs. To prevent damage and the need to replace the facepiece, place a piece of surgical stockinet over the entire facepiece down to the bottom of the breathing tubes. Cut the stockinet into three-foot strips. Knot each end and slip the open end over the facepiece and breathing tubes. The stockinet should remain in place during stowage and when proceeding to the scene.

31-16. **OBA TRAINING CANISTER KITS.** The following describes the use of training canisters. It also describes the stowage, precautions, and disposal of training canisters.

a. **Training Sessions.** All personnel will attend a training session on use the use of the OBA in accordance with commander instructions. All ships with OBAs have training kits as part of their allowance. The training kits will be used for classroom training of personnel in the use of the OBA. The training kits are used to ensure complete and realistic training for all personnel.

## NOTE

Training with quick start canisters is highly recommended, as funding permits.

b. **Introduction.** The training canister contains a replaceable candle and removable firing mechanism. It is designed for use by 40 trainees. Each candle provides a 5 minute supply of oxygen when fired. A new candle must be inserted into the canister for each trainee. Figure 31-18 is an exploded view of the training canister. Figure 31-19 illustrates the firing mechanism assembly.

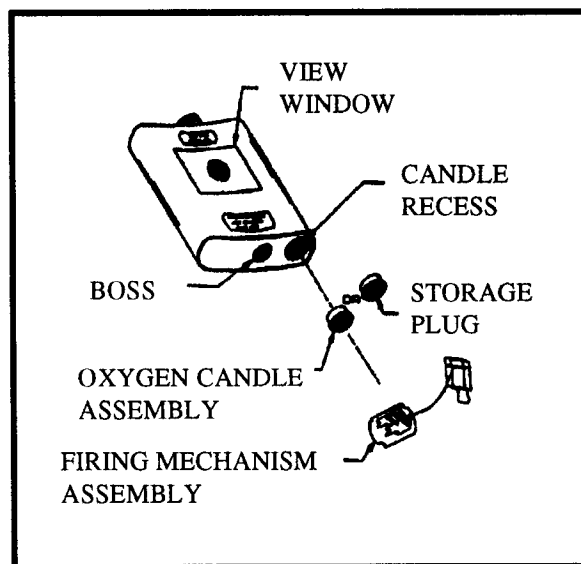


Figure 31-18. Exploded view of training canister assembly

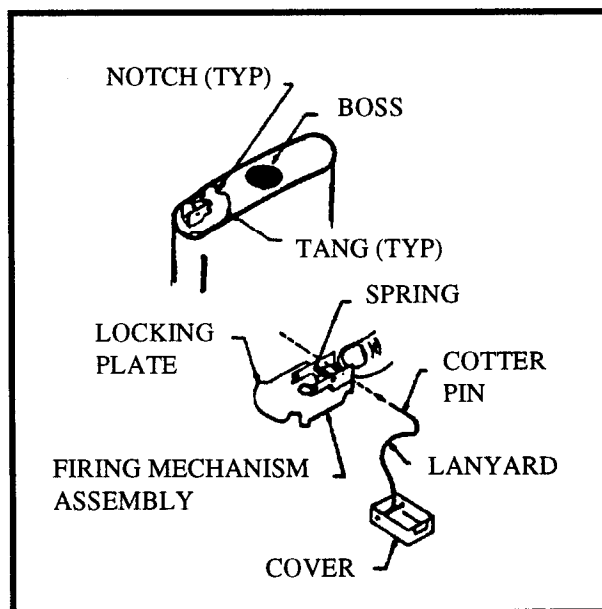


Figure 31-19. Training canister firing mechanism assembly

c. **Description.** The following items are in each training canister kit.

- One red canister (quick start canisters are green).
- One storage plug.
- Forty oxygen candle assemblies.
- Forty tear-off caps.
- One firing mechanism assembly.
- One protective housing assembly.
- Spare items include:
  - One storage plug.
  - One firing mechanism assembly.
  - Five protective housing assemblies.

A window is provided on the training canister for checking the chemicals. If the view window on the canister changes from solid pink to a solid blue color, discard the canister. The training canister should also be discarded if it has been used by 40 trainees. See paragraph 31-16j for training canister disposal instructions.

d. **Oxygen Generation.** Oxygen used in the training canister is generated by a replaceable candle, which produces a 5 minute supply (10 liters) of oxygen. Oxygen generation is started by firing the canister as you would a quick start canister. Oxygen generation starts within 15 seconds after the candle has been fired. A small amount of harmless smoke may be present when initially fired. This is a normal condition and is a positive sign that the candle is working. Another sign signifying that the candle is generating oxygen will be when the breathing bags inflate.

e. **Charging Instructions for Initial Use of Training Canisters.** Perform the following charging steps prior to initial use of a training canister.

- *Step 1* - Remove the cover from the firing mechanism and then remove the mechanism and storage plug (see Figure 31-18). Save the storage plug and reuse it when storing a partially used canister to prevent moisture from entering the canister body.
- *Step 2* - Insert the candle assembly into the candle recess in the canister. Ensure that the gasket is laying flat against the bottom of the canister.
- *Step 3* - Ensure that the firing mechanism is cocked and the cotter pin in place. Place the firing mechanism over the candle assembly with the candle primer housing projecting through the center hole. Notches should be lined up with tangs (see Figure 31-19).

**NOTE**

Notches and tangs are positioned so the unit can be assembled only in the correct position.

- *Step 4* - Rotate firing mechanism clockwise to lock the candle in place. Tighten until the tangs are in contact with the firing mechanism frame. Do not overtighten.
- *Step 5* - Fold the lanyard into the candle cover. Secure the candle cover on the firing mechanism frame.
- *Step 6* - The canister is now ready for use in the OBA.

f. **Charging Instructions for Previously Used Training Canisters.** Perform the following charging steps for canisters which have previously been fired.

- *Step 1* - Secure the metal tear-off cap on the canister neck. Ensure the hand tab is pointing toward the instruction label on the ribbed side of the canister.

**WARNING**

The firing mechanism and candle will be hot after use. Wear gloves or allow the items to cool before handling.

- *Step 2* - Remove the firing mechanism from the bottom of the canister. To accomplish this, turn the firing mechanism counterclockwise until the tangs line up with the notches.
- *Step 3* - Remove and discard the used candle.
- *Step 4* - Hold the firing mechanism with the slotted end of the frame pointing toward you. Raise the firing hammer to the cocked position.
- *Step 5* - While holding the firing hammer in this position, replace the cotter pin through the holes in the frame from the same side (see Figure 31-19).
- *Step 6* - Install the new candle and replace the firing mechanism in the training canister as described in paragraph 31-16e, steps 2 through 5.

g. **Starting the Training Canister.** Perform the following steps for starting the training canister.

- *Step 1* - Don and adjust the OBA in accordance with the steps contained in paragraph 31-9.
- *Step 2* - Remove the tear-off cap from the charged canister. Pull the tab straight backward and downward. Remove metal protective disk to expose the rubber O-ring.
- *Step 3* - To remove the candle cover, hold the canister upside down and rotate the swivel plate 180 degrees. Pull the swivel plate up toward the center of the canister. This is illustrated in Figure 31-7. Leave the cover dangling from the lanyard. This is illustrated in Figure 31-6. Do not pull the lanyard.
- *Step 4* - Don, adjust, and leak test the facepiece as outlined in paragraph 31-9, step 10.

