U.S. Environmental Protection Agency

VESSEL SAFETY MANUAL

Office of Administration and Resources Management
Safety, Health and Environmental Management Division

Washington, DC
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FOREWORD

This manual sets forth minimum acceptable requirements for the safety and occupational health of all individuals (crew, scientific staff and passengers) who embark on U.S. Environmental Protection Agency (EPA) vessels of any size. EPA vessels currently range in size from the Ocean Survey Vessel ***Bold*** (224 feet) and Great Lakes Research Vessel ***Lake Guardian*** (180 feet), down to 14-foot aluminum skiffs powered by small outboard engines, canoes and inflatables. Accordingly, this manual addresses the entire spectrum of EPA vessel sizes, powered and unpowered. EPA vessels may be operated under contract or charter, by professionally qualified EPA crew, or, in the case of small craft, by EPA scientific staff on an intermittent basis. To achieve the EPA goal of minimizing risk to anyone who embarks on an EPA vessel, all concerned shall read and understand the requirements of this manual.

EPA vessels are public vessels of the United States. It is EPA's intent to maintain compliance with those existing standards and codes of marine safety (which appear in Title 46 of the Code of Federal Regulations) deemed necessary to achieve the EPA risk management objective. To that end, this manual sets forth the minimum requirements that must be met to attain EPA's marine health and safety objectives.

All aspects of "good marine practice" cannot be set forth in statutes, regulations or standards. Accordingly, the absence of a written requirement for a specific issue should not be interpreted as meaning that the issue has a lower importance or priority. Vessel captains/masters and operators of small craft should emphasize to all personnel that health and safety are considered to be paramount at all times onboard EPA vessels.

EPA Class C vessels' contractor crews are subject to the Safety of Life at Sea International Safety Management Code. This manual provides the top-tier policy for implementing this code requirement.

In addition to safety requirements, this manual also includes general security requirements for all EPA vessels.

The EPA's Safety, Health and Environmental Management Division welcomes any suggestions for improving this manual. Please contact us at SHEMD-at-Your-Service@epa.gov to provide your feedback.

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LIST OF ACRONYMS

AA	Assistant Administrator
AB	able seaman
ABS	American Bureau of Shipping
ABYC	American Boat and Yacht Council
AED	automated external defibrillator
AIHA	American Industrial Hygiene Association
AIS	Automatic Identification System
ANSI	American National Standards Institute
ARPA	Automatic Radar Plotting Aid
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
bhp	brake horsepower
CFR	Code of Federal Regulations
CHM	Chemical Hygiene Manager
CHP	Chemical Hygiene Plan
CO_2	carbon dioxide
COLREG	International Regulations for Preventing Collisions at Sea
CPR	cardiopulmonary resuscitation
DOT	Department of Transportation
DPA	Designated Person Ashore
DSC	Digital Selective Calling
EEBA	emergency escape breathing apparatus
EMS	Environmental Management System
EO	executive order
EPA	U.S. Environmental Protection Agency
EPIRB	Emergency Position Indicating Radio Beacon
GM	metacentric height
GMDSS	Global Marine Distress Safety System
GPS	Global Positioning System
GT	gross tonnage

H_2S	hydrogen sulfide
HAZMAT	hazardous materials
HF	high frequency
HP	horsepower
IAPP	International Air Pollution Prevention
IEEE	Institute of Electrical and Electronic Engineers
IMO	International Maritime Organization
INMARSAT	International Maritime Satellite System
ISM	International Safety Management
JHA	job hazard analysis
LOTO	lockout/tagout
MARPOL	International Convention for the Prevention of Pollution from Ships
MARSEC	Maritime Security
MED-EVAC	medical evacuation
MF	medium frequency
MMC	Merchant Mariner Credential
MMSI	Maritime Mobile Service Identity
MOB	man overboard
MSD	Marine Sanitation Devices
MSDS	Material Safety Data Sheet
NAVTEX	Navigation Telex
NEC	National Electrical Code
NFPA	National Fire Protection Association
NIOSH	National Institute for Occupational Safety and Health
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxide
NRC	National Research Council
NTAS	National Terrorism Advisory System
NVIC	Navigation and Vessel Inspection Circulars
OA	Office of Administration
OARM	Office of Administration and Resources Management

OSHA	Occupational Safety and Health Administration (U.S. Department of Labor)
PFD	personal flotation device
PML	personal marker light
PPM	parts per million
PPOB	Policy, Programs, and Oversight Branch
QA/QC	quality assurance/quality control
QMED	Qualified Member Engineering Department
RA	Regional Administrator
RCC	Rescue Coordination Center
RCRA	Resource Conservation and Recovery Act
RF	radio frequency
SCBA	self-contained breathing apparatus
SEE	Senior Environmental Employment
SHEM	safety, health and environmental management
SHEMD	Safety, Health and Environmental Management Division
SHEMP	Safety, Health and Environmental Management Program
S.H.I.P.	Seafarers' Health Improvement Program
SHMS	Safety and Health Management System
SOLAS	International Convention for the Safety of Life at Sea
SOP	standard operating procedure
STCW	Standards of Training Certification and Watchkeeping
TPA	Thermal Protective Aid
TWIC	Transportation Workers Identification Credential
UL	Underwriters Laboratories
UNOLS	University – National Oceanographic Laboratory System
USC	United States Code
USCG	United States Coast Guard
VCHP	Vessel Chemical Hygiene Plan
VHF	very high frequency
VMO	Vessel Management Official
VSO	Vessel Security Officer

VSP	Vessel Security Plan
VTS	Vessel Traffic Service

1. INTRODUCTION

1.1 Scope and Policy

Scope: This document describes safe vessel specifications and operational procedures as required by the U.S. Environmental Protection Agency's (EPA's) *Vessel Safety Manual*. The manual has been developed with the goal of minimizing risk to all individuals who embark on EPA vessels.

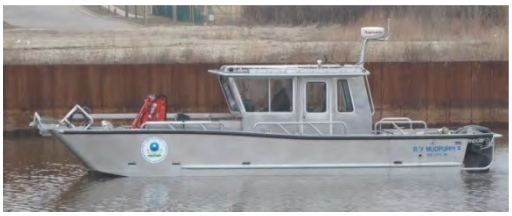
Policy: It is EPA policy that the operation of all EPA vessels will be governed in accordance with the requirements set forth in this manual.

1.2 Background and Authority

Background: The President, through Executive Order (EO) 12196, and the Secretary of Labor, through section 19 of the Occupational Safety and Health Act and Title 29 of the Code of Federal Regulations (CFR) section 1960, requires that all federal agencies establish comprehensive safety and health management programs.

Authority: In accordance with EPA Order 1440.1, *Safety, Health and Environmental Management Program,* the Director of the Safety, Health and Environmental Management Division (SHEMD), under the supervision of the Director of the Office of Administration (OA), is responsible for developing agency occupational safety and health policies, programs, standards, goals and objectives for evaluating the effectiveness of the programs at all operational levels.

SHEMD provides safety and health support for the agency's National Occupational Safety and Health programs to program offices, regional offices and laboratories. This program and related standards and guidance have been established by the Assistant Administrator for Administration and Resources Management.



The authorities cited in EPA Order 1440.1 pertain to safety and health policies, programs and standards, *including those related to protection from maritime hazards.* As such, comprehensive efforts to minimize employee exposure to accidents and enhance safety awareness onboard EPA vessels, as described in the program, correspond to the intent of EO 12196, the Occupational Safety and Health Act, the regulations established by other federal agencies, and the mandate for SHEMD.

1.3 Program Applicability

This program applies to all EPA-owned, operated or leased vessels, from the largest to the smallest, that are operated on any body of water, foreign or domestic, and all activities conducted by employees and contractors in support of EPA vessel operations on any EPA-occupied or controlled vessel.

Notes:

- The term "EPA workers" is occupational in nature and includes full-time, part-time, temporary and permanent EPA federal and contract employees; the crew and staff of leased vessels; and details to the EPA from other governmental agencies.

- Students who are assigned to the EPA; enrollees in the EPA's Senior Environmental Employment (SEE) Program; and interns and fellows assigned to the EPA may be designated as EPA workers by the EPA Vessel Management Official (VMO) or the appropriate designee responsible for the specific vessel. If they are so designated as EPA workers, they must comply with all applicable requirements of this manual.

Based on local conditions and requirements, program offices and regions may wish to establish more stringent requirements than those set forth in this manual. If this is the case, the provisions of this program may be supplemented, but not replaced or superseded, by regional and program office requirements.

1.4 EPA Auditing and Self-Assessment Programs

EPA **Class B** and **C** vessels (vessel classifications are defined in section 3.2) must be audited under the EPA Auditing Program, which requires that vessels undergo a comprehensive safety, health and environmental management (SHEM) audit every three years. The focus of the audit is to assess compliance with fire protection, health and safety, and environmental requirements and agency policy. EPA **Class A** vessels that are available will be inspected as part of the laboratory/office audits. EPA audit policies, authorities, procedures and protocols are provided at http://intranet.epa.gov/oaintran/shemd/national/manuals/shemaudit.htm.

EPA regional and program locations are required to perform annual vessel self-assessments under the EPA Self-Assessment Program. This program provides a consistent agencywide process for conducting site-specific SHEM-related monitoring in support of continual improvement in performance and includes the same areas of inquiry as the SHEMD Audit Program. This program is described more thoroughly in the EPA SHEM Self-Assessment Program Guidance and Tools (June 2009) located at http://intranet.epa.gov/oaintran/shemd/national/content/self-assess_508.pdf.

1.5 Environmental Management System (EMS) and Stewardship

The EPA is responsible for coordinating the implementation of EMS at all designated EPA facilities, including vessels, in accordance with the requirements of EO 13148. In addition to supporting EMS implementation, SHEMD is responsible for reviewing the EMS that has been established at each location and for self-declaring its conformance to the EO 13148 requirements. Similar to the EPA Audit Program, an external conformance review that includes any vessels must take place every three years. EPA **Class A** vessels are part of the conformance audit with the facility they are associated with, including the staff on these vessels. Additional information about EMS is located at http://intranet.epa.gov/oaintran/shemd/national/environmental/ems/index.htm.

In response to EO 13423, the EPA encourages and recognizes responsible environmental management across all its facilities, including vessels, through environmental stewardship reporting. The EO mandates that federal agencies conduct their environmental, transportation and energy-related activities in an environmentally, economically and fiscally sound, integrated, efficient and sustainable manner. Additional information on environmental stewardship is located at http://intranet.epa.gov/oaintran/shemd/national/environmental/stewardship.htm.

1.6 Principles of a Safety and Health Management System (SHMS)

SHMS covers similar characteristics as the EPA EMS Program. For example, the SHMS is based on the same "Plan-Do-Check-Act" continual improvement cycle as the EMS. An effective SHMS is uniquely designed for each organization but consists of six critical elements applying safety and health management practices at appropriate and relevant functions and levels of the organization. These elements include 1) management commitment and planning, 2) employee involvement, 3) safety and health training, 4) work-related hazard/risk analysis, 5) hazard prevention and control, and 6) conformance monitoring, corrective/preventative action and management review. More information on SHMS is located at http://intranet.epa.gov/oaintran/shemd/national/safety/shms.htm.

1.7 Changes

This manual will be modified on an as-needed basis as determined by experience, changing operational requirements and referenced regulations and authorities. The EPA's SHEMD welcomes any suggestions for improving this manual. Please contact us at SHEMD-at-Your-Service@epa.gov to provide your feedback.

2. PROGRAM ADMINISTRATION

2.1 Goals and Objectives

This section sets forth the administrative functions that are necessary to effectively manage the safety, health and environmental programs onboard EPA vessels. The goals of the EPA vessel safety program include:

- The strategic goals of the programs provided in the *Vessel Safety Manual* are to incorporate nationally consistent means and methods for identifying, assessing, recording, eliminating, reducing, controlling and communicating the potential risks and dangers associated with occupational accidents onboard marine vessels.

- The program's operational goals also include compliance with applicable federal, state and local governmental regulations; ongoing incorporation of appropriate elements of nationally recognized consensus standards; and a continual emphasis on quality and the effective use of the wide range of the national and international expertise available to EPA.

The objectives of the EPA vessel safety program include:

- Establishing an acceptable level of risk with respect to the operation of EPA vessels by implementing the components of the *Vessel Safety Manual*.

- Working within the current EPA organizational framework and administrative directives.

- Defining and delegating clear lines of authority and responsibility.

- Ensuring compliance with applicable domestic and international laws and regulations.

- Maximizing the contribution and participation of administrative and technical EPA staff at all operating levels in developing, implementing and monitoring the components of the *Vessel Safety Manual*.

2.2 Roles and Responsibilities

Administrator

The Administrator is overall responsible for establishing and maintaining an effective agencywide safety, health and environmental management program (SHEMP), including maritime safety.

Assistant Administrator (AA) for the OARM

The AA for the OARM is EPA's designated safety and health official. The AA establishes:

- Agencywide safety, health and environmental management programs, including those for maritime operations.

- The national program office to direct the development and implementation of the programs provided in the *Vessel Safety Manual.*

- Essential programs requirements for AAs and Regional Administrators (RAs) to follow in implementing and managing their local SHEM programs agencywide.

Director of OA

The Director is responsible for ensuring that:

- Adequate financial and staff resources are allocated for safety, health and environmental management programs.

- Program functions are strategically sited within the Office to ensure effective implementation and management.

- Delegations of authority for each component of the program are issued.

- Performance standards that parallel and clarify accountability for program performance are established for Office staff.

Director of SHEMD

The Director of SHEMD leads and directs the development and implementation of agencywide SHEMPs, including maritime safety. The Director is authorized to:

- Formulate the agency's policies, programs, plans, standards, protocols, goals, objectives, and priorities in accordance with those statutes, regulations and guidelines associated with vessel safety.

- Coordinate implementation activities by safety and health managers and environmental compliance coordinators.

- Develop national SHEM programs to guide implementation within the program offices and regions.

- Provide technical and managerial consultation services for establishing and maintaining the vessel safety program agencywide.

- Develop and maintain administrative support for the vessel safety program.

- Conduct quality assurance and quality control (QA/QC) activities in order to:

    - Assure compliance with the program.

    - Evaluate program effectiveness.

    - Foster continual program improvement.

- Collect and synthesize data to document the QA/QC results.

Primary responsibility for ensuring the successful national implementation and operation of these SHEM programs ultimately rests with the **AA for Administration and Resources Management.** Responsibility for implementation and ongoing effective management of these programs rests with the AAs, RAs and SHEMD.

RAs and AAs

RAs are responsible for:

- Allocating adequate financial and staff resources for their SHEMP managers, including for maritime safety programs provided in the *Vessel Safety Manual.*
- Strategically addressing program functions within the EPA region to ensure effective implementation.
- Issuing delegations of authority for each component of the program
- Requiring establishment of performance standards that parallel and clarify accountability for program performance.

AAs are responsible for:

- Allocating adequate financial and staff resources for their SHEMP managers, including for maritime safety programs provided in the *Vessel Safety Manual.*
- Strategically addressing program functions within their organizational units to ensure effective implementation.
- Issuing delegations of authority for each component of the program.
- Requiring establishment of performance standards that parallel and clarify accountability for program performance.

Branch Chiefs and Division Directors

Branch Chiefs and Division Directors are responsible for:

- Providing direct assistance to AAs, RAs and other senior management officials in developing, managing, implementing and evaluating SHEM programs.
- Ensuring that the necessary resources (both financial and manpower) are available so that the requirements and program elements are met.
- Providing the necessary assistance to the SHEMP manager and vessel captain/master, so that they can implement delegated components of the program, such as participating in training programs, scheduling required safety and health training, coordinating medical

monitoring and surveillance functions, participating in auditing functions, and maintaining certain records, including, but not limited to, auditing results, accident investigations, and accident and injury logs.

- Ensuring that all employees under their purview comply with all applicable elements of this vessel safety program, where necessary.

SHEMP Managers

SHEMP managers are responsible for:

- Providing direct assistance to AAs, RAs and other senior management officials in developing, managing, implementing and evaluating SHEM programs.

- Ensuring that the requirements and program elements are met.

- Implementing delegated components of the program, such as participating in training programs, scheduling required safety and health training, coordinating medical monitoring and surveillance functions, participating in auditing functions, and maintaining certain records, including, but not limited to, auditing results, accident investigations, and accident and injury logs.