- *Step 5* - With the bail handle locked in the standby position, insert the canister into the OBA with the concave, ribbed side toward your body. This is the standby position. Depress the bail handle tabs and swing the bail handle up until it locks in the operating position. Ensure the bail handle is locked in position by pushing forward on the handle without depressing the tabs. The bail handle should not move if it is properly locked in position.
- *Step 6* - Pull the lanyard straight out away from the body. This removes the cotter pin and fires the candle, inflating the breathing bags with oxygen. Leak test the OBA as outlined in paragraph 31-10, step 4. Hold the lanyard up and visually inspect it to ensure that the cotter pin has been removed from the canister candle firing mechanism.
- *Step 7* - Set the timer on the OBA. Rotate the dial to 60 minutes and then back to 5 minutes.

NOTE

The setting for a quick start canister is 30 minutes instead of 5 minutes.

- *Step 8* - After the training canister has been used for 5 minutes, remove the canister. To accomplish this, depress the tabs on the bail handle and swing the bail handle to the standby position. Loosen the waist strap, spread your legs apart, lean upper body slightly forward, and pull on the canister release tab while keeping hands away from the falling canister. The canister will drop out of the apparatus.
- *Step 9* - If the canister can be used for the next trainee, recharge it in accordance with paragraph 31-16f.
- *Step 10* - Following each use of the training canister, make a mark on the front of the canister with an indelible pen to indicate a use of the canister. When the canister has been used forty times or the canister view window changes from a solid pink color to solid blue, dispose of the canister as outlined in paragraph 31-16j.

**h. Stowage.** Training canisters will be stowed in kits and locked in special lockers or in locked compartments. The kit is to be kept locked up at all times, unless being used for training. The Damage Control Officer will have control of the keys to ensure that training canisters will not be used during actual emergencies. After the training is complete or if a break of more than one hour is taken, partially used canisters will be sealed using the metal tear-off cap. Remove the oxygen candle and insert the plastic storage plug in the canister candle recess. The partially used canister will be returned to the special locker or compartment and locked up. Inspections of all components will be made to ensure that they are protected from moisture, which will cause deterioration. If lockers are not provided, stowage will be in a locked, dry, cool storeroom.

i. **Training Canister Precautions.** The following precautions will be observed when using the OBA training canister.

- This type of canister is for TRAINING USE ONLY. The training canister will never be used during actual emergencies. Simple exercises can be performed while the unit is in use for training purposes. It will be changed with a fresh candle prior to each use and will only be used in the presence of an instructor. Personnel experienced and qualified in the use of the OBA will act as instructors. The use of the training canister by any trainee will never exceed 5 minutes.

- Prior to each use of the training canister, the instructor will inspect the color of the chemical through the view window. A pink color in the view window indicates a safe canister. As CO<sub>2</sub> is absorbed, the color in the view window will change to blue. When the canister has been used by forty trainees or if the color in the view window is completely blue (whichever occurs first), discard the canister.

- All trainees will be under the instructor's supervision at all times. The instructor will ensure that the breathing bags are inflated and continually supplying oxygen. If a low oxygen air mixture exists and is inhaled, near immediate collapse of the trainee will occur. Immediate aid will be rendered by the instructor.

- Training canisters will be kept free of oil, water and oil mixtures, gasoline, and grease.

- The training canister firing mechanism and candle assembly get hot after firing the candle. Exercise care when removing the training canister firing mechanism and candle assembly for recharging the canister (see paragraph 31-16f).

- The chlorate candles used in the training canisters are subject to moisture deterioration. Therefore, training kits will not be opened until immediately prior to use. Keep kits closed whenever practicable. Do not remove candles from their protective cans until the canister is to be recharged.

**NOTE**

Only candles contained in individual cans with tear-off caps are allowed for use in training canisters. Older candles which are wrapped in plastic will be discarded.

- Training canisters will not be stowed inside the OBA and training canister kits will not be stowed in damage control lockers. Do not attempt to cock the firing mechanism while the mechanism is mounted on the training canister. Do not remove the tear-off cap until the canister is to be inserted into the OBA. The canister will not be stowed without the tear-off cap and plastic storage plug in place. Never stow the canister with the oxygen candle installed in it.

j. **Disposal.** After the training canister has been used by 40 trainees or if the view window is a solid blue color, dispose of the canister as outlined in paragraph 31-12. Once a chlorate oxygen candle has been burned, it contains harmless sodium chloride and partially oxidized iron and can be disposed of in the regular trash once it has cooled.

**31-17. PROCUREMENT.** Order the following items by their appropriate NSN.

- Oxygen Breathing Apparatus, Navy Type A4, MSA Cage Code 55799, NSN 4240-00-616-2857.
- Oxygen Breathing Apparatus, Navy Type A4, S-TRON Cage Code 2J495, NSN 4240-01-297-5986.
- Canister, NSN 4240-00-174-1365.
- Training Kit and Canister, NSN 4240-00-238-9959.
- Wire Rope Life Line, NSN 4010-00-285-9901.
- Cap, Canister (10 per box), NSN 4240-00-089-7963.
- Bag, Plastic (100 per box), NSN 8105-00-299-8532.
- Stocknet Surgical, (2 rolls, 10" width x 75' length), NSN 6510-00-204-1000.
- Spectacle Kit, NSN 4240-00-781-6318.
- Wrench, Spanner, NSN 5120-01-148-2422.

## CHAPTER 32

### DEWATERING/FIREFIGHTING PUMP

32-1. **GENERAL.** This chapter contains information on the safe use of the HALE P-250 Pump, Mod 1 dewatering/firefighting pump unit. The purpose of the pump is to provide emergency dewatering of watercraft in danger of sinking and portable fire fighting.

32-2. **EQUIPMENT DESCRIPTION.** The P-250 Pump, Mod 1 (see Figure 32-1, page 32-2) is a gasoline-driven portable pump with an internal-combustion engine. It is used in fire fighting and in dewatering operations. When used for fire fighting, the pump draws water from the sea and pumps the water through suitable tire hoses and nozzles at a high pressure. When used for dewatering, it draws a large volume of water from flooded compartments and discharges it into the sea. It can pump 250 gpm at 125 psig. It is hand primed up to a suction lift of 16 to 20 feet. The entire pump is contained in a tubular aluminum frame that can be dragged or carried by two people.

#### WARNINGS

Do NOT try to start and/or operate the pump unit without first reading and thoroughly understanding the operating procedures in the TM provided with the pump.

Hearing protection is required when operating this pump to avoid hearing damage.

Do NOT operate pump unit in an enclosed area without proper exhaust hoses connected and routed to outside atmosphere. Exhaust gases contain carbon monoxide which is odorless and poisonous and can cause injury or death if inhaled. Regularly check exhaust hoses, connections, and gaskets for leaks during operation. Follow instructions in the TM for exhaust hose attachment.

Gasoline and gasoline vapors are extremely flammable. When filling the fuel tank, keep gasoline away from open flames, sparks, or high heat. Provide adequate ventilation.

A "NO SMOKING" decal will be on the gasoline tank.

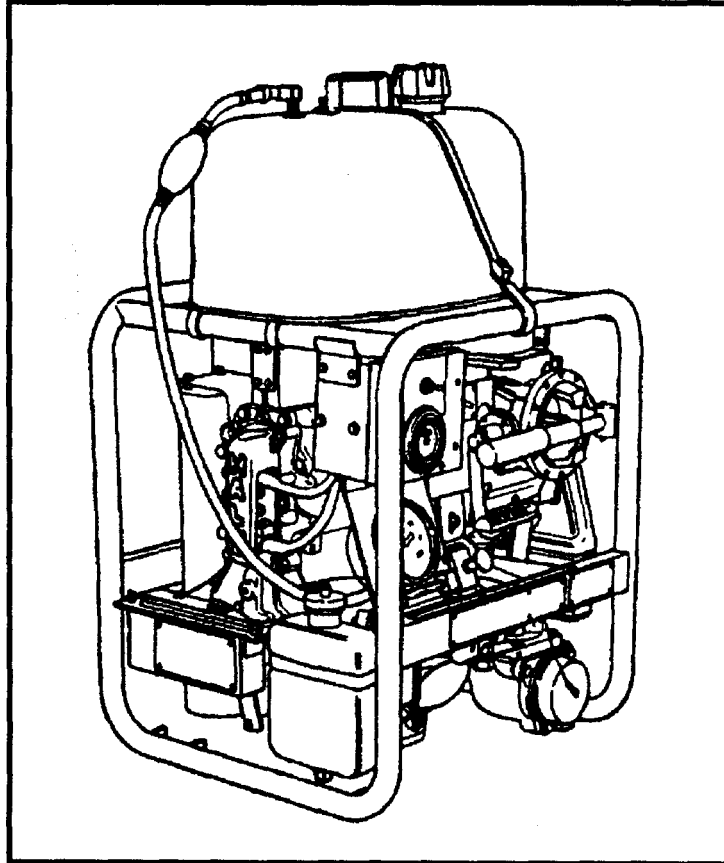
Do NOT overfill the fuel tank. Variations in atmospheric conditions may cause fuel to expand and escape from the fuel tank, causing explosive conditions.

Do NOT place hands or any other parts of the body near the exposed flywheel when operating the engine with the starter recoil mechanism removed.

If the recoil assembly must be disassembled, wear eye and face protection. The recoil spring is under tension and can cause injury.

### CAUTIONS

- Secure the discharge hose to control the discharge spray.
- Secure the pump unit so it will not move due to vibration.
- Secure the fuel tank to the pump unit.



*Figure 32-1. Dewatering/firefighting pump (P-250 Pump Mod 1)*

**32-3. INSPECTION AND MAINTENANCE.** Inspect and maintain the pump according to the procedures in the TM provided with the pump kit.

**32-4. MONTHLY PUMP AND ENGINE TEST RUN.** This inspection will be performed on all pumps in service. To perform the monthly inspection and test, complete the following steps:

- Check gasoline and oil levels.
- Attach suction hose to proper pump connection and visually check for cuts, pin holes, and burn spots.
- Attach a 1 1/2-inch fire discharge hose to the trigate.
- Ensure suction hose strainer is completely submerged in the water to be pumped.

## NOTES

For test purposes, the pump should be positioned 5 to 10 feet above the water to be pumped for the pump test.

Engines that require more than six pulls on the starter rope to start shall be tuned up or repaired as required.

Pumps that fail to pump water within 5 minutes will be inspected for adjustment or damage to the impeller/wearplate and/or leaks in the suction hose, suction hose coupling, and pump housing. Refer to the TM furnished with the pump for troubleshooting.

## CAUTION

Do not run pump for more than 20 seconds unless pressure shows on the gauge.

Start engine.

Allow a maximum of 20 seconds for pump to begin suctioning water. Allow pump to pump water for 15 minutes.

- After 15 minutes of pumping, stop engine.
- Drain pump housing and pump hoses.
- Remove all components and inspect for missing or damaged items. Repair or replace them as required.
- Store pump in accordance with vessel SOP.
- Make appropriate entries in the vessel's log and maintenance records regarding total hours of operation; any problems encountered; and any malfunctioning, damaged, or broken components.

**32-5. ADDITIONAL INFORMATION.** A problem was found with the 1 1/2-inch tire hose threads not matching with the P-250 trigate valve threads. This problem can be resolved with an adapter (NSN 4210-00-209-5023) or 1 1/2-inch fire hose (NSN 4210-01-131-0249) (orange in color).

**32-6. PROCUREMENT.** Order the pump and related items by the following NSNs.

- P-250 (Navy) Mod 1 (NSN 4320-01-186-3377).
- Suction Hose (3 feet ID X 10 feet long) (NSN 4210-00-725-9234).
- Foot Valve and Strainer (3-inch ID connection) (NSN 4820-00-540-2381).
- Exhaust Hose (2-inch ID X 20 inches long) (NSN 4210-00-776-0657).
- Spanner Wrench (NSN 5120-00-277-9076).
- Eductor (3 inch suction X 2 1/2-inch feed hose) (NSN 4320-00-256-8206).
- Adapter, 1 1/2-inch national pipe thread (P-250 trigate) to 1 1/2-inch national standard thread (white jacket fire hose) (NSN 4210-00-209-5023).
- Discharge Hose, 4 inches by 50 feet long, Orange (NSN 4210-01-220-6648).
- Trigate Valve (NSN 4210-01-038-6001).

## CHAPTER 33

### FIRE HOSE

33-1. **GENERAL.** This chapter contains inspection and maintenance information about fire hose and fire hose nozzles used on board Army watercraft.

33-2. **APPLICATION.** Fire hoses and nozzles shall be serviceable and connected to all fire stations. Fire hoses and nozzles will be maintained in accordance with this chapter.

33-3. **VISUAL INSPECTION.** Visual inspections will be made on fire hoses, nozzles, and hose couplings. The following describes the inspection of each of these items.

a. **Fire Hose.** Inspect each fire hose during weekly fire drills to determine that the hoses and nozzles have not been vandalized. Check to make sure that the fire hoses are free of debris. Also check to make sure there is no evidence of mildew or rot, or damage by chemicals, burns, cuts, abrasions, and vermin. If the hose fails the visual inspection, it must be removed from service, destroyed, and replaced.

b. **Nozzles.** All nozzles will be inspected at weekly fire drills and after each use. Inspection will include the following:

- Clear of obstructions in waterway.
- No damage to tip.
- Tip chain is intact.
- Full operation of adjustments, such as pattern selection, and so on.
- Proper operation of shutoff valve.
- No parts missing.

If the nozzle fails the inspection for any reason, it must be removed from service and repaired or replaced. Nozzles attached to in-service fire hoses will be kept in the closed position. If during use there is an obstruction that cannot be removed by flushing the nozzle, disconnect the nozzle from the hose and remove the obstruction through the hose connection end. Attempting to force the obstruction out through the tip may damage the nozzle. Handle nozzles with care. Avoid dents or nicks in nozzle tips, as this may seriously affect the reach of the stream. Nozzle control valves will be opened and closed slowly to reduce pressure surges. This would eliminate unnecessary strain on the hose and couplings. After use, all nozzles will be flushed and inspected before being placed back in service.

c. **Hose Couplings.** Couplings will be kept in serviceable condition. After use, and during each pressure test of the hose, they will be visually inspected for the following:

- Damaged threads.
- Corrosion.
- Slippage on the hose.
- Out-of-round.
- Swivel (not rotating freely).
- Missing lugs.

- Other defects that impair operation.
- Gasket for presence, tight fit, and deterioration.

Couplings found defective will be removed from service and replaced. Do not drop couplings on steel deck or other hard surfaces. Doing this can cause damage to the threads. Do not allow vehicles to drive over couplings.

**33-4. HOSE AND COUPLING PRESSURE TEST PROCEDURE.** Fire hose and couplings will be tested annually to the maximum pressure they may be subjected in service, but not less than 100 psi. Pressure tests may be performed by vessel's crew. Any length of hose that fails the visual inspection or service test, will be removed from service and destroyed. The following pressure test procedure will be followed:

- Total length of test hose line will not exceed 300 feet. The hose line shall be straight without kinks or twists.