Vessel Captains/Masters and Chief Scientists

Vessel captains/masters and chief scientists are ultimately responsible for the safety and health of all personnel on EPA vessels. As such, they are responsible for ensuring implementation of the policies, plans, procedures, and safety and health requirements onboard their vessels. They are expected to help achieve the level of risk management with respect to the operation of EPA vessels.

The captain/master of an EPA vessel has full accountability and responsibility for the safety of the vessel and embarked personnel. Accordingly, they retain ultimate authority for all underway operations of the vessel. They may terminate any operation when underway if, in their judgment, conditions endanger the vessel or personnel.

One member of the scientific party shall be designated in writing as chief scientist. The chief scientist is responsible for coordinating and executing the entire scientific mission. Traditionally, the personal and professional conduct of the scientific party onboard the vessel and ashore is the responsibility of the chief scientist.

In many cases, safety matters are common knowledge and not unique to research vessels. In other cases, there may be safety hazards unique to the research, which the vessel's crew may not be aware of. In such instances, the chief scientist has a special responsibility to ensure safety and consult with the captain/master as necessary.

U.S. EPA Vessel Management Official (VMO)

The VMO (or appropriate designee) is the designated official responsible for the oversight of employees on EPA vessels, as well as the scheduling, operation, maintenance, budgets and scientific research conducted onboard EPA vessels. In addition, the VMO (or appropriate designee) is the primary point of contact for coordinating all aspects of the funding agreement with the VMO Manager.

The VMO (or appropriate designee) is responsible for ensuring that only properly qualified or credentialed people operate EPA-owned or leased vessels. The VMO (or appropriate designee) is the primary contact with the scientific survey crews/chief scientists and other users of the vessel.

The VMO (or appropriate designee) who is responsible for a charter shall ensure safe and effective operations while in service under a charter. In all cases, chartered vessels must comply with the United States Coast Guard (USCG) or state marine laws and regulations, as applicable.

It is the VMO's (or appropriate designee's) responsibility to ensure that the fire protection program is operational at all times the vessel is in active service

U.S. EPA Vessel Security Officer (VSO)

EPA vessels must take reasonable steps to provide security for the vessel and embarked personnel from acts of theft, terrorism or piracy, and other situations that may be encountered on the high seas or in port. Under a Vessel Security Plan (VSP), a VSO will have duties to assure these security initiatives are met. This responsibility can be assigned as a collateral duty for the captain/master or another crew member. The requirements of the VSP and the responsibilities of the VSO are addressed in more detail in Section 13 of this manual.

3. CLASSES OF EPA VESSELS

3.1 Background

All seagoing vessels are subject to various requirements for documenting their ownership, occupation and safety. These requirements vary greatly, depending on the size and type of vessel, its employment, the area of operations, and other aspects. In this section, the language of common factors in this process (e.g., organizations, laws) are listed to establish the sources and a baseline of compliance for the safety, health and environmental pollution control requirements of this manual. The language used herein is chosen to convey the sense of the regulations.

3.2 Vessel Classifications

This manual classifies EPA vessels into three categories, including **Class A, B** and **C**. These classifications were selected to group like EPA vessels with regard to fire protection, life-saving equipment, manning and the extent of operations undertaken to support mission objectives (See Table 3-1 – Examples of EPA Vessel Classifications). Sections of the manual, as appropriate, indicate the applicability of requirements by class.

Class A Vessels

All *powered* EPA small craft under 65 feet, to include those carried onboard EPA vessels, berthed at a pier, or carried on a trailer, are classified for the purposes of this manual as **Class A.** In this case, **Class A** is intended to correlate closely with the old USCG **Class A,** 1, 2, 3 size designations. **Class A** is further defined under 46 CFR 24.10. Vessel classification definitions as well as other definitions are provided in Appendix C of this manual.

Unpowered vessels such as canoes and kayaks only require personal flotation devices (PFDs), handheld very high frequency (VHF) receivers, and, if intended to operate at night, 360 degree white lights. It is also strongly recommended that all EPA operators of Class A vessels take a safe boating course. As an example, a list of classroom and online safe boating courses is available at http://www.boatus.com/courseline/default.asp.

Class B Vessels

All powered EPA vessels 65 feet or greater in length but with a gross tonnage (GT) less than 300 are classified as **Class B.**

Class C Vessels

All powered EPA vessels 65 feet or greater with a GT greater than 300 are classified as **Class C.**

Table 3-1. Examples of EPA Vessel Classifications

Vessel	Class	Length	GT	Power	Responsible Program/Base Location
Mud Puppy II	A	32’ 00”	6	Twin 150 HP outboards	Region 5Great Lakes National Program Office/ Bay City, MI
R/V *Lake Explorer II*	B	90’ 00”	150	Twin 450 hp diesels	Region 5 Office of Research and Development/ Duluth, MN
R/V *Lake Guardian*	B	180’ 00”	283	Twin 12 cyl. diesels, 2,400 hp	Region 5Great Lakes National Program Office/ Bay City, MI
OSV *Bold*	C	224’ 00”	1,914	Diesel/electric Four 970 hp Caterpillar D398B Two GE electric motors	Region 3 Office of Wetlands, Oceans, and Watersheds; Oceans & Coastal Protection Division/Norfolk, VA

Mud Puppy II

Class A Research Vessel

R/V *Lake Guardian*

R/V *Lake Explorer II*

OSV *Bold*

3.3 Vessel Types

The following vessel types have applicability in part to all EPA class vessels:

Ship: Often used interchangeably with "vessel," the preferred legal term.

Small Craft: A nonlegal description of a vessel that is usually less than 65 feet long.

Uninspected Vessel: A vessel not certificated under the inspection laws or subjected to regular inspections by the USCG. Fishing vessels, recreational motorboats and oceanographic research vessels under 300 GT are examples. Uninspected vessels are still subject to rules regarding safety and, in some cases, licensed personnel in accordance with 46 CFR 24.

Inspected Vessel: In accordance with 46 CFR 2, only oceangoing oceanographic vessels over 300 GT are required to hold a valid USCG Certificate of Inspection and have yearly USCG inspections. These inspections are conducted in accordance with USCG NVIC 10-81 and the requirements of SOLAS.

Public Vessel: A confusing term, having different meanings in various laws and regulations. Under the rules for documenting and inspecting vessels, public vessels are generally defined as those owned or chartered by the U.S. government and used for public purposes (except those of the U.S. Maritime Administration). Examples are naval ships and EPA vessels. Under federal pollution-control rules, a public vessel is owned, chartered or operated by the United States or a state or political subdivision.

Undocumented Vessel: Any vessel that is not required to, and does not have, a marine document issued by the USCG, per 46 CFR 188.10-75.

Vessel-In-Class: A vessel is said to be "in-class" when it holds a current certificate of classification issued by a recognized classification society, such as the ABS, Lloyds Register or Bureau Veritas. The certificate of classification signifies conformity with prescribed standards of structural strength, machinery and equipment, providing for seaworthiness and safety in connection with marine insurance.

4. LAWS AND REGULATIONS

Code of Federal Regulations (CFR): A compilation of the rules and regulations made by federal and executive departments and agencies, pursuant to the authority of a federal law. Most material concerning shipping is contained in Title 46 of the CFR. This is divided into chapters and subchapters, of which Subchapter U contains rules for oceanographic vessels. For example, "46 CFR 192" means Part 192 of Title 46 of the CFR.

United States Code (USC): A compilation of the laws of the United States, generally arranged by subject matter under "Titles." Shipping laws are primarily contained in Title 46 of the code, which contains the Oceanographic Vessels Acts of 1964. Note that the USC contains actual laws from Congress; the CFR contains agency-generated regulations.

USCG Boat Safety: Related boat and small craft regulatory and safety information provided by the USCG. (See http://www.uscgboating.org.)

International Load Line Act: The act (46 CFR 42) concerning stability standard and inspections.

Navigation and Vessel Inspection Circulars (NVIC): An NVIC provides detailed guidance about the enforcement or compliance with certain federal marine safety regulations and USCG marine safety programs. While NVICs are nondirective, meaning that they do not have the force of law, they are important "tools" for complying with the law. Noncompliance with an NVIC is not a violation of the law in and of itself, but may be an indication that there is a potential for noncompliance with a law, regulation or policy.

Rules of the Road: The statutory and regulatory rules published by the USCG (33 CFR 81 and 82) governing the navigation of vessels. (See http://www.navcen.uscg.gov.)

Safety Standards for Small Craft: Voluntary standards issued by the ABYC to promote quality technical practices and engineering standards for the design, construction, maintenance and repair of small craft. (See http://www.abycinc.org.)

Standards of Training Certification and Watchkeeping (STCW): The standards for the training and competency of officers and seamen; enforced by the USCG in licensing and inspections. (See http://www.stcw.org.)

4.1 Involved Organizations

The codes and standards promulgated by the following organizations have applicability, *in part*, to all EPA class vessels and have been reviewed in preparing the EPA requirements set forth in this manual.

United States Coast Guard (USCG): The federal agency authorized by Congress under the Department of Transportation (DOT) with enforcement of laws and regulations concerning ships and seagoing operations, including compliance with the Standards of Training Certification and Watchkeeping (STCW).

Commandant
Headquarters
2100 2nd Street, SW, Stop 7238
Washington DC 20593-7238
http://www.uscg.mil/

American Boat and Yacht Council (ABYC): An organization primarily concerned with private pleasure craft that sets standards for small vessel construction. Some of its standards are referenced in portions of these safety standards and some are incorporated by reference in USCG regulations concerning small craft.

613 Third Street, Suite 10
Annapolis, MD 21403
http://www.abycinc.org/

Federal Communications Commission (FCC): The federal agency charged with the regulation of radio communications, including those to, from and between ships.

445 12th Street, SW
Washington, DC 20554
http://www.fcc.gov/

Institute of Electrical and Electronic Engineers (IEEE): A professional group that develops standards in electrical and electronic practices. Many of these are incorporated as legal or prudent requirements for ships. IEEE 45 is a document issued by the IEEE concerning "Recommended Practices for Electrical Installations on Shipboard" and provides many good standards in this area, commonly accepted for prudent use.

2001 L Street, NW, Suite 700
Washington, DC 20036-4910 USA
http://www.ieee.org/index.html

National Fire Protection Association (NFPA): A professional organization that sets standards for firefighting equipment and fire prevention. Some of its standards are included in USCG regulations by reference, such as those for a National Electrical Code (NEC) and for pleasure and commercial craft.

1 Batterymarch Park
Quincy, Massachusetts 02169-7471
http://www.nfpa.org/

Underwriters Laboratories (UL): A testing and certification laboratory that provides standards and tests equipment for safety. Some of its standards are used in USCG regulations by reference, such as those for smoke detectors and commercial cooking exhaust hoods.

2600 NW Lake Rd.
Camas, WA 98607-8542
http://www.ul.com/

American Bureau of Shipping (ABS): A nonprofit organization authorized by the USCG to ensure compliance with load line regulations and other related safety factors. The organization provides inspection services to operators for a fee. For vessels "in-classed" by the ABS, such as the R/V *Lake Guardian,* ABS performs annual and other periodic hull and machinery inspections, oversight of specific repairs, and overhauls.

16855 Northchase Drive
Houston TX 77060
http://www.eagle.org/

International Maritime Organization (IMO): A United Nations agency concerned with, among other things, the establishment of safety standards and pollution regulations. It develops modifications to Safety of Life at Sea (SOLAS) conventions. Although IMO regulations as adopted by the USCG apply to commercial international voyages for ships 500 GT or more or passenger vessels carrying more than 12 passengers, some regulations are being accepted by exempt vessel operators because of a universal application, such as the new International Safety Management Code (ISM Code) and the Seafarers Training, STCW Code.

4, Albert Embankment
London
SE1 7SR
United Kingdom
http://www.imo.org/

Seafarers' Health Improvement Program (S.H.I.P.): A collaborative group with membership from vessel owners/operators, seafarers, shipping associations, the U.S. Public Health Service, the U.S. Maritime Administration and the USCG.

ICSW – International Committee on Seafarers' Welfare
Gresham House
53 Clarendon Road
Watford
Hertfordshire, WD17 1LA
United Kingdom
http://www.seafarershealth.org/

5. MANNING

5.1 Background

Personnel onboard EPA vessels are categorized as crew, scientific personnel or passengers. The makeup of the crew and scientific party, along with the vessel's ability to carry passengers, is governed by the size of the vessel, the nature of the mission and the facilities available onboard the vessel.

Basically – although responsibilities vary somewhat from vessel to vessel – the scientific party carries out the scientific objectives of the voyage and the crew operates the vessel. From the standpoint of safety, it should be noted that there are major differences in the makeup of the crew and the scientific party.

A crew adequate to operate the vessel, if necessary around the clock and for extended periods, will be provided. This section sets forth the criteria for that manning.

5.2 Licensed Personnel

USCG licensing of crew personnel ensures that they meet minimum levels of competency and experience. The nature and number of licensed personnel varies, ranging from a competent single operator on small craft to fully licensed captains/masters, mates, and engineers, as required on EPA **Class C** vessels. VMOs should ensure actual competency, using licensed personnel or their equivalent in training, skill and experience based on the needs of the specific vessel.

Competency beyond the legal minimum, even on a small day boat, may also be needed because of the nature of the operation, unique features of the vessel, or an intricate research and operational program, and may involve the same skill levels as for a much larger vessel.

5.3 Makeup of Crew

EPA Class C Vessel Crew Requirements

EPA requires that, onboard all **Class C** vessels, licensed and unlicensed personnel hold current Merchant Mariner Credentials (MMC) with appropriate endorsements, as prescribed in Table 5-1. In addition, there are specific Standards of Training Certification and Watchkeeping (STCW) endorsement requirements applicable to all vessels greater than 300 GT in near-coastal and ocean waters. These endorsements establish basic requirements on training, certification and watchkeeping for seafarers on an international level. Some of the STCW requirements are satisfied by basic MMC endorsements (e.g., an able seaman [AB] has proficiency in survival craft as part of the basic AB proficiency requirements). However, several STCW certifications must be obtained in addition to the MMC. Table 5-2 provides a listing and applicability of these STCW endorsement requirements. STCW requirements are not applicable to the Great Lakes and U.S. inland waters.

Class B Vessel Crew Requirements

The captain/master of any EPA **Class B** vessel that is 65 feet or longer and operated by EPA employees shall have, at a minimum, a valid USCG MMC of captain/master or limited captain/master of motor vessels, as required in accordance with the applicable section(s) of 46 CFR 10 and 11. The captain/master of a vessel over 200 GT will, in addition, require MMC and the applicable STCW endorsements listed in Table 5-2. STCW requirements are not applicable to the Great Lakes and U.S. inland waters.

Additional crew members need not hold a valid license or valid USCG MMC, although it is encouraged. It is the responsibility of the captain/master to determine the acceptability of additional crew members with regard to adequate vessel knowledge and to provide training, as needed, and instruction, particularly concerning vessel safety and emergency response.

Class A Vessel Crew Requirements

Captains/masters of **Class A** vessels who are *EPA employees or contractors* shall conform to the following minimum qualifications, as well as those that may be required by the VMO.

1. Be approved by the VMO (or appropriate designee) for the operation of the specific type of vessel for which he or she is to be the captain/master. The approval process must consider total boating experience and required knowledge of the specific craft and the waters involved.

2. Satisfactorily complete a safe boating course approved by the National Association of State Boating Law Administrators, a public education course conducted by the U.S. Power Squadron, a USCG Auxiliary-approved course, or a course through BOAT/US (http://www.boatus.com). Periodic refresher training should be completed, preferably annually. The training should match the skill level of the operators (e.g., basic training for the beginners, more advanced navigation training for those who are well versed).

3. Completion of a first aid and cardiopulmonary resuscitation (CPR) course in accordance with 46 CFR 11.205(e). The actual need for this training will depend on the vessel service area, the number of people onboard and the proximity of alternative help, as determined by the VMO (or appropriate designee).

4. Successful completion of any additional requirements as determined by the VMO (or appropriate designee), e.g., triennial competency practical/evaluation or additional location-, vessel- or operation-specific training.

5.4 Scientific Personnel Limitations – All EPA Class Vessels

The maximum number allowed onboard shall be consistent with specific vessel capacity based on weight distribution, including people, mission-specific equipment and duration, particularly on **Class A** and **B** vessels, as well as accommodations and related safety issues, available life-saving equipment and housekeeping facilities for all EPA Class vessels.