**WARNING**

Questionable hose or hoses that have been repaired or recoupled will be tested one length at a time.

- Connect the test hose line to a fire station valve. This valve must be manned during the test to prevent discharging a large volume of water in the event of a hose bursting during the test.
- Attach a nozzle to the far end of the hose line.
- With the fire station valve open and the end nozzle open, gradually increase the pressure to approximately 45 psi. Slowly close the end nozzle when the hose line is free of air and full of water. Close the fire station valve.
- Secure the hose line to avoid possible whipping or other uncontrolled reaction in the event of a hose burst.
- Check hose line for leakage at the couplings. Tightened couplings with a spanner wrench where necessary. Mark each hose at the back of each coupling with a felt tip marker to determine if the coupling moves on the hose during the test.

**WARNING**

Clear all personnel from the area except those required to perform the remainder of the test procedure.

- Slowly increase the pressure to test pressure (not less than 100 psi) and hold for five minutes.
- Inspect for leaks while the hose line is at the test pressure.

**WARNING**

Personnel shall never stand in front of the free end of the hose, within 15 feet to the side of the hose, or straddle a hose during the pressure test.

- If a section of the hose is leaking or bursts, terminate the test. Drain the hose line and remove and destroy the failed hose.
- After the five minute pressure test, shutdown the pump, open the end nozzle to relieve the pressure, and drain the hose line.
- Observe the marks placed on the hose at the back of the couplings. If the coupling has slipped or twisted, the hose has failed the test. Remove and destroy the failed hose.
- Enter the test results in the ship's log.

All hoses shall be cleaned, drained, and dried before being placed in service or storage.

33-5. **MARKING.** All tire hoses shall be marked with the vessel's name or number, test date, and test pressure.

33-6. **PROCUREMENT.** The following are the NSNs for fire hoses and nozzles.

- . Hose, fire, 1 1/2 inches by 50 feet, orange, NSN 4210-01-131-0249.
- . Hose, fire, 2 1/2 inches by 50 feet, orange, NSN 4210-01-131-0247.
- . Nozzle, 1 1/2 inches, 3 position, NSN 4210-00-392-2943.
- . Nozzle, 1 1/2 inches, 3 position, NSN 4210-00-329-2944.

**NOTE**

Do not replace old fire hoses and nozzles unless they are damaged or are no longer serviceable.

## CHAPTER 34

### MANEUVERING DATA

34-1. **GENERAL.** This chapter contains information about the posting of maneuvering data in the wheelhouse of US Army watercraft.

34-2. **PURPOSE.** This chapter will cover the requirement to have posted, in the wheelhouse of class A Army vessels, the vessel's maneuvering data.

34-3. **AVAILABILITY AND POSTING OF MANEUVERING DATA.** The availability and posting of maneuvering data is required by Title 33, subparts 164.35 and 164.11 of the Code of Federal Regulations. This information is normally available in the following three documents:

a. **Pilot Card.** This card presents in a brief form the current conditions of the ship with regard to its propulsion and steering equipment and loading conditions of the ship. The pilot card should be filled out by the ship's Master prior to the arrival of the pilot. A standardized format for the pilot card will benefit all parties involved and can prevent omission of important information when briefing the pilot. A properly completed pilot card will satisfy the regulatory requirements of 33 CFR 164.11(k).

b. **Wheelhouse Poster.** The wheelhouse poster provides more complete information concerning ship hull and engine characteristics than the pilot card. It also contains information on stopping distances and trajectories for entering turns at the maximum rudder angle in loaded and ballasted conditions. Use of these standardized wheelhouse posters is helpful in presenting the required information in a form that is readily recognizable by operating personnel and pilots unfamiliar with the vessel. A Wheelhouse Poster will satisfy the present regulatory requirements of 46 CFR.

c. **Maneuvering Booklet.** A Maneuvering Booklet may also be developed to provide detailed information about the ship's maneuvering characteristics indifferent conditions.

# APPENDIX ITEMIZED SAFETY EQUIPMENT

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
ALARM, SMOKE 9V 6350-01-264-6795	4 EA	6 EA	4 EA	2 EA	3 EA	1 EA					8 EA	2 EA	2 EA	2 EA		
ANCHOR, MARINE 1500 LB 2040-00-37-8607				2 EA												
ANCHOR, MARINE 75 LB 2040-00-377-8599							1 EA	1 EA	1 EA							
ANCHOR, MARINE, 200 LB 2040-00-377-8602						1 EA										
ANCHOR, SEA, 36 X 70 2040-00-222-3729		1 EA			1 EA											
ANCHOR CHAIN ASSEMBLY 4010-00-555-9510							1 EA	1 EA	1 EA		1 EA					
ANCHOR LINE, NYLON 3" 4020-00-919-3443							1 EA	1 EA	1 EA		1 EA					
APPLICATOR, 4" 4210-00-372-0864	5 EA	2 EA	2 EA	2 EA	1 EA	1 EA					6 EA	2 EA	2 EA			
APPLICATOR, 10" 4210-00-372-0865	3 EA	2 EA	2 EA	2 EA	1 EA	1 EA					2 EA	2 EA	2 EA			
APRON, RUBBER 8415-00-082-6108	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA					5 EA	1 EA	1 EA	4 EA		
AURAL PROTECTOR 4240-00-022-2946	6 EA	12 EA	6 EA	6 EA	10 EA	6 EA	6 EA	6 EA	8 EA	8 EA	10 EA	5 EA	5 EA			
AXE, FIRE 4210-00-142-4949	16 EA	6 EA	6 EA	4 EA	4 EA	3 EA	1 EA	1 EA	2 EA	1 EA		10 EA	10 EA	4 EA		
BATTERY, SIZE "C" ALKALINE 6135-00-985-7846	1 BX		1 BX	1 BX												
BATTERY, SIZE "D" ALKALINE 6135-00-835-7210	2 BX	2 BX	2 BX	1 BX	2 BX	2 BX		1 BX	1 BX	1 BX	2 BX	2 BX	2 BX	2 BX		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
BATTERY, DRY 6V 6135-00-050-3280					24 EA			8 EA	2 EA	2 EA	40 EA	34 EA	34 EA	6 EA		
BATTERY, RING BOUY LUG TYPE 6135-00-100-0413	6 EA	6 EA	6 EA	5 EA	5 EA	3 EA		2 EA	1 EA	1 EA	8 EA	4 EA	4 EA	10 EA		
BELL, SHIPS, 20 LB 6350-00-256-9061						1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
BELL, SHIPS, 30 LB 6350-00-256-9062	1 EA	1 EA		1 EA	1 EA											
BLOWER, GAS POWERED 4140-01-039-9845	2 EA	2 EA	1 EA	1 EA	2 EA						1 EA	1 EA	1 EA	1 EA		
BLOWER, DUCT 8" X 15" 4720-00-277-7225	2 EA	4 EA	2 EA	2 EA	4 EA						2 EA	2 EA	2 EA	4 EA		
BURN DRESSING "WET JEL" LOCAL PURCHASE	3 KT	3 KT	3 KT	3 KT	2 KT	1 KT	1 KT	1 KT	2 KT	1 KT	6 KT	2 KT	2 KT	3 KT		
COVERALL, ANTI-EXPOSURE GSA CONTRACT #07f 4206A	10 PR	11 PR	6 PR	6 PR	10 PR	15 PR	4 PR	8 EA	8 PR		10 PR	15 PR	15 PR	15 EA		
COVERALLS, FIRE RETARDANT 8405-01-286-6336/6554	13 PR	16 PR	6 PR	5 PR	6 PR	3 PR					6 PR	4 PR	4 PR	3 EA		
////////// DAMAGE CONTROL ITEMS:	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////
KIT, PIPE REPAIR 4730-01-414-6976	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA			1 EA	1 EA	2 EA	1 EA	1 EA	1 EA		
KIT, TOOL ELECTRICAL 5180-00-391-1087	1 EA	1 EA	1 EA		1 EA	1 EA				1 EA	1 EA	1 EA	1 EA	1 EA		
MAUL, SHIPS 5 LB 5120-00-255-1476	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
PLUG, 1" X 0" X 3" 5510-00-260-8953	10 EA	20 EA	10 EA	5 EA	10 EA	10 EA	5 EA	5 EA	5 EA	5 EA	20 EA	5 EA	5 EA	10 EA		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
PLUG, 2" X 0" X 4" 5510-00-260-8958	10 EA	20 EA	10 EA	5 EA	10 EA	10 EA					20 EA	5 EA	5 EA	10 EA		
PLUG, 3" X 0" X 8" 5510-00-260-8962	10 EA	20 EA	10 EA	5 EA	10 EA	10 EA	10 EA	5 EA	5 EA	5 EA	20 EA	5 EA	5 EA	10 EA		
PLUG, 5" X 1" X 10" 5510-00-260-8966	10 EA	20 EA			10 EA						20 EA			10 EA		
PLUG, 7" X 3" X 10" 5510-00-260-8969	10 EA	20 EA	10 EA	5 EA	10 EA	10 EA	10 EA	5 EA	5 EA	5 EA	20 EA	5 EA	5 EA	10 EA		
PLUG, 8" X 4" X 10" 5510-00-260-8973	5 EA	10 EA	5 EA	5 EA	5 EA	5 EA					10 EA	5 EA	5 EA	10 EA		
PLUG, 10" X 7" X 12" 5510-00-260-8949	5 EA	20 EA	5 EA	5 EA	10 EA	5 EA					10 EA			10 EA		
SHORING, STEEL 3' - 5' 2090-00-058-3737	10 EA	6 EA	5 EA	5 EA	5 EA	3 EA	1 EA	4 EA	4 EA	4 EA	5 EA	5 EA	5 EA	5 EA		
SHORING, STEEL 6' - 11' 2090-00-052-1581	10 EA	6 EA	5 EA	5 EA	5 EA	3 EA	1 EA				5 EA	5 EA	5 EA	5 EA		
WEDGE, 1.5" X 2" X 12" 5510-00-268-3475	5 EA	10 EA	10 EA	5 EA	5 EA	10 EA	6 EA	5 EA	5 EA	5 EA	10 EA	5 EA	5 EA	5 EA		
WEDGE, 2" X 2" X 8" 5510-00-268-3479	5 EA	10 EA	10 EA	5 EA	5 EA		6 EA	5 EA	5 EA	5 EA	10 EA	5 EA	5 EA	5 EA		
WEDGE, 3" X 3" X 12" 5510-00-268-3481	5 EA	10 EA	10 EA	5 EA	5 EA	10 EA					10 EA	5 EA	5 EA	5 EA		
WEDGE, 4" X 2" X 8" 5510-00-268-3485	5 EA	10 EA	10 EA	5 EA	5 EA	10 EA					10 EA	5 EA	5 EA	5 EA		
WEDGE, SHOR 1.5" X 3" X 12" 5510-00-268-3476	5 EA	10 EA	10 EA	5 EA	5 EA	10 EA					10 EA	5 EA	5 EA	5 EA		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
//////////////////// DISTRESS SIGNALS:	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////
MARKER, SMOKE & ILLUM 1370-01-030-8330						12 EA	12 EA	12 EA	12 EA	12 EA	12 EA	12 EA	12 EA	12 EA		
MARKER, LOCATION MK58 1370-01-074-0591	2 EA	2 EA	2 EA	1 EA	2 EA											
MARKER, SIGNAL ILLUM 1370-00-629-2336	12 EA	12 EA	12 EA	12 EA	12 EA											
MARKER, SEA, FLOURESCENT 6850-00-270-9986	4 EA		4 EA	4 EA												
//////////////////// ////////////////////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////	//// ////
EEBD, SERVICE UNIT 4240-01-116-9888, CC 53655	40 EA	27 EA	22 EA	22 EA	16 EA	5 EA	1 EA				15 EA	9 EA	9 EA	6 EA		
EEBD, TRAINING UNIT 4240-00-116-9889, CC 53655	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA					1 EA	1 EA	1 EA	1 EA		
EEBD, CABINET, NONSHOCK 2040-01-162-3206					16 EA	5 EA					15 EA	9 EA	9 EA	6 EA		
EPRB, SATFIND 406M3 6320-01-378-0221 GSA CONTRACT W/ALDEN ELEC.	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA										
EXTINGUISHER, FIRE 5 LB 4210-00-775-0127				8 EA	4 EA				6 EA	6 EA				2 EA		
EXTINGUISHER, FIRE 10 LB 4210-00-889-2491	23 EA	14 EA		12 EA	8 EA	7 EA	4 EA	4 EA	2 EA	4 EA	18 EA	4 EA	4 EA	17 EA		
FACESHIELD, INDUST, TILT 4240-00-542-2048	3 EA		3 EA	14 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	3 EA	3 EA	12 EA		
FACESHIELD, CLEAR 4240-00-764-5152	4 EA	1 EA			5 EA						4 EA	4 EA	4 EA			