This limit will be established for each EPA vessel and should be made known to prospective chief scientists well in advance so their staffing can be adequately planned.

Recommended guidelines are to be found in small vessel manufacturers' specifications, vessel data plates, ABYC publications, the Federal Safe Boating Act and similar sources. Due to casualty lessons learned, the average calculation for adult weight has been increased from 150 pounds to 185 pounds for all vessels less than 65 feet in length. If the small craft was built before 2011, it is recommended to de-rate the data plate person capacity by 20 percent (e.g., if the data plate has a capacity of five persons, motor and gear, then limit total capacity to four persons, motor and gear).

5.5 Captain/Master of the Vessel

The vessel's captain/master is responsible for the safe operation of the vessel and all persons aboard. Accordingly, the captain/master is provided with full authority over all operations and personnel onboard the vessel. The captain/master and the crew, however, are there solely to facilitate carrying out the operational/scientific mission. In practice, the chief scientist submits a chemical hygiene plan, relevant standard operating procedures (SOPs), and job hazard analyses (JHAs) for the particular research planned to the responsible program official, and unless it is deemed unsafe or illegal by the vessel's captain/master while underway, it will be carried out. If a decision has to be made quickly on the spot, in the interest of safety, the authority of the captain/master takes precedence and priority over anyone else on the vessel.

5.6 Chief Scientist

One member of the scientific party shall be designated in writing as chief scientist. The chief scientist is responsible for coordinating and executing the entire scientific mission. Traditionally, the personal and professional conduct of the scientific party onboard the vessel and ashore is the responsibility of the chief scientist.

In many cases, safety matters are common knowledge and not unique to research vessels. In other cases, there may be safety hazards unique to the research, which the vessel's crew may not be aware of. In such instances, the chief scientist has a special responsibility to ensure safety and consult with the captain/master as necessary.

5.7 Vessel Organization – Class C Vessels

A vessel-specific organization chart or description shall identify all operating crew positions and lines of authority and provide a brief description of their duties and responsibilities. This document will be made available to all scientists and passengers planning to ride the vessel. Particular emphasis will be on the officer positions. This document will also be the basis for all crew member qualifications and training.

Table 5-1. EPA Class C Vessel Crews Minimum Merchant Mariner Credential (MMC) Endorsement and Manning

Position	USCG License/Document	46 CFR[a]	Applicability/Comments
Master	1 – Master of ocean or near coastal, Great Lakes motor[b]	11.404/11.412/11.418	Applies to all waters, including Great Lakes
	– Radar Observer endorsement	11.480	– Applies to all waters
	– Master of Great Lakes & inland, only, motor[b]	11.433/11.442/11.446	– Great Lakes and inland only
	– First Class Pilot endorsement	11.701	– As required; applies to any deck license
Chief mate	1 – Mate of ocean or near coastal, Motor[b]	11.405/11.414/11.420	– Applies to all waters including Great Lakes
	– Radar Observer endorsement	11.480	– Applies to all waters
	– Mate of Great Lakes & inland Motor[b]	11.437/11.444/11.448	– Great Lakes and inland only
	– First Class Pilot endorsement	11.701	– As required; applies to any deck license
Mates	1–3 – Mate of ocean or near coastal Motor[b,c]	11.406/11.407/11.414/ 11.420	– Applies to all waters including Great Lakes
	– Radar Observer endorsement	11.480	– Applies to all waters
	– Mate of Great Lakes & inland, Motor[b,c]	11.437/11.444 /11.448	– Great Lakes and inland only
	– Great Lakes pilots endorsement	11.701	– As required; applies to any deck license
Master/mate/ engineers	Person designated to provide medical first aid/to take charge of medical care on board vessel	13.13-1	– Certification as a Medical First Aid Provider/ Medical at Sea Person in charge
Chief engineer	1 – Chief Engineer, Motor[d]	11.510/11.518	
1st assistant engineer	1 – 1st Asst. Engr., Motor[d]	11.512/11.522	
	– Alternative, Designated Duty	11.524	
	Engineer[e]		
Assistant engineer	2 – Asst. Engineer, Motor[c,d]	11.514/11.516/11.522	
	– Alternative, Designated Duty Engineer[e]	11.524	
	– Alternative, Marine Electrician[e]	11.524	
QMED	Qualified Member Engineering Dept[c]	12.15-11	
Seaman	3 – MMC – Able Seaman[c,f]	12.05-7	
	– Alternative, Vessel trained & experienced (Unqualified Rating)		
Cook	1 – MMC – Food Handler[c]	12.25-10	
Steward	1 – MMC –Food Handler[c]	12.25-10	
TWIC	All MMC holders must also hold a valid Transportation Workers Identification Credential (TWIC)		

Notes:

[a] 46 CFR references are for the service requirements for the various MMC Endorsements. See all of 46 CFR 10 and 12 for the full requirement.

[b] Minimum GT and ocean/near-coastal/Great Lakes/inland or higher MMC endorsement, as required for the assigned vessel.

[c] Crew position and number depends on three considerations to be determined by the VMO for each vessel: (a) complexity of the vessel or operations; (b) the length of any particular cruise, which is driven primarily by continuous watch standing requirements (46 CFR 15.111); and (c) the most effective crew level to maintain the vessel in a planned state of readiness.

[d] Minimum horsepower MMC endorsements, as required for the assigned vessel.

[e] Alternative for small vessels.

[f] 65 percent of Deck Department (excluding officers) must be AB.

Table 5-2. EPA Class C Vessel Crew Minimum STCW for Seafarers Endorsements Required for Service Near Coastal and Ocean, in Addition to the MMC Endorsements in Table 5-1 Service in Great Lakes or U.S. inland waters is exempt, per 46 CFR 202(5)

STCW REQUIREMENT	46 CFR	APPLICABLE TO
Basic safety training consisting of	11.202(b)	All crew members
Personal survival techniques	11.202(b)(1)	
Fire prevention and fire fighting	11.202(b)(2)	
Elementary first aid	11.202(b)(3)	
Personal safety and social responsibilities	11.202(b)(4)	
ARPA	11.202(c)	Master and mates
GMDSS operator	11.202(d)	Master and mates
Bridge resource management	11.202(e)	Master and mates
Proficiency in survival craft	12.10-3	Non-AB members of the Deck Department

6. GENERAL MARINE ENGINEERING AND ONBOARD SAFETY REQUIREMENTS

6.1 Background

As delivered, EPA vessels conform to all requirements, rules and regulations of the regulatory bodies noted below (as in force at the time of delivery):

- ABS (Rules for Building and Classing Steel Vessels, Requirements for the Certification of the Construction and Survey of Cargo Gear on Merchant Vessels)
- USCG
- United States Public Health Service (including all requirements to entitle ships to receive rat-free and sanitary construction certificates)
- American Institute of Electrical Engineers Standards
- Federal Communications Commission

Although EPA vessels are exempt from the above regulatory bodies and their rules, except for load lines, these rules are adhered to in policy and, where practical, this is reflected in this manual. The load line is not exempt for vessels on a foreign voyage (e.g., Lake Guardian touching at a Canadian port).

6.2 Standards

Construction and Testing

Where, in this manual, an item or method of construction or testing is required to meet the standards established by the ABS, the standards in effect at the time of alteration to the vessel, or otherwise as applicable, shall be used. Standards that result in a lesser degree of safety for the vessel must be avoided. Shipbuilder's and manufacturer's operating procedures should be available for reference.

Preventive Maintenance

Procedures for the maintenance of the vessel and equipment are required to ensure that EPA vessels are maintained in conformity with relevant rules and regulations and EPA-specific requirements. To meet these requirements, vessel-specific procedures must be prepared to ensure that:

- Inspections of the vessel, equipment and spares are held at defined, regular intervals. Such inspections should cover machinery, equipment and the vessel structure.

- Nonconformities are reported with their possible causes, if known.
- Appropriate corrective action is taken by vessel and shore personnel.
- Records of the above are maintained and monitored.

6.3 Marine Engineering Details

General Criteria

All marine engineering details, such as piping, valves, fittings, boilers and pressure vessels, and their appurtenances installed on the vessel, insofar as practicable, shall be designed, constructed and installed in accordance with the provisions of 46 CFR Parts 50 through 64 or other related standards for marine engineering as related to inspected vessels. Suitable hand covers, guards or rails must be installed to protect against all exposed and dangerous places (e.g., gears, machinery).

Color Coding

Piping systems should be marked in accordance with the following USCG-approved color legend:

Table 6-1. USCG-Approved Color Legend for Piping Systems

Fresh treated engine cooling water	**Light blue**
Saltwater	**Dark green**
Fire systems and mains	**Red**
Diesel fuel	**Yellow**
Lubricating oil	**Striped yellow and black**
Hydraulic systems	**Orange**
Vessel service air	**Tan**
Starting and control air	**Dark gray**
Steam	**White (with pressure and direction)**
Fresh potable and distilled water	**Dark blue**
Sewage	**Gold**
Refrigerants	**Dark purple**
Oxygen	**Light green**
Nitrogen	**Light gray**
Halon	**Striped gray/white**

6.4 Exhaust Uptake and Vent Control

Internal combustion engine exhausts, boiler and galley uptakes, and similar sources of ignition must be kept clear of, and suitably insulated from, any woodwork or other combustible matter.

Uptakes and stacks must not be used for storage of combustible or flammable materials and must be kept clear of any obstructions.

Except as noted in this manual, all enclosed spaces within the vessel must be properly vented or ventilated. Means shall be provided to close off all vents and ventilators. Weather deck vents, covers and closure devices must be properly maintained. Dampers or other means of closure must be inspected to ensure proper operations in the opened and closed positions.

Means must be provided for stopping all fans in ventilation systems that serve machinery and storage spaces and for closing all doorways, ventilators and annular spaces around stacks and other openings to such spaces in case of fire.

6.5 Electrical Engineering Details

For all new vessels, and modifications to existing vessels, all electrical engineering details and installations must be designed and installed in accordance with 46 CFR Parts 110-113. Electrical wiring methods must conform to IEEE-45 and NEC USCG Adopted Standards.

Battery lockers must have an appropriate eye and skin burning hazard warning signs and “no smoking” signs posted.

An eyewash station must be placed in the vicinity of a battery locker and be clearly labeled.

6.6 Structural Standards and Alterations

General

Compliance with the standards established by the ABS will be considered as satisfactory evidence of the structural efficiency of the vessel. Current ABS classed vessels must meet these standards and inspection requirements and remain ABS in-class.

Alterations

Approved alterations to all EPA vessels should strive to meet ABS standards. Spaces must remain in use as originally designed unless specifically approved for alteration; if vessel structural alterations are involved, the changes must be approved by the captain/master, owner/master, the USCG, or alternate approval compliance via ABS.

Habitability

Habitability improvements or rearrangements that do not change the function of a space, involve bulkhead alterations, and change the weight and/or stability of the vessel must be approved by the EPA organization overall responsible for owning or leasing and operating the vessel. Use of flammable material such as wood paneling, studding, firing strips and flammable drapes are prohibited. Ceilings, linings and insulation, including pipe and duct lagging, shall be of approved noncombustible materials.

6.7 Stability

Responsibilities

It shall be the responsibility of the vessel's captain/master to maintain the vessel in a condition of satisfactory stability throughout the duration of the voyage.

Stability Documentation

The captain/master and chief engineer of any **Class B** or **C** vessel must be supplied with a Trim and Stability Booklet that provides rapid and accurate information concerning the stability of the vessel under varying conditions of load. The content of this document must be in accordance with applicable USCG requirements, as described in 46 CFR Part 170.

At a minimum, the Trim and Stability Booklet provides the captain/master with instructions and information sufficient to permit computation of the vessel's metacentric height (GM) and to determine whether the value so determined is adequate. It generally includes several "standard" loading conditions with adequate stability; these calculations must be modified by the captain/master if the actual loadings are expected to differ significantly and the resulting GM be checked against criterion provided.

Revisions of a vessel's Trim and Stability Booklet shall be published as required. These revisions are generally prompted by significant changes in a vessel's configuration. The VMO, as the vessel owner, must maintain records of known weight and center changes resulting from vessel modifications.

Damage Stability

In addition to damage stability information contained in the Trim and Stability Booklet, most vessels have been provided with flooding effect diagrams to provide dewatering and counter-flooding guidance following hull damage. The vessel's captain/master should be familiar with the use of these materials.

Maintenance of Watertight Integrity

Watertight bulkheads shall be kept watertight. Any modifications or repairs to watertight structures must restore the original watertight integrity of the structure. If a main transverse watertight bulkhead is penetrated, the penetration must be repaired and made watertight. Lead or other heat-sensitive materials must not be used in a system that penetrates a main transverse watertight bulkhead if fire damage to this system would reduce the watertight integrity of the bulkhead. If a pipe, scupper or electric cable passes through a main transverse watertight bulkhead, the opening through which it passes must be watertight.

Decks occasionally act as bulkheads. This occurs when main transverse bulkheads above and below a deck are offset (by design) and the deck forms a "connector" between them. This portion of the deck must be maintained watertight if the bulkheads are to be effective.

Watertight and weather tight doors and hatches and their associated fittings must be kept in good operating condition to ensure their suitability as portions of the watertight envelope. Any modifications or repairs to these items shall be followed by hose testing, if feasible; otherwise by chalk testing.

"Keep Closed" markings shall be provided at all weather envelope access closures and at any manually operated doors in main transverse bulkheads to ensure their closure at sea.

Stability Letter

Each **Class C** vessel must have a stability letter issued by the USCG. This letter sets forth the conditions of operation. This requirement also applies to **Class B** vessels that have been modified in such a way that stability could have been affected. A stability letter is not required if the information can be, and has been, placed on the Load-Line Certificate (46 CFR 170.120). (**Note:** The Lake Guardian has a stability letter that was issued by the ABS rather than the USCG.)

6.8 Ground Tackle

The Preservation Cycle

The preservation cycle for the anchor chain shall be at least once every three years for vessels operating in salt water and once every five years for vessels operating in fresh water. The chains shall be cleaned, scaled and carefully inspected for defects. The shackles and detachable links and their pins may be refitted, identification marks restored and shots shifted to new positions, as necessary, in order to distribute uniform wear throughout the entire length of the chain. Chains should be repainted whenever necessary to prevent excessive corrosion.

6.9 Inspection

Chains must be periodically inspected to determine wear. If any part of the chain has been reduced by corrosion or wear so that the mean diameter is reduced to 90 percent of its original diameter, or the length of six links exceeds the original length of these links plus the wire diameter of the chain in inches due to wear or elongation, or a combination of both, that part must be replaced.

6.10 Oxygen and Acetylene Cylinders

Receiving Cylinders Onboard

Upon pier-head delivery of oxygen and acetylene cylinders and before accepting and receipting, a close and careful inspection of the cylinder must be conducted by a qualified member of the crew, as designated by the captain/master. Any oxygen or acetylene cylinder that has evidence of heavy deterioration or wastage, is not stamped with a recent hydrostatic test date, or has no protective cap in place shall not be accepted for use onboard the vessel. (**Note:** Acetylene cylinders do not require a hydrostatic test, as this gas is not corrosive.)

Stowage Onboard

Keeping in mind the size and arrangement of the vessel, the following precautionary measures must be taken to ensure proper and safe stowage of oxygen and acetylene cylinders onboard EPA vessels, per 46 CFR Part 147:

- Cylinders shall be stowed upright and secured in a permanent rack to prevent shifting and toppling.

- Valve protection caps shall be secured in place at all times while cylinders are in storage. (**Note:** Small portable oxygen cylinders – whether for welding or medical purposes – and small portable acetylene cylinders do not require protective caps.)

- Readily combustible or flammable materials (such as wood, rags and paper, especially if soaked in grease or oil) shall not be present near the cylinder storage areas.

- Cylinders should be stowed in a well-ventilated space so that any leakage will be carried away.

- Spark-producing tools and electrical appliances should not be operated in cylinder storage areas.

- "Warning" and "No Smoking" signs shall be clearly and prominently displayed in cylinder storage spaces.

- Oxygen cylinders should be stowed as far away as possible from acetylene cylinders, with a minimum distance in excess of 20 feet.

- Cylinders must be protected from all heat sources to ensure the outside ambient temperature does not exceed 130°F.

Backflow Valves

Backflow or flashback valves shall be installed in all lines of gas welding and cutting equipment. The valves may be installed at either the torch or regulator ends of the lines with installation at the regulator end preferred.