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
FENDER, MARINE 16" DIA X 36" L 2040-00-821-0808		6 EA	14 EA	14 EA		6 EA	8 EA		8 EA	8 EA		20 EA	20 EA			
FENDER, MARINE 24" DIA X 36" L 2040-00-807-4197	16 EA				6 EA						16 EA			6 EA		
FENDER, MARINE 32" DIA X 50" L 2040-00-128-7982	6 EA	6 EA														
//////////////////// FIREFIGHTERS ENSEMBLE:	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///	/// ///
BAG, CANVAS, FIREFIGHTERS 8465-01-316-5706	7 EA	7 EA	6 EA	6 EA	5 EA	4 EA					7 EA	4 EA	4 EA	4 EA		
BOOTS, FIREFIGHTER SZ 5-15 8430-00-753-5935/45	7 PR	7 PR	6 PR	6 PR	5 PR	4 PR					7 PR	4 PR	4 PR	4 PR		
COVERALL, MEDIUM 8415-01-300-6557	3 PR	2 PR	3 PR	3 PR	2 PR	1 PR					3 PR	1 PR	1 PR	1 PR		
COVERALL, LARGE 8415-01-300-6558	3 PR	3 PR	2 PR	2 PR	2 PR	2 PR					3 PR	2 PR	2 PR	2 PR		
COVERALL, EXTRA LARGE 8415-01-300-6559	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR					1 PR	1 PR	1 PR	1 PR		
FLASHLIGHT, EXP PROOF 6230-00-269-3034	7 EA	7 EA	6 EA	6 EA	5 EA	4 EA					7 EA	4 EA	4 EA	4 EA		
GLOVES, FIREFIGHTER, MED 8415-01-335-7902	3 PR	2 PR	3 PR	3 PR	2 PR	1 PR					3 EA	1 PR	1 PR	1 PR		
GLOVES, FIREFIGHTER, LRG 8415-01-335-7903	3 PR	3 PR	2 PR	2 PR	2 PR	2 PR					3 EA	2 PR	2 PR	2 PR		
GLOVES, FIREFIGHTER, XLRG 8415-01-335-7904	1 PR	2 PR	1 PR	1 PR	1 PR	1 PR					1 EA	1 PR	1 PR	1 PR		
GLOVES, ANTIFLASH 8415-01-267-9661	7 PR	29 PR	6 PR	6 PR	16 PR	5 PR	6 PR	4 PR	8 PR	8 PR	7 PR	15 PR	15 PR	15 PR		
HELMET, FIREFIGHTER 8415-01-271-8069	7 EA	7 EA	6 EA	6 EA	5 EA	4 EA					7 EA	4 EA	4 EA	4 EA		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
HOOD, ANTIFLASH 8415-01-268-3473	7 EA	29 EA	6 EA	6 EA	16 EA	5 EA	6 EA	4 EA	8 EA	8 EA	7 EA	15 EA	15 EA	15 EA		
FLAG, SIGNAL LETTER "A" 8345-00-935-0445							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "B" 8345-00-926-6803							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "O" 8345-00-935-0451							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "U" 8345-00-926-6814							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "V" 8345-00-935-0455							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "W" 8345-00-935-0456							1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA		
FLAG, SIGNAL LETTER "Y" 8345-00-935-0457									1 EA		1 EA	1 EA	1 EA	1 EA		
FLASHLIGHT, WATERTIGHT 6230-00-264-8261	8 EA	14 EA	12 EA	6 EA		4 EA	2 EA	2 EA	2 EA	2 EA	8 EA	15 EA	15 EA	4 EA		
FOUNTAIN, EYE WASH 16 GAL 4240-01-258-1245	1 EA	2 EA	1 EA	1 EA	1 EA	1 EA	1 EA			2 EA	4 EA	1 EA	1 EA	4 EA		
FOUNTAIN, FUNGICIDE 6840-01-267-4346	1 BX	2 BX	1 BX	1 BX	1 BX	1 BX	1 BX			1 EA	4 EA	1 BX	1 BX	4 BX		
FOAM, LIQUID AFFX 5 GAL 4210-01-056-8343	12 EA	6 EA		8 EA	6 EA						8 EA					
GLOVES, CHEMICAL PROTECT 8415-00-266-8677		2 PR			2 PR	1 PR				1 PR	5 PR					
GLOVES, LEATHER, WELDERS 8415-00-268-7859	2 PR	2 PR			2 PR						2 PR					
GLOVES, ELECTRICAL 8415-01-158-9455	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR
SHELLS, ELECTRICAL 8415-00-264-3618	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR	1 PR

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
GLOVES, GUNN CUT 8415-00-643-4658		16 PR			16 PR				8 PR		8 PR					
GOGGLES, NONVENTED 4240-00-190-6432	4 EA	2 EA	6 EA	2 EA	2 EA	2 EA	1 EA	1 EA	1 EA	1 EA	5 EA	2 EA	2 EA	4 EA		
GOGGLES, VENTED CLEAR 4240-00-052-3776	15 EA	8 PR	15 EA	14 EA	5 EA	2 EA	3 EA	4 EA	8 EA	8 EA	15 EA	6 EA	6 EA	4 EA		
GOGGLES, SAFETY, WIND, DUST 8465-01-328-8268					10 EA	4 EA	4 EA	4 EA	8 EA	8 EA	10 EA	6 EA	6 EA			
HARD HAT, ORANGE 8415-00-935-3136	12 EA	15 EA	10 EA	10 EA	10 EA	4 EA	3 EA	3 EA	7 EA	7 EA	15 EA	8 EA	8 EA	13 EA		
HARD HAT, WHITE 8415-00-935-3139	4 EA	6 EA	5 EA	4 EA	6 EA	1 EA	1 EA	1 EA	1 EA	1 EA	5 EA	3 EA	3 EA	2 EA		
HARNES, SAFETY TORSO 4240-00-022-2522	4 EA	4 EA	6 EA	4 EA	2 EA	2 EA	2 EA	2 EA	8 EA	8 EA	2 EA	2 EA	2 EA	4 EA		
HARNES, LANYARD W/DYNA BK 4240-00-022-2521	4 EA	4 EA	4 EA	4 EA	2 EA	2 EA					2 EA	2 EA	2 EA	2 EA		
HARNES, LANYARD, WORKING 4240-00-022-2518	4 EA	4 EA	6 EA	4 EA	2 EA	2 EA	2 EA	2 EA	8 EA	8 EA	2 EA	2 EA	2 EA	4 EA		
HELMET, WELDERS 4240-00-540-0632	1 EA	1 EA	1 EA	1 EA	1 EA						2 EA			1 EA		
HOOK, BOAT 10' 2040-00-268-9250	2 EA	62 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA	2 EA		
HOSE, FIRE 1.5" X 50' ORNG 4210-01-131-0249	28 EA	7 EA	10 EA	6 EA	4 EA	4 EA					18 EA	5 EA	5 EA	6 EA		
HOSE, FIRE 2.5" X 50' ORNG 4210-01-131-0247	6 EA	4 EA	4 EA		4 EA						14 EA			2 EA		
HOSE, POTABLE WATER, BLUE 4210-01-248-8822	6 EA	3 EA	3 EA	3 EA	5 EA	2 EA					4 EA	3 EA	3 EA			

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
HYDRO RELEASE UNIT (HRU) THE "CAN" 4220-01-279-7287	4 EA	2 EA	2 EA	1 EA	2 EA	1 EA					6 EA	1 EA	1 EA	2 EA		
JACKET, WELDERS 8415-00-268-8264	1 EA	1 EA	1 EA	1 EA	1 EA						2 EA					
KIT, FIRST AID SMALL 6545-00-922-1200	2 EA		2 EA		2 EA	2 EA	1 EA	1 EA						4 EA		
KIT, LIFERAFT, FIRST AID 6545-00-168-6893	4 EA	2 EA	2 EA	1 EA	2 EA	1 EA					6 EA	2 EA	2 EA	2 EA		
KIT, FIRST AID, SHIP 6545-00-656-1094	2 EA	2 EA		2 EA	1 EA			1 EA			2 EA	1 EA	1 EA	1 EA		
LADDER, JACOBS 15' 2090-00-242-2511	1 EA	1 EA														
///////// LANTERN, BATTLE	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///
HAND HELD COMPLETE ASSY 6V 6230-01-300-6426					6 EA				10 EA	10 EA	20 EA	17 EA	17 EA			
HOLDER, BULKHEAD MOUNTING 6230-00-578-7401					6 EA				10 EA	10 EA		17 EA	17 EA			
RELAY, 115V AC W/10' CABLE 5945-00-783-6251																
RELAY, 115V DC W/10' CABLE 5945-00-783-6252												17 EA	17 EA			
///////// /////////	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///
LIFERAFT, NAVY MK6 25 MAN 1940-01-015-7346	4 EA	2 EA	2 EA	1 EA	2 EA	1 EA					6 EA	1 EA	1 EA	2 EA		
LINE, HEAVING 100' 4020-01-344-0552	8 EA	4 EA	4 EA	4 EA	4 EA	4 EA	2 EA	2 EA	2 EA	2 EA	4 EA	4 EA	4 EA	2 EA		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
LINE THROWING DEVICE 1095-00-270-7164	1 EA	1 EA	1 EA	1 EA	1 EA	1 EA										
LITTER, MEDICAL, EVAC SAR 6530-01-187-0104		1 EA														
LITTER, STOKES 6530-00-042-8131	2 EA	2 EA	1 EA	1 EA	1 EA	1 EA					2 EA	1 EA	1 EA	1 EA		
LITTER, FLOAT ASSY KIT 6545-01-155-1598	2 EA	2 EA	1 EA	1 EA	1 EA	1 EA					2 EA	1 EA	1 EA	1 EA		
LITTER, SLING, RESCUE, HELO 1670-01-226-5300	2 EA	2 EA	1 EA	1 EA	1 EA	1 EA					2 EA	1 EA	1 EA	1 EA		
LITTER, ROPE TENDING, MANILA 4020-00-289-8616	1 RL	1 RL			1 RL	1 RL					1 RL					
MAT, ELEC. INSUL 7220-00-267-4630					1 RL											
MEGAPHONE, PWR, HAND HELD 5830-00-688-6633	1 EA													1 EA		
MEGAPHONE, HAND 18" 8465-00-238-3344		1 EA		1 EA	1 EA	1 EA					1 EA	1 EA	1 EA			
METER, CONFID. SPACE ENTRY MSA PASSPORT PART #804645	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
CALIBRATION TUBING PART #24194	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
REMOTE ALARM CABLE PART #812706	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
METER, CALIBRATION KIT MSA PART #467895	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
METER, CALIBRATE GAS, 60% MSA PART #478191	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
METER, CALIBRATE GAS, 10PPM MSA PART #467898	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
METER, REMOTE ALARM MSA PART #800991	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
METER, CARRYING CASE MSA PART #636552	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
METER, CARRY CASE INSERT MSA PART #803822	1 EA	1 EA	1 EA	1 EA							1 EA			1 EA		
NOZZLE, FIREHOSE, 1.5" 4210-00-392-2943	11 EA	8 EA	8 EA	5 EA	4 EA	4 EA					10 EA	4 EA	4 EA	4 EA		
NOZZLE, FIREHOSE, 2.5" 4210-00-392-2944	5 EA				2 EA						9 EA					
NOZZLE, FOAM, 1.5" 4210-00-223-6225	6 EA	2 EA		2 EA	1 EA						2 EA					
OXYGEN BREATH APPAR (OBA) 4240-01-297-5986	7 EA	7 EA	6 EA	6 EA	5 EA	4 EA					7 EA	4 EA	4 EA	4 EA		
OBA, SERVICE CANNISTER 4240-00-174-1365	63 EA	63 EA	54 EA	54 EA	45 EA	36 EA					63 EA	36 EA	36 EA	36 EA		
OBA, TRAINING CANNISTER 4240-00-238-9959	2 EA	2 EA	2 EA	2 EA	2 EA	1 EA					2 EA	2 EA	2 EA	1 EA		
OBA TENDING LINE 4010-00-285-9901	7 EA	7 EA	2 EA	2 EA	5 EA	4 EA					7 EA	2 EA	2 EA	4 EA		
PERSONAL SURVIVAL EQUIP; //////////	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///	///
BOUYANT VEST, WORK TYPE 4220-00-276-8926	15 EA	10 EA	6 EA	6 EA	10 EA	5 EA	6 EA	8 EA	8 EA	8 EA	10 EA	6 EA	6 EA	6 EA		
EXPOSURE/SURVIVAL SUIT 4220-01-251-6466	36 EA	30 EA	23 EA	17 EA	18 EA	14 EA					66 EA					

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWPU	BG	CHI
LIFE PRESERVER, VEST 4220-00-200-0538	40 EA	30 EA	23 EA	20 EA	18 EA	14 EA	6 EA	8 EA	8 EA	8 EA	66 EA	18 EA	18 EA	18 EA		
LIGHT, DISTRESS, PERSONAL 6260-01-086-8077	100 EA	62 EA	52 EA	50 EA	56 EA	31 EA	16 EA	24 EA	24 EA	24 EA	86 EA	31 EA	31 EA	40 EA		
WHISTLE, PLASTIC BALL 8465-00-254-8803	100 EA	51 EA	29 EA	37 EA	38 EA	34 EA	16 EA	24 EA	24 EA	24 EA	86 EA	31 EA	31 EA	40 EA		
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PLUG, DECK SOCKET LOCAL PURCHASE	97 EA		125 EA	52 EA												
PUMP, EMER. P-250 MOD 1 4320-01-186-3377	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, ADAPTER, TRI-GATE 4210-00-209-5023	4 EA	2 EA	2 EA	2 EA	2 EA						2 EA	2 EA	2 EA	4 EA		
P-250, EDUCTOR 4320-00-256-8206	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, EXHAUST HOSE, ENG. 4210-00-776-0657	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, FOOT VALVE W/STRAIN 4820-00-540-2381	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, HOSE, SUCTION 10' 4210-00-725-9234	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, HOSE, DISCHARGE 4210-01-220-6648	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA			
P-250, TRI-GATE VALVE 4210-01-038-6001	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
P-250, WRENCH, SPANNER 5120-00-277-9076	2 EA	1 EA	1 EA	1 EA	1 EA						1 EA	1 EA	1 EA	2 EA		
PUMP, CENTRI. ELEC, SUBMR. 4320-00-368-3186	2 EA	2 EA														

SAFETY ITEM NSN	LSV	LT 800	LCU 2000	LCU 1600	LT 100	ST	LCM	LARC LX	SLWT	CPS	FMS	BD 100	BD 60	ROWFU	BG	CHI
RAT GUARD, GALVANIZED 2040-00-288-2866	6 EA	6 EA		4 EA	6 EA	4 EA						6 EA	6 EA			
RING BOUY, LIFESAVING 30" 4220-00-275-3157	8 EA	8 EA	8 EA	6 EA	8 EA	4 EA	3 EA	3 EA	2 EA	22 EA	10 EA	5 EA	5 EA	8 EA		
RING BOUY, LIGHT MARKER 6230-01-143-4778	6 EA	6 EA	6 EA	5 EA	5 EA	3 EA	2 EA	2 EA	1 EA	1 EA	8 EA	4 EA	4 EA	10 EA		
RING BOUY, LINE RETRIEVING 4020-00-530-0698	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL		
SHAPE, DAY, BLK BALL 2' DIA 8345-00-174-0453		3 EA			3 EA	3 EA			2 EA	2 EA	3 EA	4 EA	4 EA	2 EA		
SHAPE, DIAMOND BLACK 4' X 2' 8345-01-101-1101		2 EA			1 EA	2 EA			1 EA	2 EA	1 EA	3 EA	3 EA	1 EA		
STRETCHER, NEIL ROBERTSON 6530-00-783-7600	1 EA	1 EA		1 EA	1 EA	1 EA					1 EA	1 EA	1 EA	2 EA		
TAPE, RETROREFLECTIVE SLVR 9390-01-078-8660	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL	1 RL		
WRENCH, SPANNER ADJUSTABLE 5120-00-277-9075	10 EA	10 EA	10 EA	4 EA	6 EA	3 EA					18 EA	4 EA	4 EA	2 EA		
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## GLOSSARY

**AC** alternating current  
**AFFF** aqueous film forming foam  
**AIDS** acquired immune deficiency syndrome  
**AM** ante meridiem  
**APPAR** apparatus  
**APPROX** approximate; approximately  
**AR** Army regulation  
**ARNG** Army Reserve National Guard  
**ASMIS** Army Safety Management Information System  
**ASSY** assembly  
**ATTN** attention  
**Backdraft** An explosion that results from combining fresh air with hot flammable fire gases that have reached their autoignition temperatures. Large volumes of carbon monoxide and other tire gases can be generated by incomplete combustion in closed spaces.  
**BD** barge derrick  
**BG** barge liquid (fuel)  
**BII** basic issue items  
**BK** brake  
**BLK** black  
**BN** battalion  
**b/s** breaking strength  
**BX** box(es)  
**C** Celsius  
**CC** Cage Code  
**CA** California  
**CENTRI** centrifugal  
**CERT** certificate  
**CFR** Code of Federal Regulation  
**CHI** coastal, harbor, and inland  
**CO** carbon monoxide  
**CO<sub>2</sub>** carbon dioxide  
**COMDTINST** Commandant Instruction  
**CONFD** confined  
**COSPAS** Space System for Search of Distressed Vessels  
**CPR** cardiopulmonary resuscitation  
**CPS** Causeway Powered Section  
**CSRE(T)** course (title)  
**CTA** common tables of allowances  
**DA** Department of the Army  
**db** decibel(s)  
**D.C.** District of Columbia  
**DC** damage control; direct current  
**DD** Department of Defense  
**DIA** diameter  
**DMA** Defense Mapping Agency  
**DOD** Department of Defense