Propane

The use and/or storage of propane onboard EPA vessels is prohibited, except as follows:

- The limited use of small, handheld propane torches while in port, and the stowage in port of such small propane tanks in well-vented, flammable material lockers located appropriately on the weather decks.

- Transportation onboard EPA vessels, in the form of deck cargo in response to clearly identified project needs, such as propane-fueled thermal generators for the use of radio navigational aids.

With respect to these exceptions, quantities shall be limited to identified needs, and containers (both full and empty) should be removed from the vessel as soon as possible. All compressed combustible gas containers must be securely stored in well-vented weather deck containers or racks that are able to be easily jettisoned, insofar as is practicable.

6.11 Scientific Equipment

Background

Scientific equipment carried onboard research vessels ranges from the completely standardized, with which everyone is familiar (such as conductivity/temperature/dissolved oxygen/Rosettes and rock dredges), to one-of-a-kind developmental hardware. From this, two safety concerns arise:

1. Familiarity may lead to carelessness with gears, which is dangerous in itself. At the other extreme, novel equipment whose potential hazards are not known can lead to unpleasant surprises. In either case, both crew and scientific party should exercise the greatest prudence and caution, particularly if the scientific operation might be dangerous to the vessel and personnel other than the immediate users.

2. With few exceptions, scientific equipment is not covered by federal laws and regulations. It is all the more important, then, that all hands approach research operations with particular care, using the principles of good seamanship, sound marine engineering practices and common sense.

In the case of inspected vessels, 46 CFR Part 189 contains rules for certain examination and testing procedures. All EPA vessels using such gear must meet these safety standards as applicable. But in the majority of cases, CFR and other rules delegate the responsibility for safety procedures to the captain/master, thus placing a heavy burden on those involved. **Accordingly, the chief scientist must ensure through the chemical hygiene plan, relevant SOPs, and JHAs that the captain/master of the vessel has all relevant information needed to evaluate the potential risks to the vessel, crew and passengers.**

Operating Instructions

It is not possible to cover the myriad of safety problems involved with research operations. Accordingly, each EPA vessel, regardless of the classes, will have onboard an overboarding equipment operations and maintenance manual specifically developed for that vessel and kept current. A visual inspection check-off sheet and instructions for use will be developed for all weight-handling equipment.

Weight-Handling Equipment

Many heavy or bulky pieces of research equipment are handled over the side, usually using metal wire rope. The following applies to all EPA vessels with such equipment onboard:

- All the handling gear involved should be installed to meet recognized codes and specifications.

- The entire installation should be in accordance with the approved stability data.
- Where applicable, stress and general design calculations should be performed.
- Operating limitations should be clearly posted, and operators of the equipment (e.g., winches, cranes) must be qualified in their use.
- At a minimum, a visual inspection of the entire winch, A-frame and wire rope in operation shall be accomplished annually by a competent person who will certify safe operations and safe operating limits and post a certification on the equipment. A load test to 125 percent of the load-handling, equipment-rated capacity will be accomplished by a competent person at a minimum of every four years in accordance with 29 CFR 1919.15. A load testing frequency that conforms to marine best practice would be every two years.
- Wire rope will be sized to a safety factor of five of the working load, based on the rated pull of the winch. In other words, if the winch-rated pull is 1,000 pounds, then the wire rope used on that winch will have a breaking strength of no less than 5,000 pounds.
- Since overstresses may degrade the long-term safety factor, historical and current records should be maintained of tests, excessive loading, maintenance, alterations and other factors.

Note: these strength precautions become even more important as the weight of the equipment being lowered increases (46 CFR 189.35).

6.12 Watertight Integrity

Background

The watertight integrity of a vessel is absolutely essential to the accuracy and viability of calculations on which freeboard assignment is based, as it is for stability and subdivision considerations. In general, preserving the watertight integrity of the vessel involves maintaining, correctly operating and protecting all openings in the hull, watertight bulkheads and superstructure. These openings include hatches, side openings and doors. The requirements concerning the design, construction, location and operation are grouped together in "Conditions of Assignment." These conditions are reviewed annually and periodically, every five years, during load line inspection and surveys on applicable vessels.

Applicability

For EPA **Class B** and **C** vessels, watertight integrity guidelines for a similar hull configuration are given in the watertight section of the USCG NVIC No. 5-86, section H. For vessels under 65 feet long, guidelines are provided in "Safety Standards for Small Craft" by ABYC (ABYC H-3, H-4, H-5 and H-27).

Responsibilities

Captains/masters of EPA vessels are responsible for maintaining the watertight integrity of these vessels. This responsibility involves the careful inspection and maintenance of all watertight closures and associated systems and the assurance that their functions, operation and status in normal and emergency conditions are clearly understood by members of the crew and researchers.

Further, captains/masters of **Class B** and **C** EPA vessels subjected to load line requirements, in accordance with 46 CFR 188.05-35 and Subchapter E, have the responsibility to maintain load line certificates and current survey reports onboard their vessels and to comply with all terms and conditions stated in these documents. These captains/masters must keep logbook records as prescribed in 46 CFR, Subchapter E, section 42.07-20.

Information

Sources of information on the details of watertight integrity include:

- CFR 46, Subchapter E, Subpart 42.15, titled "Conditions of Assignment of Freeboard," contains details on doors, hatches, machinery space openings, miscellaneous openings, ventilators, air pipes, cargo ports, scuppers, inlets and discharges, side scuttles and freeing ports.

- CFR 46, Subchapter O, Subpart 69.03 (69.03-67), contains information on tonnage openings.

- CFR 46, Subchapter H, Subpart 72.05, contains information on windows and air ports.

- CFR 46, Subchapter H, Subparts 78.15 and 78.17, contains information on doors to be closed at sea and closing appliances

- CFR 46, Subchapter I, Subpart 97.15, contains information on hatches and other openings.

- CFR 46, Subchapter S, Subparts 170.248 and 170.070, contains information on watertight bulkhead doors and oceanographic research vessel subdivision.

- NVIC 5-86, "Voluntary Standards for U.S. Uninspected Fishing Vessels," contains information on watertight integrity in section H.

6.13 Onboard Safety Requirements

6.13.1 Vessel Safety Familiarization

Applicability

This section is applicable to EPA **Class B** and **C** vessels. In addition, portions of the safety familiarization guide are generally applicable to EPA **Class A** vessels that do not have laboratories onboard.

For example, **Class A** Vessel Safety Familiarization includes:

- The captain/master conducting a safety briefing prior to disembarking for all crew and scientific personnel onboard.

- Fire extinguisher locations, MOB procedures, PFDs, VHF radio operation (channel 16), fuel shutoff valve locations, motor on/off switches, etc., all need to be discussed.

Purpose

The purpose of this section is to provide a means for crew members and scientific staff to review the basic safety requirements for vessel operations.

Program Elements

6.13.1.1 Familiarization Guide

Section 6.13 provides onboard safety requirements for **Class B** and **C** vessels. Appendix A of this manual contains additional information, including a safety familiarization guide that addresses safety issues applicable to all EPA vessels with a laboratory onboard. Appendix B of this manual provides safety guidelines for deck and science operations. Also, portions of the guide are generally applicable to EPA **Class A** vessels that do not have laboratories onboard. The guide was adapted from Chapter 1 of the Safety Training Manual – Crew Supplement, prepared by the University – National Oceanographic Laboratory System (UNOLS) Research Vessel Operators Committee. It provides basic safety information for those crew members and scientists who are serving onboard an EPA vessel.

Each EPA **Class B** and **C** vessel shall have sufficient copies of the guide to provide one to each new crew member and members of the scientific staff who have not previously embarked on the vessel. The vessel captain/master will prepare a vessel-specific guide that includes the same categories of material.

The guide does not replace the requirement to prepare station bills or the need to conduct emergency drills, as described by other sections of this manual.

6.13.1.2 UNOLS Safety Training Manual

The UNOLS Safety Training Manual – Crew Supplement was prepared to provide more in-depth coverage of the safety issues associated with science vessels. A copy of the manual is recommended for inclusion in the library of all EPA **Class B** and **C** vessels that have laboratories onboard.

Program Responsibilities

6.13.1.3 Captain/Master

The captain/master of each applicable EPA vessel shall ensure that there are sufficient copies of the guide onboard to provide one to each new crew member and new members of the scientific staff who have not previously embarked on the vessel.

6.13.1.4 New Crew Members

To help ensure their safety while onboard, each new crew member should read the guide and make sure they understand the basic principles as well as their individual responsibilities for their personal safety and the safety of other crew members and the vessel. Questions should be directed to the captain/master or the chief scientist, as appropriate.

6.13.2 Scientific Diving Operations

Diving procedures are based on the fact that the master/captain of the vessel retains ultimate authority for all diving operations conducted from the vessel, which includes terminating all diving operations if, in the master's/captain's judgment, conditions endanger the vessel or personnel. In practical terms, and to minimize risk, this means that the approval of two people is required to commence a dive operation – the master/captain of the vessel and the divemaster. Either one can terminate a dive operation.

While afloat, the master/captain has the ultimate responsibility and authority for the safe operation of the vessel and embarked persons, to include all scientific diving operations conducted from the vessel. To this end, the master/captain will ensure that he or she fully understands the proposed diving operation, and that the vessel is equipped, and the vessel's crew is prepared, to effectively support the operation.

Additional scientific diving operations are addressed in the EPA Diving Safety Manual (revised August 2011) located at the SHEMD Intranet "Manuals and Guidelines" page.

6.13.3 Vessel Chemical Hygiene Plan (VCHP)

Applicability

This element is applicable to all EPA vessels that have a laboratory onboard. This includes all laboratories internal to the vessel's original structure, as well as van or container laboratories secured to a weather deck(s).

Purpose

The purpose of this program is to ensure that the safety measures required by the various EPA laboratories onshore, as set forth in its Chemical Hygiene Plans (CHPs) required by 29 CFR 1910.1450, are integrated with and carried over to laboratory operations afloat.

Further, the VCHP must address the additional and/or different risks associated with operating a laboratory on a vessel.

As determined by each chief scientist, the CHP required by this element may be either:

- A stand-alone document for a specific EPA vessel
- An appendix or chapter in the laboratory's primary CHP

Regardless of the method used, the document must:

- Address the specific design, installed equipment, potential chemicals used and contemplated laboratory operations of the shipboard laboratory(s) on a specific EPA vessel, including SOPs relevant to safety and health considerations to be followed when laboratory work involves the use of hazardous chemicals.
- Include the criteria that the employer will use to determine and implement control measures to reduce employee exposure to hazardous chemicals (including engineering controls, PPE and hygiene practices), with particular attention to the selection of control measures for chemicals that are known to be extremely hazardous (e.g., carcinogens, reproductive hazards, chemicals with a high degree of acute toxicity).
- Require that fume hoods and other protective equipment are functioning properly and specific measures are taken to ensure proper and adequate performance of such equipment.
- Entail provisions for employee information and training as prescribed under the CHP (29 CFR 1910.1450).
- Detail the circumstances under which a particular laboratory operation, procedure or activity shall require approval prior to being brought aboard.
- Contain provisions for medical consultation and medical examinations in accordance with both 29 CFR 1910.1450 and EPA Order 1460.1.
- Ensure that chemical exposures encountered on the vessel are considered in concert with exposures to the same individual(s) in their laboratory work onshore, and that these chemical exposures are kept within the prescribed regulatory limits of the most conservative regulatory standard.

- Be reviewed and approved by the captain/master with respect to those issues that can affect the safety of the vessel and/or crew (e.g., amount and type of hazardous materials brought onboard, hazardous material storage procedures).

- Be available on the vessel.

VCHP Elements

The following elements, included in most CHPs onshore, are discussed from the perspective of the potential additions and/or the differences associated with operating a shipboard laboratory. Each Chemical Hygiene Manager (CHM) should review the following listing and make a decision regarding the relative effectiveness of preparing a stand-alone document for the laboratory (or laboratories) on a specific EPA vessel or an appendix or chapter in the laboratory's primary CHP:

6.13.3.1 CHM

A CHM, who will be present during the cruise, must be appointed to provide expertise on laboratory safety and industrial hygiene and to ensure that the requirements of the VCHP are carried out. The CHM should be familiar with the vessel, vessel laboratory operations and the scientific research. The CHM should report to the chief scientist.

6.13.3.2 Standard Operating Procedures (SOPs)

Shipboard operations may require additional precautions over operations onshore. These may include handling acids or caustics in heavy seas, power interruptions, different equipment, exposures from sampling, climatic factors such as heat and cold, dampness, equipment storage, emergency equipment, and emergency evacuation and drills.

6.13.3.3 Ventilation

The VCHP should address the differences in the ventilation systems on the vessel and how these differences may affect staff exposures, including how often the system must be evaluated. Also, consider the effect of laboratory ventilation on nonlaboratory areas of the vessel. The CHP must require that fume hoods and other protective equipment function properly and that specific measures be taken to ensure proper and adequate performance of such equipment. This includes monitoring hoods' flow rates and determining their effectiveness in containing chemical exposures.

6.13.3.4 Spills

The cleanup and disposal of spilled materials on a vessel introduces significantly different risks and should be addressed in the document. Consideration should be given to bringing aboard spill kits that are unique to the chemicals that will be used in the research.

6.13.3.5 Distribution and Storage of Hazardous Materials

This area can significantly affect the safety of the vessel and crew. It should address:

- The amount and type of materials to be brought onboard.
- Procurement and maintenance of a Material Safety Data Sheet (MSDS) and/or Safety Data Sheet for all hazardous materials brought onboard. A copy of the MSDS must be furnished to the captain/master, and a copy must be readily available to the scientific staff.
- The distribution of the material to be brought onboard (e.g., laboratory and storage areas).
- Approval of storage areas.
- Segregation of materials.
- Security against moving and breakage in heavy seas.
- Labeling.
- Periodic inventories to ensure that unnecessary materials are not kept onboard and/or are removed at the end of the voyage.
- Onboard movement of materials in heavy weather.

6.13.3.6 Environmental Monitoring

Differences between onshore and vessel monitoring requirements with respect to materials, hoods, hood performance such as cross drafts, local and general ventilation systems, industrial hygiene monitoring, and other aspects.

6.13.3.7 Protective and Emergency Equipment

Address the differences in equipment. For example:

- Location and type of PPE including, but not limited to, safety glasses, goggles, laboratory coats, chemical-resistant aprons, and respiratory protection.
- Location and type of first aid supplies and medical equipment that is readily accessible.
- Location and type of drench-type safety shower(s) and testing requirements.
- Location and type of emergency eyewash station and testing requirements.
- Firefighting systems (e.g., blankets, extinguishers, fixed systems).
- Type and audibility of alarms and expected response (include alarms associated with vessel operations and how various vessel emergencies may affect critical laboratory operations).
- Intervessel communications (e.g., intercom, telephones).

6.13.3.8 Records

Recordkeeping requirements onboard should be consistent with recordkeeping onshore, including:

- Maintaining an accurate record of any measurement taken to monitor employee exposures and any medical consultation and examinations required by the basic CHP.
- Maintaining an accurate record of any accident investigations and recordkeeping requirements that are mandated by the Occupational Safety and Health Administration (OSHA).
- A system to maintain and transfer records to the onshore facility at the end of a survey voyage or trip.

6.13.3.9 Laboratory Waste Disposal

Prepare and enforce a written procedure for disposing of laboratory waste for the vessel, including:

- Specifying how waste is to be collected, segregated, stored and transported.
- Specifying how the waste is to be labeled and containerized.
- Specifying requirements for satellite collection areas and manifesting of waste.
- Precautions for use of sinks, sifting trays and other equipment.

6.13.3.10 Fume Hoods

Hoods should be selected, installed, operated and maintained in accordance with the same criteria used in the laboratory onshore. This criteria includes the following:

- EPA Performance Requirements for Laboratory Fume Hoods (February 26, 2009)
- American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) Method of Testing Performance of Laboratory Fume Hoods Standard (ASHRAE Standard 110)
- American National Standards Institute (ANSI)/American Industrial Hygiene Association (AIHA) Laboratory Ventilation Standard (ANSI/AIHA Z9.5)

6.13.3.11 Respirators

Respirators should be selected, used and maintained in accordance with the same basic criteria used in the laboratory onshore – to include all medical approval and fit test requirements. This includes the following:

- The OSHA Respiratory Protection Standard (29 CFR 1910.134)
- The SHEMD Respiratory Protection Guideline (Guideline 46)

Note: When selecting respirators for use onboard an EPA vessel, the CHM should also consider the environment in which the respirator will be used (e.g., the effect of salt spray on a charcoal canister filter).

Program Responsibilities

The vessel's captain/master shall review and approve the VCHP with respect to those issues that can affect the safety of the vessel and/or crew (e.g., amount and type of hazardous materials brought onboard, hazmat storage procedures).

The chief scientist shall be responsible for ensuring that:

- A CHM is appointed for the cruise. The chief scientist could be the CHM or the CHM could be selected from the science crew. Whoever is chosen to be the CHM must be knowledgeable about the planned research.
- A VCHP has been prepared for the vessel that accurately and completely addresses the appropriate laboratory safety issues and is consistent with the intended operations and the design and equipment of the vessel.
- Scientific staff members are familiar with the requirements of the VCHP and comply with its provisions.

6.13.4 Lockout/Tagout (LOTO)

Applicability

This program is applicable to all EPA **Class B** and **C** vessels. It is also applicable for **Class A** vessels when the VMO (or appropriate designee) deems that application of the LOTO program will reduce the risk involved in EPA vessel operations and/or maintenance. Each vessel should have a stand-alone LOTO program and procedures, prepared for operations specific to that vessel, that are available to the crew at all times.

Purpose

The purpose of the LOTO program is to prevent injury to personnel and/or damage to equipment by notifying personnel that equipment or systems are not in a normal operating condition, and/or to control hazardous energy.

Note: 29 CFR 1910.147 provides regulatory requirements for administering LOTO. 29 CFR 1910.147a(1)(ii) specifically exempts maritime employment. This modified program combines the LOTO requirements of 29 CFR 1910.147 into one program.

Program Elements

The LOTO program consists of the following elements:

6.13.4.1 Use of Tags and/or Labels

The tagout procedure consists of a series of tags or adhesive labels that are applied, as appropriate, to equipment, switches, valves, instruments, gages or meters to indicate that the equipment is inoperative, has restricted use, or is out of calibration. The tags or labels, available from commercial sources, must contain the information necessary to avoid injury to personnel and/or damage to equipment.

Tagout procedures are to be used for all corrective maintenance, including work done by an outside maintenance or repair activity. Tagout procedures shall be enforced at all times.

All components necessary for the isolation of a system must be tagged. Only in this manner can safety be ensured. Once tags are attached, only authorized individuals may remove the tags and place the system back in operation.

6.13.4.2 Use of Lockout Tags and Devices

The purpose of the LOTO program is to prevent injury to personnel by ensuring that equipment has been de-energized for maintenance and cannot be inadvertently re-energized.

The LOTO process involves placing a lock and tag on the energy-isolating device in accordance with an established procedure after the device has been de-energized. The presence of the lock and tag indicates that the energy-isolating device shall not be activated until removal of the lock and tag takes place by the person who was responsible for the initial placement. An isolating device can be an electrical circuit breaker, disconnect switch, line valve or similar device used to block or isolate energy.

Warning: Removing the power source from any type of equipment does not necessarily remove energy that may be stored in the equipment, such as electrical energy stored in a capacitor, kinetic energy stored in flywheels, mechanical energy due to pressure differences, heat energy and hot surfaces, or potential energy stored in pendulums and heavy objects not at their lowest position. Therefore, it is imperative that crew members responsible for removing power sources be thoroughly knowledgeable of the system characteristics. Any stored energy should be released. If this is not possible, it should be controlled by blocking, and all individuals who could be injured from such unexpected energy releases must be free and clear of the danger zones.

General requirements of the LOTO program include:

- An initial survey of the vessel shall be made to identify all energy sources and related exposures to determine if machines, equipment and processes can be isolated.

- The requirements for tags, chains, locks, adapters, pins and the like shall be ascertained, based on the initial survey, and an adequate supply shall be maintained, distributed or assigned as needs dictate.

- The tags used for this program shall be uniform throughout the vessel (i.e., size, shape, color and format). Also, they shall be durable enough to withstand the environment to which they may be exposed for the maximum period of time that exposure is expected.

- Tags must warn against hazardous conditions if the equipment/process is re-energized and shall include the following legend: "DO NOT START, DO NOT OPEN, DO NOT CLOSE," or similar language.

- Only the person who has locked out a piece of equipment is authorized to remove the lock. To ensure compliance, only those employees actually engaged in the repair, maintenance or replacement of the equipment or process shall have the key to the locking device.

- LOTO procedures are to be used for all corrective maintenance, including work done by an outside maintenance or repair contractor. The outside contractor must coordinate with EPA employees performing maintenance when initiating a LOTO procedure.

- LOTO procedures must be enforced at all times.

- All components necessary for the isolation of a system must be locked out. Only in this manner can safety be ensured. Once tags are attached, only authorized individuals may remove them and place the system back in operation. If more than one person is needed to perform the work, then multiple locks uniquely identifying each person must be applied. Hasps accommodating multiple locks can be used to coordinate this effort.

6.13.4.3 Procedures

- All personnel affected by the LOTO shall be informed before the LOTO takes place.

- Using appropriate equipment/process shutdown procedures, all operating controls shall be turned off or returned to the neutral mode.

- All involved energy-isolating devices shall be located and operated in such a manner as to isolate the equipment or process from the energy source. All residual energy shall also be discharged.

- Appropriate locking devices shall be applied to each energy-isolating control. The preferred method shall be lockout, then tagout. Tagout without lockout shall be considered only as a last resort. Lockout devices shall be attached so as to prevent the operation of energy-isolating devices. Tagout devices shall be attached to energy-isolating devices; where the installation does not permit this attachment, they shall be located so as to be immediately obvious to anyone attempting to operate the energy-isolating device. Where lockout tags are used, the crew member responsible for completing tag information shall include:

    - Date and time of the LOTO

- Printed name of crew member performing the LOTO
- Reason for the LOTO

- Using due care, the following actions shall be taken after LOTO to determine if the operation of the energy-isolating devices has, in fact, produced the required isolation of the equipment or process:
  - Operate the equipment or process operating controls (e.g., push buttons, switches) to determine that the energy isolation has been effective.
  - Test the equipment or process by use of appropriate test equipment and/or visual inspection to determine that the energy isolation has been effective. (**Warning:** Return operating controls to the off or neutral position after each test.)

- The equipment or process shall be carefully examined to detect and relieve, disconnect, or restrain any residual energy.

- Where hydraulic, steam, water, pneumatic or gas isolation valves are involved, they shall be tightly closed, chained, locked and appropriately tagged.

6.13.4.4 Release of LOTO

Warning: Energy stored in a locked or tagged out system must be considered before power is restored to the system, regardless of the source. It is essential that the involved crew member be well versed in the possibility of unexpected movement or power when the locking mode is removed.

- Before energy is restored to the equipment/process, the work area shall be visually inspected to ensure that all nonessential items have been removed and that all components are operationally intact. At this time, advise all affected personnel that locks and tags are to be removed for the purpose of restoring energy.

- Devices shall be removed from each energy-isolating device by the person who initially applied the device.

- After ensuring that all affected personnel have been advised of the LOTO removal, restore energy to the equipment/process.

6.13.4.5 Recordkeeping

A LOTO log indicating which equipment is locked out/tagged out must be established for the vessel. The log will include:

- A listing of all disabled switches, valves or other components.

- The date on which the equipment was placed out of service, lock/tag locations, valve/switch positions, and the name of the person who attached the tag(s).

- The dates on which the equipment was placed back in service and the tag(s) were removed and the name of the person who removed the tag(s).

- A section to document training on the LOTO program.

6.13.4.6 Training

All hands must receive training on the LOTO program upon reporting onboard and annually thereafter. This training will be documented in the vessel's LOTO training log. As specified in 29 CFR 1910.147(c)(7)(iv): "The employer shall certify that employee training has been accomplished and is being kept up to date. The certification shall contain each employee's name and dates of training." Additionally, scientific staff embarked must be familiar with the program, as science-related equipment (e.g., fume hoods, cranes) may be involved.

This training will include the following:

- Each authorized employee shall receive training in the recognition of applicable hazardous energy sources, the type and magnitude of the energy available in the workplace, and the methods and means necessary for energy isolation and control.

- Each affected employee shall be instructed in the purpose and use of the energy control procedure.

- All other employees whose work operations are or may be in an area where energy control procedures may be used shall be instructed about the procedure, and about the prohibition relating to attempts to restart or re-energize machines or equipment that are locked out or tagged out.

- When tagout systems are used, employees shall also be trained in the limitations of tags.

Program Responsibilities

- The vessel's captain/master shall ensure that all hands comply with the LOTO procedures.

- The chief engineer shall:

  - Manage the LOTO program.

  - Establish and supervise a LOTO log and ensure that sufficient supplies of tags, locks, locking devices, labels and forms are available to properly execute the program.

  - Personally check the LOTO log at least once a month, note errors, bring errors to the attention of responsible personnel, and remove completed tagout record sheets and instrument logs.

6.13.5 Confined Spaces

Applicability

This program is applicable to all EPA vessels that have a confined space capable of being entered. A confined space is defined as:

- Large enough and so configured that an employee can enter and perform assigned work.
- Having limited or restricted means for entry or exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, and pits).
- Not designed for continuous employee occupancy.

Each vessel should have a stand-alone confined space program and procedures, prepared for operations specific to that vessel, that are available to the crew at all times.

Purpose

The purpose of this program is to ensure that anyone who enters or works in a confined space does so in a safe and compliant manner. By design, some vessels have confined spaces (especially tanks and voids) in which both toxic and nontoxic gas- or vapor-creating substances are used in the normal operation of the vessel, or can accumulate as a result of system failures. Hazardous atmospheres may be created that can explode or cause asphyxiation. Compounding the problem is the fact that many gases or vapors are colorless and odorless and are not detectable by humans, such as carbon monoxide, a product of incomplete hydrocarbon combustion. Personnel attempting to save a fallen shipmate may themselves be overcome by undetected vapors. It is for these reasons that the atmosphere of every confined space must be tested before entry. Additionally, there must be an effective means of safe rescue immediately available.

This program element was developed from 29 CFR Part 1915, Subpart B, "Confined and Enclosed Spaces and Other Dangerous Atmospheres in Shipyard Employment." This section is intended to describe the minimum requirements for EPA vessels.

Program Elements

The confined space entry program consists of the following elements:

6.13.5.1 Initial Survey and Marking

All EPA **Class B** and **C** vessels will be surveyed to identify potential confined spaces (e.g., tanks, voids, cofferdams, double bottoms). The entries to all such spaces (e.g., hatches, manholes) will be labeled "DANGER: CONFINED SPACE – DO NOT ENTER" in prominent letters. Also, all such spaces shall be appropriately secured with locking mechanisms to deny such entry. The remaining elements apply to entry into a confined space.

6.13.5.2 Entry Restrictions

In normal practice, entry to vessel confined spaces is a part of maintenance activity and should be conducted only while the vessel is alongside a pier or in a shipyard. The purpose of this restriction is to conduct the entry only when competent technical advice and local rescue capabilities are readily available in the event of a mishap.

Confined space entry while underway shall be considered to be an emergency procedure only. Therefore, it shall be attempted only when the captain/master determines that it is necessary for the safety of the vessel or crew.

6.13.5.3 Required Equipment

The following equipment is the minimum required for confined space entry:

- Properly calibrated test equipment capable of measuring oxygen levels, flammable atmospheres or the percent of the lower explosive limit/lower flammable limit of that atmosphere, carbon monoxide, hydrogen sulfide and any other involved toxics.
- Ventilation equipment (duct fans and hoses) capable of ventilating the confined space.
- Rescue equipment suitable for rescuing an incapacitated person in the space from outside the space (e.g., lifeline and harness, rescue tripod).
- A means to communicate with a person(s) who enters a confined space. (**Note:** For each confined space entry, a second employee, known as an attendant, must monitor the entire entry by communicating with the entrant and performing non-entry rescue, if needed.)

6.13.5.4 Qualifications

Only the following people are authorized to test and certify the atmosphere in a confined space on an EPA vessel:

- A marine chemist certified by NFPA.
- A certified industrial hygienist.
- A person designated by the VMO (or appropriate designee) as a "competent person" who can accomplish limited gas-freeing duties, such as providing day-to-day follow-on safety testing after initial gas freeing by a marine chemist. Such a person must be qualified in accordance with 29 CFR 1915.7

Regardless of job classification, anyone who monitors and tests the confined space atmosphere is an attendant for the confined space, and anyone who enters a confined space must be

appropriately trained according to OSHA Standard, 29 CFR Part 1915, Subpart B. This training must include acquiring the understanding, knowledge, and skills necessary for the safe performance of the duties assigned for confined space entry.

6.13.5.5 Procedures

Ventilation: The space will be opened and ventilated to the outside atmosphere with a portable blower. Care must be taken that the blower is placed in fresh air so that it is not contaminated with engine exhaust or any other contaminants.

Testing: After ventilation, and prior to entry, the space must be tested. All testing must be done with a calibrated meter, which is "bump tested" both before and after use. Testing of the confined space must be performed in the following sequence:

- Oxygen – A space will not be entered if the oxygen content is below 19.5 percent or above 22.0 percent.
- Flammable atmospheres – A space will not be entered when the concentration of flammable vapors or gases is equal to or greater than 10 percent of the lower explosive limit.
- Other (e.g., carbon monoxide, hydrogen sulfide) – A space will not be entered until a competent person has determined that toxic vapors or gases do not present a dangerous atmosphere. In no instances shall anyone enter the space when the concentration of contaminant is greater than one half of OSHA's Permissible Exposure Limit, NIOSH's Recommended Exposure Limits, the American Conference of Governmental Industrial Hygienists' Threshold Limit Values, or one half of the most conservative applicable regulation or standard.

Certification: After testing, the person who performed the test will complete a "Gas Free Certificate" (available from commercial sources). The certificate will be:

- Signed by the person who completed the tests.
- Signed by the person who will enter the space.
- Posted in plain view of the confined space entry point.
- Retained by the chief engineer upon completion of the work.

In addition, the person who performed the test will complete a confined space entry permit that is compliant with the applicable OSHA Standard (29 CFR Part 1915, Subpart B).

The entry permit that documents compliance and authorizes entry to a permit space shall identify:

- The permit space to be entered.

- The purpose of the entry.
- The date and the authorized duration of the entry permit.
- The authorized entrants within the permit space, by name or other such means (for example, rosters or tracking systems), so as to enable the attendant to determine quickly and accurately, for the duration of the permit, which authorized entrants are inside the permit space. (**Note:** This requirement may be met by inserting a reference on the entry permit as to the means used, such as a roster or tracking system, to keep track of the authorized entrants within the permit space.)
- The personnel, by name, currently serving as attendants.
- The person, by name, currently serving as entry supervisor, with a space for the signature or initials of the entry supervisor who originally authorized entry.
- The hazards of the permit space to be entered.
- The measures used to isolate the permit space and to eliminate or control permit space hazards before entry. (**Note:** Those measures can include the lockout or tagging of equipment and procedures for purging, inerting, ventilating and flushing permit spaces.)
- The acceptable entry conditions.
- The results of initial and periodic tests performed, accompanied by the names or initials of the testers and an indication of when the tests were performed.
- The rescue and emergency services that can be summoned and the means (such as the equipment to use and the numbers to call) for summoning those services.
- The communication procedures used by authorized entrants and attendants to maintain contact during the entry.
- Equipment, such as PPE, testing equipment, communications equipment, alarm systems, and rescue equipment, to be provided for compliance with this section.
- Any other information whose inclusion is necessary, given the circumstances of the particular confined space, in order to ensure employee safety; and any additional permits, such as for hot work, that have been issued to authorize work in the permit space.

Entry: Individuals entering a confined space will be equipped with a harness and lifeline to facilitate rescue in the event of a mishap. At least one person will remain immediately outside the entry point to man the lifeline and communication system. This individual is known as the attendant. If required, a tripod or chain hoist device will be immediately available to assist in any required rescue.

Training: The chief engineer is responsible for ensuring that personnel involved in confined space entry receive initial training from a certified confined space training program in accordance with 29 CFR Part 1915, Subpart B, upon reporting onboard, and then annual refresher training thereafter. Records of such training shall be maintained by the SHEMP manager's office having jurisdiction for that vessel and by the captain/master of the vessel. They are to be kept in an area (designated by the captain/master) where all regulatory materials are kept and immediately accessible to any government official (e.g., OSHA) who may need access to these records. Training will consist of at least the following topics:

- How to identify confined/enclosed areas.
- Hazards encountered when entering confined/enclosed spaces.
- Procedures for requesting gas-free testing.
- Procedures for helping crew members in an emergency to perform CPR. Training must stress to all personnel that if a person is observed to be unconscious in any space, no one is to enter that space without appropriate respiratory protective equipment and a backup assistant.