**DODIC** Department of Defense identification code  
**DSN** Defense Switched Network  
**DTG** date-time group  
**EA** each  
**EEBD** Emergency Escape Breathing Device  
**ELEC** electrical  
**EMER** emergency  
**ENG** engine  
**EOCC** Emergency Operations Control Center  
**EOS** Engineering Operating Station  
**EOW** Engineering Officer of the Watch  
**EPIRB** Emergency Position-Indicating Radio Beacon  
**EQUIP** equipment  
**ETA** estimated time of arrival  
**ETD** estimate time of departure  
**EVAC** evacuation  
**EXP** explosion; expiration  
**F** Fahrenheit  
**FCC** Federal Communications Commission  
**FED** federal  
**Fire out** All visible flames have been extinguished. Smoldering fires may still be present.  
**FL** Florida  
**FM** field manual; frequency modulated  
**FMS** floating machine shop  
**FY** fiscal year  
**GAL** gallon(s)  
**gpm** gallons per minute  
**GPS** Global Positioning System  
**GSA** General Services Administration  
**H<sub>2</sub>O** water  
**H<sub>2</sub>S** hydrogen sulfide  
**HAZMAT** hazardous material  
**HBV** hepatitis B virus  
**HCF** hydrochlorofluorocarbon  
**HELO** helicopter  
**HI** Hawaii  
**HIV** human immunodeficiency virus  
**HQ** headquarters  
**HRU** hydrostatic release unit  
**IAW** in accordance with  
**ID** inside diameter  
**IDLH** immediately dangerous to life or health  
**I Fire Under Control** When one or more hose teams are making progress advancing on a fire and the fire is contained in a single area within a compartment.  
**ILLUM** illuminate; illumination  
**INDUST** industrial; industry  
**INSUL** insulated; insulation  
**JP** jet propulsion

**KT** kit(s)  
**KTS** knots  
**L** length  
**LARC** lighter amphibious resupply cargo  
**LB** pound(s)  
**LCM** landing craft, mechanized  
**LCU** landing craft, utility  
**LED** light emitting diode  
**LEL** lower explosive limit  
**LFL** lower flammable limit  
**LG** large  
**LIC** license  
**LOAEL** lowest observed adverse effect level  
**LOTS** logistics-over-the-shore  
**LRG** large  
**LSV** logistics support vessel  
**LT** large tug  
**LX** sixty  
**Machinery space** Main and auxiliary machinery spaces which contain any of the following: installed fire fighting systems, oil fired boilers, internal combustion engines, gas turbines or steam turbines.  
**MAN** manual  
**MAT** material  
**MAX** maximum  
**MED** medium  
**MEDDAC** medical department activity  
**MEDEVAC** medical evacuation  
**METT-T** mission, enemy, terrain, troops and time available  
**MHz** megahertz  
**Mk** Mark  
**Mod** Model  
**MOS** military occupational specialty  
**MPN** manufacture part number  
**MSA** Mine Safety Appliances Company  
**MSDS** Material Safety Data Sheet  
**NCO** noncommissioned officer  
**NEC** national electric code  
**NESDIS** National Environmental Satellite, Data, and Information Service  
**NFPA** National Fire Protection Association  
**NO** number  
**NOAA** National Oceanic and Atmospheric Administration  
**NSN** national stock number  
**OBA** oxygen breathing apparatus  
**OH** Ohio  
**OIC** officer in charge  
**OJT** on-the-job training  
**OPCON** operational control  
**ORNG** orange

**OSHA** Occupational Safety and Health Act

**Out-of-Control Fire** A fire that creates unrenable conditions due to heat and smoke forcing personnel to abandon the space.

**Overhaul** An examination and cleanup operation. it includes finding and extinguishing hidden fire and hot embers and determining whether the fire has extended to other parts of the ship.

**PA** Pennsylvania

**PAM** pamphlet

**PEL** permissible exposure limit

**PFD** personal flotation device

**PKP** Purple-K-Powder

**PM** post meridiem

**PML** personnel marker light

**PMS** Periodic Maintenance System

**PN** part number

**P.O.** Post Office

**PPE** personal protection equipment

**PPM** parts per million

**PR** pair(s)

**psi** pounds per square inch

**psig** pounds per square inch gauge

**PUB** publication

**PVC** polyvinyl chloride

**PWR** powered

**Qtr** quarter

**REG** regulation; regular

**RL** roll

**ROWPU** reverse osmosis water purification unit

**SAR** search and rescue

**SARSAT** Search and Rescue Satellite-Aided Tracking

**SAT** satisfactory; satellite

**SATFIND** Alden Electronics, Inc. (trade name for Category 1,406 EPIRB)

**SIMA** shore intermediate maintenance activity

**SLVR** silver

**SLWT** side loadable warping tug

**SM** small

**SOI** signal operation instructions

**SOLAS** safety of life at sea

**SOP** standing operating procedure

**SOW** statement of work

**SSN** social security number

**ST** small tug

**STBD** starboard

**STD** standard

**SUBMR** submersible

**Surfactant** A large group of surface acting compounds that include detergents, wetting agents and liquid soaps.

**S.W.** southwest

**SZ** size(s)

**TB** technical bulletin  
**TCFE** Transportation Corps and Fort Eustis  
**TDI** test drills and inspections  
**TM** technical manual  
**TN** Tennessee  
**TRADOC** United States Army Training and Doctrine Command  
**TRANS** transportation  
**UHF** ultra high frequency  
**UI** unit of issue  
**Unaffected space** Any space other than the burning space.  
**UNSAT** unsatisfactory  
**US** United States (of America)  
**USATC&FE** United States Army Transportation Center and Fort Eustis  
**USCG** United States Coast Guard  
**USMCC** United States Mission Control Center  
**v** volt  
**VA** Virginia  
**Vapor secure** Establishing a film or foam blanket over flammable liquid to prevent vaponation. When vapors cannot reach the flames, flame production ceases and the surface is vapor secured.  
**VCR** video cassette recorder  
**VHF** very high frequency  
**VIP** very important person  
**w** with  
**WA** Washington  
**WI** Wisconsin  
**WIFCOM** wire free radio communication  
**X** extra  
**XLG** extra large  
**XLRG** extra large  
**XSM** extra small  
**XV** fifty  
**XXLG** extra-extra large

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 FM 55-501-1. *Landing Craft Operator's Handbook*. 13 May 1985.  
 FM 55-501-2. *Harbor Craft Crewman's Handbook*. 21 December 1984.  
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### DOCUMENTS NEEDED

These documents must be available to the intended users of this publication.

S9086-CH-STM-030, *Naval Ship's Technical Manual, Chapter 074, Gas Free Engineering*.  
 S9086-CL-STM-010, *Naval Ship's Technical Manual, Chapter 077, Personnel Protection Equipment*.  
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