Training must also be provided should any of the following circumstances occur:

- Before there is a change in assigned duties.
- Whenever there is a change in permit space operations that presents a hazard about which an employee has not previously been trained.
- Whenever the employer has reason to believe that either there are deviations from the permit space entry procedures or inadequacies in the employee's knowledge or use of these procedures.
- The training shall establish employee proficiency in the duties required and shall introduce new or revised procedures, as necessary.

Certification of this training must be kept by the captain/master of the vessel. The certification shall contain each employee's name, the signatures or initials of the trainers and the dates of training.

Program Responsibilities

If the vessel design is such that there are confined spaces where toxic and nontoxic gases may accumulate, the vessel's captain/master is responsible for a comprehensive confined space entry program. The vessel's captain/master shall ensure that:

- There is at least one trained, qualified and certified "competent person" onboard.
- Confined space entry practices are established.

- The program is evaluated annually for compliance and effectiveness and that all cancelled entry permits are retained for one year for this review.

The chief engineer shall ensure that:

- Applicable crew members are trained concerning confined space entry procedures and precautions. Additional support may be obtained from qualified marine chemists or industrial hygienists.

- All entryways to confined spaces are properly labeled.

- All equipment required for proper evaluation of confined spaces and rescue is onboard the vessel, inventoried annually, inspected and properly maintained.

- Gas-free certificates and entry permits are posted in necessary areas and verified daily by signature of the competent person.

- Records of gas-free space testing and entry permits are kept at the entrance to the confined space as long as the space is open. In accordance with 29 CFR Part 1915, no one can enter such a space unless these certificates are in place and valid (signed each day).

- Assigned personnel receive training on the confined space entry program upon reporting onboard and annually thereafter.

- Information is available on the rescue and emergency services that can be summoned and the means for summoning them (such as the equipment to use and the numbers to call). (Dockside rescue and emergency services should be given the opportunity to view the vessel's confined spaces to ensure that they can safely perform entry rescue in an emergency.)

The entrant to the confined space and the attendant are responsible to ensure that:

- The chief engineer is notified before entry into any unventilated, unoccupied space that has been designated to store hazardous or toxic materials, or any sealed space.

- The chief engineer is notified before any hot work on a bulkhead, deck or overhead adjacent to a space containing flammable or potentially explosive atmospheres (such as a fuel oil or contaminated holding tank).

- The space was checked by a competent person prior to entry, and it complies with the gas-free engineering certificates and permits that are posted outside the space.

The gas-free engineering certificates and entry permits are posted on spaces at all times when these spaces are being entered. Gas-free engineering retesting of spaces is accomplished before the end of the period for which a gas-free certificate is valid. If a space is changed, it shall be retested and recertified prior to any additional work in the space.

6.13.6 Electrical Safety

Applicability

This element is applicable to all EPA vessels.

Specific procedures should be written when using fish shocking equipment.

Purpose

The purpose of this element is to provide guidance on identifying electrical hazards, and to prevent mishaps that could cause fatal injuries and extensive damage to vessel equipment and compromise the vessel's mission capabilities.

Program Responsibilities

The vessel's captain/master shall assign an electrical safety officer who shall:

- Ensure that this program is evaluated for compliance and effectiveness.
- Provide electrical safety training to the crew and embarked science team.
- Ensure that all electrical equipment (vessels, scientific or personal) received onboard the vessel is inspected, free from defect and approved for use onboard the vessel.
- Ensure that all electrical equipment is periodically inspected.

Electrical safety is the responsibility of all onboard. All hands and scientific staff shall request permission from the chief engineer to bring electrical/electronic equipment onboard.

6.13.7 Smoking Policy

Policy

EPA policy prohibits smoking within enclosed or indoor portions of vessels. Additionally, EPA Order 1000.9B prohibits smoking within 25 feet of vessel cabin entrances, emergency exits and open windows. If the vessel is not large enough to allow smoking beyond 25 feet of vessel cabin, entrances, emergency exits and open windows, then smoking will only be permitted at the furthest and safest point from cabin entrances, emergency exits, and open windows that is practical. A vessel's captain/master shall designate one or more weather deck spaces as smoking areas, as safety and operational requirements permit.

6.13.8 Vessel Crew Respirators

Applicability

This element is applicable to all EPA vessels where non-scientific work (e.g., painting, welding) or scientific research with no laboratory onboard (e.g., studying exposures from heavy metal or PCB-contaminated sediment) may require the use of a respirator. The selection and use of

respirators for science-related exposures when there *is* a laboratory onboard is to be addressed in the vessel's CHP or other approved health and safety plan.

Purpose

Many vessel repair and maintenance operations generate air contaminants that may be dangerous if inhaled. These contaminants can be in the form of gases, dusts, mists, fumes or vapors. Engineering controls are the most effective means for protecting personnel against such contaminants. Engineering controls include local and general exhaust ventilation systems. In addition, administrative procedures could be put into place that would eliminate or reduce the presence of airborne contaminants (e.g., prohibit dry sweeping). However, when engineering and/or administrative controls are not practical or feasible, respirators are necessary to ensure the protection of personnel. Respirators are available in many types and styles. They must be matched to the hazard where they will be used for protection. Both the respirator construction material and the filter element composition, for those types that use a filter, must be taken into consideration.

Respiratory Protection Program

Where respirators are necessary to protect the health of personnel, or whenever respirators are required by the EPA, a written respiratory protection program shall be established and implemented in accordance with OSHA's Respiratory Protection Standard, 29 CFR 1910.134. Each vessel should have a stand-alone respiratory protection program, prepared for operations specific to that vessel, that is available to the crew at all times.

6.13.8.1 Selection

Respirators will be selected for a specific vessel purpose in accordance with 29 CFR 1910.134, requirements for the use of respirators, and adhere to the following:

- The employer shall select and provide an appropriate respirator based on the respiratory hazard(s) to which the worker is exposed and workplace and user factors that affect respirator performance and reliability.

- The employer shall select a NIOSH-certified respirator. The respirator shall be used in compliance with the conditions of its certification.

- The employer shall identify and evaluate the respiratory hazard(s) in the workplace; this evaluation shall include a reasonable estimate of employee exposures to respiratory hazard(s) and an identification of the contaminant's chemical state and physical form. Where the employer cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be immediately dangerous to life and health.

- The employer shall select respirators from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

6.13.8.2 Medical Clearance

Vessel captains/masters are to ensure that all crew members required to wear respirators are medically approved to do so. Medical exams and testing for respirator use must follow the provisions of 29 CFR 1910.134 and EPA Order 1460.1. Medical clearance for respirator use must occur annually.

6.13.8.3 Training and Fit Testing

Qualitative or quantitative fit testing by a qualified person is required prior to any crew member's initial use of a tight-fitting respirator, and at yearly intervals thereafter. A respirator shall be assigned only to the individual for whom the respirator was fit tested.

Note: Fit testing should not be confused with a fit check, which is a test conducted by the wearer to determine if the respirator is properly sealed to the face. A fit check should be performed each time the respirator is donned or adjusted.

Individuals, required to wear respirators, must be trained annually on their use. This training must include the following:

- Why the respirator is necessary and how improper fit, usage or maintenance can compromise the protective effect of the respirator.
- What the limitations and capabilities of the respirator are.
- How to use the respirator effectively in emergency situations, including situations in which the respirator malfunctions.
- How to inspect, put on and remove, use, and check the seals of the respirator.
- What the procedures are for maintenance and storage of the respirator.
- How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.
- The general requirements of the OSHA Respiratory Protection Standard (29 CFR1910.134).

6.13.8.4 Cleaning, Inspection and Repair

Each individual who has been fitted for and assigned a respirator is responsible for cleaning and maintaining it in accordance with the manufacturer's instruction manual or pamphlet. At a minimum, respirators should be cleaned and inspected prior to use and stored in a protective bag to avoid contamination. Any necessary repairs shall be completed in accordance with the manufacturer's instructions. Supervisors shall conduct periodic checks for serviceability and make sure respirators are being cleaned and maintained as required.

6.13.8.5 Recordkeeping

The captain/master shall ensure that a record is maintained of the results for each individual fit tested to wear a respirator. Additionally, training records for respirator use must be kept by either the SHEMP manager having jurisdiction over the vessel or the captain/master of the vessel. The records shall be retained for a minimum of three years and be available for inspection.

6.13.8.6 Problems with Use

If the wearer of a respirator experiences difficulty in breathing or dizziness, senses irritation, or can smell or taste the contaminant(s), or the respirator becomes damaged, he/she must discontinue the operations or work activities immediately and seek medical attention.

7. FIRE PROTECTION

7.1 Applicability

This section is applicable to, and mandatory for, all EPA **Class C** vessels. EPA **Class B** vessels should be assessed with respect to their operations (e.g., laboratories, amount of hazardous materials onboard), and those portions of this section deemed necessary to achieve an acceptable level of risk, as determined by the captain/master, should be adopted for those vessels. **Class A** vessels shall follow USCG rules for the type and size of the involved vessel. (**Note:** unpowered vessels such as canoes and kayaks are excluded from this section.)

Vessels that do not operate continuously throughout the year need not fully comply with the listed requirements while in winter lay-up. Before a vessel resumes active operation, it is the captain's/master's responsibility to verify that all aspects of the fire protection program are functionally tested and found to be in operable condition. It is also the captain's/master's responsibility to verify that all aspects of the fire protection program are functional and in operable condition following any extended shipyard work.

7.2 Responsibilities

It is the VMO's (or appropriate designee's) responsibility to ensure that the fire protection program is operational at all times the vessel is in active service for both **Class B** and **C** vessels. All fire-extinguishing and fire alarm systems must be functional, as demonstrated through current testing by a qualified organization within the required service intervals.

If the vessel is at sea and any fire protection equipment becomes disabled, it is the captain's/master's responsibility to enact temporary alternate procedures to ensure fire protection until the equipment can be repaired. The captain/master should determine the appropriate type and level of remedial action necessary. If the captain/master feels that an unsafe condition exists, the vessel shall immediately proceed to port.

When the captain/master temporarily leaves the vessel, a senior officer shall be pre-designated to be in charge of the fire protection program until the captain/master returns to the vessel.

In a medical emergency that incapacitates the captain/master during a fire event, the senior officer onboard the vessel shall automatically assume control of the program.

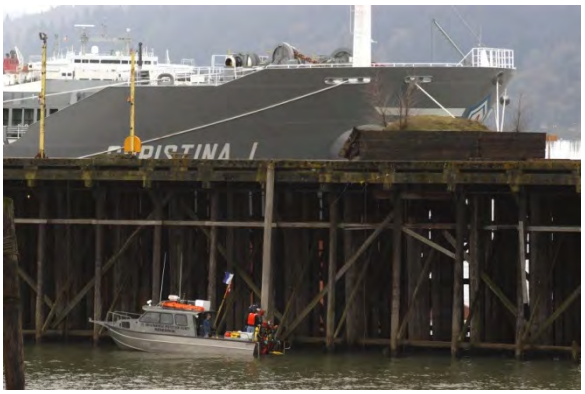
7.3 Firefighting Responsibilities

Training Requirements

All licensed crew members must have completed the USCG required firefighting training specified for their grade of license. Each licensed crew member must possess a current firefighting certificate from a USCG-approved fire training academy. Information regarding this USCG-approved training can be found at http://www.marad.dot.gov/about_us_landing_page/gateway_offices/fire_training_center/fire_training_center.htm.

All other crew personnel have received, as a minimum, Basic Fire Protection and Firefighting training as part of their STCW MMC Basic Safety Training Endorsement and are required to participate in advanced firefighting training programs that are available through various mariner, union, state and local programs.

EPA **Class A** vessel personnel are only required to have attended a Boating Course, and do not need to hold a USCG MMC. USCG licensing for this size vessel is only mandated by the USCG if the vessel is designated as a passenger-carrying vessel. The USCG defines Oceanographic Research Vessels as non-passenger carrying vessels, even though they carry temporary scientific teams.



It is the captain's/master's responsibility to ensure that the vessel's crew conducts fire drills at least biweekly (In port and short at-sea periods) or weekly (extended at-sea periods) in accordance with 46 CFR 131.535, ensuring that all crew members participate at least once per month in order to facilitate effective team training and to retain their necessary firefighting skills.

To ensure that drills are effective, they should be pre-planned to allow critical review of the fire control team's performance. A post-drill critique should be conducted to allow free interaction of ideas and improve the crew's firefighting abilities. The type and location of the drills should be varied to include practical exercises in all shipboard areas during a one-year period. The following drill tropics must be covered in an annual training cycle. Vessel-specific hazards may require drills in specialized hazards:

- Fire control team notification procedure
- Fire control team communications procedures
- Fire behavior
- Controlled application of water to vessel fires
- Use of portable fire extinguishers
- Use of hoses and nozzles
- Use of firefighting foam
- Knots and ropes
- Use of SCBA
- Use of ladders

- Forcible entry techniques
- Coordination with port fire departments
- Rescue techniques in below-deck spaces
- Ventilation and smoke removal techniques
- Firefighter safety
- First aid and CPR
- Fires involving hazardous materials
- Coordination of firefighting procedures with vessel operating and emergency procedures
- Pre-fire planning
- Firefighting techniques when normal suppression equipment is obstructed or inoperable
- Firefighting techniques “at sea” versus in port
- Operation of installed fire-extinguishing systems

Additional guidance on firefighting training can be obtained from:

National Fire Protection Association
1 Batterymarch Park
Quincy, MA 02169-7471
http://www.nfpa.org

For a listing of USCG-approved firefighting training schools, contact the following organizations:

National Maritime Center
100 Forbes Drive
Martinsburg, WV 25404
http://www.uscg.mil/nmc/courses/approved_courses_school.asp

Federal Emergency Management Agency
National Fire Academy
16825 South Seton Ave.
Emmitsburg, MD 21727
http://www.usfa.dhs.gov/nfa/

Firefighter Personal Protective Equipment

Every EPA **Class C** vessel must maintain a minimum of two complete sets of protective equipment onboard to allow effective firefighting operation. (**Note:** this section is optional for EPA **Class B** vessels.) Due to height and weight differences among crew members, it may be necessary to have additional sets of equipment to ensure that all crew members have access to equipment of the appropriate size. The captain/master will determine the need for additional sets of equipment based on the specific conditions onboard the vessel. Each set of protective equipment must include:

- Helmet (NFPA 1971)
- Gloves (NFPA 1971)
- SCBA (NFPA 1981)
- Protective coats and pants (NFPA 1971)
- Face shields or approved eye protection (NFPA 1971)
- Rubber boots or approved footwear (NFPA 1971)
- Nomex hoods or approved ear protection (NFPA 1971)
- Fire Party Communications System (NFPA 1221 and 1561 for guidance)
- Flashlight

The NFPA references listed above provide additional information on the type of equipment recommended. When purchasing equipment, the supplier must certify that the equipment complies with the listed NFPA standards.

All personnel must be familiar with the use and care of the protective equipment through regular practice. The equipment must be kept clean and maintained in good condition in accordance with the manufacturer's instructions, as well as applicable federal regulations. Personnel must be aware of the life cycle of protective equipment and not use equipment past its service life.

Firefighting Equipment

In addition to the required firefighter's personal protective equipment, each EPA vessel must carry an adequate supply of tools and equipment to facilitate firefighting operations as appropriate to the vessel's size and function. The supply of tools and equipment must be sufficient to properly respond to catastrophic incidents at sea, such as to fight fire, control flooding, or temporarily repair a damaged hull section. This equipment does not have to be special purpose equipment, specifically dedicated for firefighting, as regular maintenance tools could be used. Each vessel may have differing needs due to the level of hazard present; however, possible equipment includes:

- Portable lighting equipment, either handheld battery lights or cord-connected lighting units powered from an emergency power source
- Fans or blowers and ducting for smoke removal
- Portable pumps and hoses for dewatering
- Ropes
- Safety harnesses
- Forcible entry tools such as axes, pry bars or bolt cutters
- Portable ladders
- Portable radios

Class B and **Class C** vessels should have fire axes onboard and mounted where they are available for ready use, as required by 46 CFR 76.60-5. Suitable safety guards or covers should be provided over the exposed ax pick heads.

Fire Notification and Evacuation Procedures

Each powered EPA vessel, regardless of size, must develop a specific procedure for crew and passenger actions to be taken when a fire is discovered. The procedure must be developed by the captain/master with assistance from the Vessel Safety Officer, if one is assigned. All crew members and passengers must be trained on this procedure when embarking for the first time. A generic format that may be used to develop procedures is provided on page 7-6 of this manual.

Figure 7-1. Fire Procedure Template

ACTIONS TO BE TAKEN UPON DISCOVERY OF FIRE

All personnel, upon discovery of a fire, shall take the following actions in the listed order unless conditions warrant a different course of action:

1. Immediately call for help. If you have a radio, call the bridge and describe the situation. If you do not have a radio, find another means of communicating with the bridge.

2. Find a fire alarm pull station and activate. Determine if any personnel are injured or trapped by the incident.

3. Determine if you are able to assist trapped or injured individuals. If you are alone, make all attempts to remove the individuals to a safe location. If you are with other people, immediately send one person for help while you attempt to rescue the trapped individuals.

4. Evaluate the size of the fire. If it is a very small fire, attempt to extinguish it with a portable fire extinguisher. Only those trained on extinguisher use within the past year may use the extinguisher. Leave the area of the fire and proceed to a safe location.

5. Follow the instructions of your station bill, or proceed to the emergency assembly area.

Each EPA vessel must develop a standard response procedure for crew actions to be taken when a notification of fire is sounded. The fire control team should assemble at a predetermined location. Usually this will be a control station such as the navigating bridge or the fire equipment locker. The location should allow the fire control team to communicate directly with the captain/master or mate on watch to decide if any vessel maneuvers will be necessary to allow more favorable conditions for firefighting.

In response to the activation of the fire alarm, all individuals onboard who do not have a station bill (emergency duties) assignment should assemble at a preselected location, identified during their pre-underway safety briefing. At sea, this location would generally be the lifeboat or life raft embarkation station. In port, a different emergency assembly location should be selected that allows convenient access to the gangways. The purpose of this is to allow a determination of whether all individuals are safely accounted for.

Visitors

EPA vessels that carry visitors at sea or allow public group tours while in port shall develop specific emergency evacuation procedures to safely account for and rescue these people in a fire emergency. A complete documented head count must be taken while the vessel is still in port.

When public tours are brought onboard the vessel, the exit procedures shall be tailored to the increased occupant load. The existing means of egress onboard vessels are designed to move the occupants up to the lifeboats and may be inadequate to promptly evacuate a large number of visitors down to the dock.

The procedures shall specifically address the:

- Presence of deck obstructions, such as mooring chocks and cleats that could impede egress.
- Adequacy of aisle and stairway widths.
- Location and number of gangways that provide access to the dock.
- Potential presence of disabled persons and small children.

7.4 Fire Control Plans

All EPA **Class B** and **C vessels** shall have permanently displayed fire control plans. These plans shall consist of general arrangement drawings for each deck that clearly show the fire-retardant bulkheads together with specific information on the automatic detection systems, manual fire alarm stations, fire-extinguishing systems, locations of fire doors and means of egress for each area. The plans shall also include details of the ventilating systems, including the positions of dampers and the location of the remote means of stopping the fans. They must also identify which fans serve each section.

It is also recommended that a copy of the fire control plans be provided to the local fire department in the vessel's home port, and that another be kept in a conspicuously marked, weather-tight, on-deck container.

7.5 Quality Controls

Use of Approved Materials and Equipment

Only USCG-approved fire protection systems and equipment may be used onboard EPA vessels. The USCG has extensive testing requirements to ensure that installed equipment will continue to operate properly after exposure to the vibration and corrosion associated with the marine environment. If additional fire protection equipment is carried onboard an EPA vessel, it must also be of an approved type. This is to ensure that substandard equipment is never relied on in emergency situations. All replacement parts and repairs to the fire protection systems must be performed using manufacturer-recommended equipment that is listed for use as part of that system.

Electrical components must be USCG-approved or UL-approved marine products. This is to prevent electrically initiated fires. The USCG Electrical Engineering Regulations (Subchapter J, 46 CFR 110-113) contain information regarding shipboard wiring practices that must be followed in all cases when installing new equipment or making modifications.

It is also important to note that electrical equipment (e.g., starters, alternators, distributors) installed on gasoline-powered engines is specially designed to prevent the ignition of gasoline vapors. Gasoline vapors are heavier than air and will accumulate in lower deck areas and in the bilges. Any time repairs are made to gasoline engines or auxiliaries, the replacement parts must be UL-approved marine-grade components. Gasoline-powered engines must also have an approved flame arrestor installed on the carburetor air intake.

Class A vessels with in-board gasoline-powered engines must maintain operational powered blowers for positive engine compartment ventilation. Before attempting to start the engine, the captain/master must operate the engine compartment blower for a minimum of four minutes to ensure removal of potentially explosive gasoline vapors.

Recordkeeping

It is important to keep adequate records of modifications and the inspections, testing and maintenance of the fire protection systems and equipment. All records of such inspection, testing and maintenance shall be maintained for the durations required by the applicable NFPA standard. Original design documents should be available for all installed fire protection systems. Any time modifications or repairs are made to installed systems or structures, the work order must require that adequate documentation or drawings be provided so that future inspectors will have access to the updated information. The drawings are also needed because the manufacturer's part numbers for each piece of equipment are listed, providing a ready reference for ordering replacement parts.

A file must be kept that includes copies of all system testing and maintenance reports. If the vessel's engineering staff test any fire protection systems, it is necessary to prepare (and keep on file) a report or checklist showing the items tested, a simple description of the test procedures, whether the tested item passed or failed the test, and recommended corrective actions. The file shall be periodically reviewed by the chief engineer to verify that necessary corrective actions are being completed in a timely manner. The time interval for this review is semiannually or at the beginning of each year's sailing schedule, after the winter lay-up.

All fire drills and related firefighting training must be pre-planned, post-critiqued, and recorded in the vessel's log book. It is required that a separate log be kept of all such exercises. This log must include a description of the exercise and the names of all the participants as well as a drill critique with recommendations for improvement.

Operational Procedures

Minimum Required Equipment: Each EPA vessel shall adopt operational procedures to define the required minimum fire protection systems and equipment that must be operational before the vessel is allowed underway. All required fire protection equipment must be fully operational at all times. In special circumstances, however, it may be necessary to operate the vessel before repairs to nonfunctional equipment can be completed. If the captain/master believes the vessel can still be safely operated with the fire protection systems partially inoperable, the mission can proceed. The captain/master and the chief engineer should develop these guidelines based on the

specific equipment and hazards onboard the vessel. General guidance for the development of realistic criteria includes the following:

Table 7-1. Fire Protection Equipment Guidance

System	Minimum Required Equipment
Fire main system	• At least one functional fire pump • Sufficient hose stations on each deck so that all areas can be reached through not more than 100 feet of interconnected hoses • System tested within required interval
Fire alarm system	• At least one functional manual pull station per deck that sends an alarm signal to the wheelhouse • Sufficient functional alarm bells or horns to provide adequate audible alarm notification in all areas • Functional smoke detectors (if provided) in all high-hazard areas • System tested within required interval
Portable fire extinguishers	• At least one extinguisher available within 75-foot travel distance in all laboratories, machinery spaces and other high-hazard areas
Specialized extinguishing systems	• Fully functional systems protecting the main engine room and auxiliary spaces • Systems tested within required interval
Emergency lighting	• Sufficient functional lighting units to provide at least one foot-candle of illumination to permit emergency evacuation from all areas

Inspection, Testing and Maintenance Procedures: Each EPA vessel must have procedures that include the necessary information for the inspection, testing and maintenance of all onboard vessel fire protection systems. Such procedures shall be in accordance with the installation standards for the type of system provided (e.g., NFPA 10, NFPA 12, NFPA 72, NFPA 2001). This will ensure that the systems will be ready for use at all times and that all equipment provided is maintained and replaced after use or repairs. The procedures must include documentation (such as checklists or reports) for each inspection. This documentation should detail the extent of the work performed and must be signed by the person performing the work when completed. The documentation must be kept on file for three years to serve as a record of the required inspection, testing and maintenance performed on the fire protection systems.

The recommended procedures for the testing of the various systems and their frequencies have been taken from USCG regulations and NFPA standards. The criteria applicable to the fire protection systems have been developed from the following:

- 46 CFR Part 189, “Oceanographic and Research Vessels”
- NFPA 10/46 CFR 118.500, “Standard for Portable Fire Extinguishers”

- NFPA 12/46 CFR 410, “Standard on Carbon Dioxide Extinguishing Systems”
- NFPA 14/46 CFR 310, “Standard for the Installation of Standpipes and Hose Systems”
- NFPA 17, “Standard for Dry Chemical Extinguishing Systems”
- NFPA 17A, “Standard for Wet Chemical Extinguishing Systems”
- NFPA 20/46 CFR 118.300, “Standard for the Installation of Stationary Pumps for Fire Protection”
- NFPA 25, “Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems”
- NFPA 72, “National Fire Alarm Code”
- NFPA 101, “Life Safety Code”
- NFPA 2001, “Standard on Clean Agent Fire Extinguishing Systems”

The frequency and scope of the required inspections, testing and maintenance must be based on the codes and standards identified above. For vessels that are in lay-up for a portion of the year, the inspection frequency may be adjusted to a level that is more compatible with their operational schedule. The required inspections are intended to be performed by shipboard personnel, while other testing and maintenance requirements are expected to be performed by a licensed and qualified contractor.

7.6 General Fire Prevention Training

All personnel must be provided with general training instructions on fire prevention when embarking on the vessel for the first time. The instructions should consist of either a brief training exercise or self-review of a written lesson. The training should include a review of the vessel’s specific policies concerning:

- Control of combustible materials
- Control of ignition sources
- Special requirements during fueling operations
- Safety precautions when operating gasoline-powered equipment
- Safety precautions in carbon dioxide (CO_2) protected areas
- Handling flammable and combustible liquids
- Fire reporting procedures

- Response to fire alarm signals
- Laboratory fire safety

7.7 Marking of Fire Protection Equipment

All required fire protection equipment must be readily identifiable. The criteria for markings are contained in the USCG regulations listed in 46 CFR 196.37. It is recommended that all fire protection system piping be painted red to make it easily identifiable. The requirements for the permanent marking of specific fire protection equipment are summarized below.

Fixed Flooded Gas Systems

All total flooding gaseous fire suppression systems, such as CO_2, halon and clean agent systems, shall be provided with obvious signage at all entrances to the protected space, warning occupants of a system discharge. Refer to the applicable NFPA installation standard for the proper warning signage for the particular system.

Extinguishing System Valves

The branch line valves of all fire-extinguishing systems shall be plainly and permanently marked indicating the spaces served.

Extinguishing System Controls

The control cabinets or spaces containing valves or manifolds for the various fire-extinguishing systems shall be distinctly marked in conspicuous red letters at least 2 inches high: "CARBON DIOXIDE, CLEAN AGENT HALON REPLACEMENT HFC -227," "FE-241 FIRE APPARATUS," or "FOAM FIRE APPARATUS," as appropriate.

Fire Hose Stations

Each fire hose station shall be identified in red letters and figures at least 2 inches high,: "FIRE STATION NO. 1" or whatever the appropriate number sequence is on the vessel.

SCBA

Lockers or spaces containing SCBA shall be marked: "SELF-CONTAINED BREATHING APPARATUS."

Fire Extinguishers

Each portable fire extinguisher shall be marked with a number, and the location where it is stowed shall be marked with a corresponding number at least ½ inch high.

Emergency Lights

All emergency lights shall be marked with a letter "E" at least ½ inch high.

7.8 Control of Ignition Sources and Combustible Materials

General Storage Practices for Ordinary Combustible Materials

Each EPA vessel must develop programs and operating practices to minimize potential fire hazards due to the storage and use of ordinary combustible materials such as wood, paper and cardboard, as follows:

- Ordinary combustible materials must not be stored in areas where flammable liquids or chemicals are stored.
- Large quantities of combustible or flammable materials must not be kept onboard unless required by the scientific mission, in which case they must be secured in approved flammable storage cabinets.
- Whenever equipment is unpacked, all shipping crates, packing materials and dunnage must be promptly removed from the vessel.
- Whenever work onboard the vessel creates scrap materials and debris, these materials must be collected and removed at the end of each day's work shift.
- Whenever quantities of ordinary combustible or flammable materials are required, they must be stowed in a central location that has fire detection capability or is protected by an installed extinguishing system. On-deck stowage should be considered if possible.
- Combustible or flammable materials must not be stored in an area where they could come into contact with heated surfaces. This consideration should include engine exhaust trunks, boiler and galley uptakes, laboratory fume hoods, and laboratory areas where open flames could be used.
- Temporary structures, room partitions and laboratory enclosures should be constructed of noncombustible materials or materials of limited combustibility, if possible.
- Smoking can be a source of ignition (see section 6.13.7 of this manual for information on the vessel smoking policy), so extreme caution should be used when designating smoking areas onboard EPA vessels.

Storage Practices for Hazardous Materials

Definitions: Any combustible or flammable liquid, gas or chemical is a hazardous material. The exact basis for the definition of these materials is provided in NFPA 30. Generally, the basis for classification of the materials is defined as follows:

Combustible liquid – A liquid having a flashpoint at or above 100°F (37.8°C).

Flammable liquid – A liquid having a flash point below 100°F (37.8°C).

Flammable gas – A material that exists in a gaseous form at room temperature and will burn in combination with air or oxygen.

Nonflammable gas – A material that exists in a gaseous form and will not burn in combination with any amount of air or oxygen. This category generally includes two subsets: inert gases and oxidizers. Oxidizers themselves do not burn, but can cause the enhanced combustion of other materials.

Procedures: Various quantities of these materials are needed as fuels or lubricants to operate the vessel's machinery. Others are necessary for operation of the laboratories. For either application, each vessel must develop and implement safe handling and use procedures. General guidance for the content of these procedures is provided below:

- *Using hazardous materials for vessel machinery*. Diesel fuel and similar combustible liquids are normally stored in bilge tanks or day tanks, and as such present a limited fire hazard. Any spills due to overflows or leakage must promptly be cleaned up. Flammables such as lubricants, aerosol sprays and solvents must be kept in an approved flammable liquids storage cabinet in or near the engine room. If any of these materials are removed from the approved storage cabinet for day-to-day equipment maintenance, they should be returned at the end of the work shift. If any gasoline-powered equipment is used onboard, the gasoline reserves must be stored in approved flammable liquid cans kept inside an approved flammable storage cabinet. Alternatively, on-deck stowage of the gasoline is acceptable.

- Paints and solvents used for the upkeep of the vessel must be stored in an enclosed paint locker, preferably in an on-deck location away from the accommodations areas. The paint locker must be separated from adjacent areas by steel bulkheads and decks. Ordinary combustible materials must not be stored in paint lockers. Flammable gas cylinders must not be stored in occupied areas. Whenever flammable gas cylinders are used, they must be securely fastened in an upright position to prevent their physical damage due to vessel movement. Cylinders not connected to a manifold or piece of equipment must have their safety caps in place. Empty cylinders must be stored separately from full cylinders and must be clearly designated as empty.

- *Using hazardous materials in chemical laboratories.* Flammable and combustible liquids used in the laboratories must be restricted to the quantities needed for the experiments being conducted. Larger quantities of flammable and combustible liquids must be kept in approved flammable liquid storage cabinets within a protected chemical storage room. Additional information on the safe laboratory use of flammable chemicals can be found in NFPA 45 and 29 CFR1910.106.

Cutting and Welding

Each EPA **Class B** or **C** vessel must develop procedures and operating practices to govern the safe performance of hot work operations. Detailed guidance on this issue is contained in NFPA 51 and 29 CFR 1910, Subpart Q. A welding permit system shall be developed for each vessel, either by the crew or by the organization responsible for vessel maintenance. Before any hot work operations commence, workers shall require permission from the captain/master or a responsible person designated by the captain/master. A suggested generic welding permit format is listed on page 7-15 of this manual; CG Form CG-4201 may also be used. The second page of

the permit contains general fire safety precautions that, as a minimum, must be addressed. These precautions should also be used if welding is required on an EPA **Class A** vessel.

If a confined space is involved, see subsection 6.13.5 of this manual.

Figure 7-2. Welding Permit Template

HOT WORK PERMIT

Date:

Work Location:

Description of Work:

Special Precautions:

Is Fire Watch Required?

Hot Work Permit Checklist Completed?

Permit Expires:

Signed:

Time Work Began: **Time Completed:**

==========

Final Inspection

The work area and areas below, above and behind the work area were inspected 30 minutes after the completion of the work. No charring, smoke or other evidence of fire spread was observed.

Signed:

Figure 7-3. Hot Work Permit Checklist

Before any hot work operations begin, the captain/master or a designated person shall complete the following checklist and confirm that conditions are acceptable to begin work:

General Precautions

- Fire suppression or detection is in service
- Cutting and welding equipment is in good repair
- Fully functional fire extinguisher is provided at work area

Within 35 Feet of Work Area

- Decks swept clean
- Combustible deck coverings covered with metal
- No combustible materials or flammable liquids present
- Combustible structure or interior wall finishes covered with metal
- All bulkhead and deck openings covered
- Noncombustible covers suspended beneath work to collect hot sparks

Work on Bulkheads and Decks

- All combustible structure or coverings removed from work area
- Combustible materials moved away from the opposite side of the work area

Work on Tanks and Enclosed Areas

- All combustibles removed
- Containers purged of flammable liquids
- Marine chemist certified safe for welding

Fire Watch

- Required during and 30 minutes after work completed
- Provided with spare fire extinguisher
- Trained in use of equipment and fire reporting

7.9 Life Safety Considerations

Means of Egress

The regulations pertaining to the arrangement of exits and stairways onboard oceanographic and research vessels are contained in the USCG rules listed in 46 CFR 190.10 and were used to develop EPA policy for this section.

Briefly summarized, the criteria specify that two independent means of escape must be provided from all general areas where personnel are normally quartered or employed. The key term here is "general areas." This does not mean that two means of escape are required from *all* areas. For example:

- Each stateroom normally has only one exit door. The exit door, however, leads to a passageway in the accommodations area, which in turn, leads to two independent means of escape from the "general" accommodations area.

- Public areas larger than 300 square feet must have two independent means of escape. Onboard most EPA **Class C** vessels, this requirement would be applicable only to large public assembly areas, such as dining areas or crew lounges.

- Single laboratory areas larger than 300 square feet require two independent means of escape. Two means of escape must be provided from any laboratory area when one of the following conditions applies:

    - The laboratory contains an explosion hazard.

    - A fume hood is located adjacent to the main exit.

    - Compressed gas cylinders are present that are larger than a lecture bottle and contain a flammable gas or have a health hazard rating of 3 or 4 (NFPA 704).

- Cryogenic containers are present that contain a flammable gas or have a health hazard rating of 3 or 4 (NFPA 704) or contain a substance that could prevent safe egress if an accidental release occurred.

If the scientific mission requires that any of the above conditions exist, even temporarily, the experiments must only be conducted in a laboratory with two independent means of escape.

The concept is to provide two independent, widely separated means of escape so that a single fire cannot prevent emergency evacuation. Onboard vessels at sea, the means of egress are designed to provide a protected path up to the lifeboat and/or life raft embarkation areas. (This is significantly different than in buildings, where the means of egress are arranged to provide a protected path down and out of the building on the ground floor.) When a vessel is in port, personnel are generally evacuated via the gangways to the dock. It may be necessary to develop special evacuation procedures if there are many people onboard a vessel in port.

If public tours are permitted while the vessel is in port, a second set of evacuation procedures must be developed to ensure that adequate egress provisions are in place.

Personnel Accountability

It is important that all personnel onboard EPA vessels be accounted for at all times. A sign-in board or other means must be used for this purpose. The captain/master must be aware of the number of crew, scientists and passengers onboard the vessel at all times while underway. In port, an accountability process must be developed and enforced any time a large number of visitors are present. In an emergency requiring evacuation of the vessel, it is vital that the captain/master or fire control team have this information readily available. Fire evacuation procedures should also assign personnel to search the vessel at the end of an evacuation to determine that all are accounted for.

Emergency Lighting and Exit Signs

Each vessel is required to have sufficient emergency lighting facilities and exit signs to allow safe egress from the vessel. The lighting fixtures are normally arranged to illuminate and mark the exit paths to the lifeboat and life raft embarkation stations. If the vessel is used for public tours while at the dock, the normal system of emergency lighting and exit path markings may be inadequate. Additional fixtures must be installed whenever a vessel is used for this purpose. These fixtures should provide an indication of the egress paths to the dock via the gangway. The crew must be trained on the two different evacuation routes.

Impediments to Egress

All exit paths and doors must be kept free from obstructions, however slight, at all times. Equipment may not be stored in exit passageways or adjacent to exit doors for any amount of time. Trash and debris must not be allowed to accumulate in any exit path. Locks or fastening devices must never be installed on doors (except watertight doors) that are required as an exit, unless the door can be opened from the egress side with a single-hand action. Extra latches or hasps that require two actions to open the door must not be used. Exits must be kept visible and readily discernible at all times. Any doorway or passageway that is not an exit path and could be confused with an exit must be marked “NOT AN EXIT” to prevent personnel from inadvertently traveling in the wrong direction.

7.10 Structural Fire Protection

Onboard vessels, the term “structural fire protection” is used to describe the barriers and insulating materials used to subdivide the vessel into protected fire areas. The fire area concept is used to protect less-hazardous areas from higher hazard areas and also to limit the extent of fire damage if a fire should occur. Structural fire protection onboard EPA vessels is engineered and installed on the vessel during construction or conversion. Existing EPA vessels are not required to comply with the USCG regulations unless modifications are made to the vessel’s structure.

Structural fire protection principles are discussed here to allow an understanding of the barrier systems that are typically installed. For the structural fire protection to function as designed, it

must remain intact. If openings are cut through required fire barriers for the passage of wiring or piping, the effectiveness of the system will be circumvented.

Bulkheads are defined in two main categories: Class A and Class B. Class A bulkheads are steel barriers that can prevent the passage of fire (burn-through) for one hour. Class B bulkheads are barriers that can prevent the passage of fire for 30 minutes. Class B bulkheads may be either steel or joiner work (Marinite). For certain areas, a temperature rise restriction is also placed on the bulkhead so that combustible materials on the unexposed side of the barrier are not ignited by heat transmission. For these barriers, a numerical rating is also applied to the bulkhead designation. For example, an A-30 bulkhead will not fail under fire conditions for 60 minutes, and will prevent the temperature rise on the unexposed side of the barrier from igniting combustible material by heat transfer for 30 minutes.

Onboard research vessels, the following minimum fire separations are required by USCG regulations (46 CFR 190.07):

Table 7-2. Minimum Fire Separations

A Class Boundaries	Boundary bulkheads and decks of general laboratory areas, chemical storerooms, galleys, paint lockers and emergency generator rooms. Boundary bulkheads and decks that separate accommodations areas and control stations from hold and machinery spaces, galleys, main pantries, laboratories and storerooms. Boundary bulkheads of elevator, dumbwaiter and stair tower[a] shafts.
A-15 Class Boundaries	Boundary bulkheads and decks that separate laboratory areas of 500 square feet or less from accommodations areas and control stations.[b]
A-30 Class Boundaries	Boundary bulkheads and decks that separate laboratory areas of over 500 square feet from accommodations areas and control stations.
B Class Boundaries	Divisional bulkheads between laboratories, corridor bulkheads in accommodations areas.

Notes:

a A "stair tower" is a ladder or stairway that connects more than two decks. Stair towers are required to have approved A Class fire doors installed at each level. A "stairway" connects only two decks. A stairway is required to have an A Class or B Class fire door installed on only one of the two levels.

b Control stations are generally the navigating bridge, the emergency generator room and the radio room.

Before any modifications to the structure of EPA vessels are made, and before any cables or piping are temporarily or otherwise routed through existing bulkheads and decks, the vessel fire control plan must be reviewed to determine which boundaries are structural fire protection boundaries. These barriers must not be penetrated without proper protection of the fire barrier.

7.11 Fire-Extinguishing Systems

Three types of fire-extinguishing systems and equipment are installed, as required on EPA vessels and detailed below:

- A fire main system (**Class C**) or larger (**Class B**) vessels.

- A fixed fire-extinguishing system for special hazards.

- Portable fire extinguishers. (Portable extinguishers are not considered fire-extinguishing systems; however, their criteria are best included in this section.)

Requirements for all three are found in the USCG regulations in 46 CFR 193.05.

Fire Mains

All EPA **Class C** vessels are required to have a fire main consisting of one or more fire pumps, branch piping and fire hose outlets located throughout the vessel. The arrangement of the system and required equipment is listed in 46 CFR 193.10.

Fixed Fire-Extinguishing Systems

Fixed fire-extinguishing systems are required for the protection of special hazards. Typically, total flooding CO_2 or clean agent systems are used in this application.

On EPA vessels under 1,000 GT, special hazards include chemical storerooms, paint lockers, oil rooms and similar spaces, as well as spaces containing gasoline-powered engines. (**Note:** All powered EPA vessels 65 feet or more in length but with a GT less than 300 are classified as **Class B.** All powered EPA vessels with a GT of greater than 300 are classified as **Class C.**)

For EPA vessels over 1,000 GT, a CO_2 or clean agent system is also required in engine rooms and auxiliaries with an aggregate power of 1,000 brake horsepower (bhp) or greater. The arrangement of the system and required equipment is listed in 46 CFR 193.15.

Portable Fire Extinguishers

Portable fire extinguishers are required to be installed throughout all EPA vessels. The detailed requirements for portable fire extinguishers are listed in 46 CFR 193.50. All fire extinguishers must be USCG-approved and UL-labeled for marine use. The extinguishers must also be mounted in approved marine mounting brackets.

Fire extinguishers have two rating systems that are both included on the UL label:

- The NFPA 10 system uses a series of alphanumeric ratings (e.g., 4A, 60B:C).

- The USCG uses a Roman numeral type system (e.g., A-II). Under the USCG system, the letter indicates the type of fire for which the extinguisher is suitable, and the number indicates the relative size of the unit. The types of fire are identical to the NFPA 10 designations, where A rated extinguishers are for fires in ordinary combustible materials, B rated extinguishers are for fires in flammable liquids, and C rated extinguishers are for fires in electrical equipment.

The USCG number designations for fire extinguisher sizes range from I for the smallest to V for the largest.

- Sizes I and II are considered portable fire extinguishers.

- Sizes III, IV and V are considered semi-portable fire extinguishing systems that are generally too heavy to be carried. These units are either installed in a fixed location or fitted with an adequate length of hose so that all portions of the space concerned may be covered, or mounted on wheels.

- Descriptions of typical types of extinguishers are provided in the following table:

Table 7-3. Typical Fire Extinguishers

USCG Classification					
Type	**Size**	**Water (Gal.)**	**Foam (Gal.)**	**CO (lbs)**	**Dry Chemical (lbs)**
A	II	2.5	2.5	–	–
B	I	–	1.25	4	2
B	II	–	2.5	15	10
C	I	–	–	4	2
C	II	–	–	15	10

The minimum fire extinguisher requirements applicable to all EPA **Class B** and **C** vessels are listed in 46 CFR 193.50, Table 193.50-10a.

Typical fire extinguisher space locations onboard EPA **Class C** vessels are listed here for reference:

Table 7-4. Typical Fire Extinguisher Space Locations

Space	Classification	Quantity and Location
Wheel house	C-I	Two in vicinity of exits
Stairways		None required
Elevators		None required
Lifeboat embarkation stations		None required
Staterooms, toilets		None required
Public spaces, offices		None required
Lockers, pantries		None required
Isolated storerooms, etc.		None required
Communicating corridor, not corridors	A-II	One in each main; maximum 75 feet travel distance to extinguisher
Galleys	B-II or C-II	One for each 2,500 square feet or fraction thereof, suitable for hazards involved
Paint rooms	B-II	One outside space, near exit
Vessel's engine room	B-II	Two minimum, plus one for every 1,000 bhp

Table 7-4. Typical Fire Extinguisher Space Locations

Space	Classification	Quantity and Location
Auxiliary spaces, internal combustion	B-II	One outside the space near exit
Laboratories and chemical storerooms	C-II	One dry chemical and one carbon dioxide for each 300 square feet, with one of each located near exits

Class A vessels will be equipped at a minimum with the following fire extinguishers:

Table 7-5. Minimum Fire Extinguishers for Class A Vessels

Less than 26 feet	One B-I
26 to 40 feet	Two B-I, or one B-II
More than 40 feet	Three B-I, or one B-I and one B-II

The above-listed criteria are the minimum requirements. All vessels are encouraged to consider installing extra fire extinguishers in any areas where they may be of added benefit.

Each EPA vessel must carry sufficient spare charges to recharge 50 percent of each type of fire extinguisher carried onboard. In lieu of carrying spare charges, spare extinguishers may be provided.

7.12 Precautions for Flooded Space Fire Suppression Systems

The use of total flooding CO_2 and halon replacement clean agent systems onboard EPA vessels can pose a hazard to improperly prepared personnel. Adequate training and understanding of the systems will allow their safe use.

Gases extinguish fires by displacing the oxygen available for combustion. For the extinguishing gas to work effectively, the protected space must be sealed off from the available air supply to ensure that the proper agent concentration is maintained within the space. Spaces protected by a total flooding system must be evacuated and sealed before the release of agent. Approved extinguishing systems have numerous built-in safeguards designed to prevent the accidental release of agent. Automatic release by smoke detectors is not permitted in occupied areas. Electrically operated releasing controls are also not permitted. Two separate and distinct actions are required to release the agent. One system release opens the cylinder control valves, while the second release opens the manifold stop valve. Unless both releases are operated, the extinguishing agent will not be released. Another built-in safeguard is the discharge time delay device. This is a pneumatic reservoir that prevents the release of agent for at least 20 seconds while the siren sounds and the ventilation fans are stopped.

All personnel in a protected space must leave immediately if the fire suppression system siren sounds and must close the space boundary doors behind them. If a release of agent has occurred, the protected space must be thoroughly ventilated before re-entry is permitted. These gases are heavier than air and will settle in low-lying areas. It is possible that agent released in one space

will flow to lower areas, such as the bilges. Caution must be used when entering these areas after the discharge of agent.

7.13 Fire Detection and Alarm Systems

Policy

While the USCG requirements for oceanographic and research vessels do not specify the installation of a manual fire alarm or an automatic fire detection system, **it is EPA policy that all Class C vessels be provided with fire alarm and detection systems. If a vessel already has a fire detection and alarm system, it must be maintained.**

System Requirements

- The system must consist of a USCG-approved fire alarm system, installed in accordance with the manufacturer's recommendations.
- All wiring and devices must be installed in accordance with the USCG Electrical Engineering Rules (46 CFR 110–113 Subchapter J).
- The control panel must be located on the navigating bridge or other continuously occupied location.
- Battery back-up power supplies, sized in accordance with the requirements of NFPA 72, must be provided for each control panel.
- The fire alarm signals must consist of both audible and visual devices. Manual pull stations must be located by main exits from occupied areas.
- High-hazard areas must be protected by smoke or heat detectors, as appropriate. High-hazard areas include:
    - Machinery spaces
    - Galleys
    - Large storerooms
    - Laboratories
    - Chemical storerooms
- All sleeping areas must be provided with single-station-type smoke detectors that will sound a local alarm in the associated sleeping room. These detectors should be connected to the vessel fire alarm system.

- The system must be subdivided into zones such that each deck is a separate zone. Small, isolated areas on adjacent decks may be included in a zone if the spaces communicate freely.

8. MEDICAL AND FIRST AID

8.1 Purpose

The purpose of this element is to ensure that EPA vessels and their embarked crews are medically qualified for their duties and are prepared to cope with medical issues and emergencies that may arise during the course of operations. The specific requirements are geared to the operations of the vessel.

8.2 Specific Requirements

Personnel Data Form for All EPA Vessels

"Survey Personnel Data Sheets" shall be required of all scientific survey personnel, including divers for vessels that go to sea overnight or longer. The forms will be presented to the vessel's captain/master and will be kept in a locked file in the captain's/master's quarters. Personnel data and information for the crew is already held by the captain/master.

Note: This form has been designed to obtain information necessary in an emergency, while still preserving a person's privacy. In the interest of personnel's safety and well-being, it is vital that someone onboard be aware of any significant medical conditions that might require the knowledgeable action of someone onboard.

EPA chief scientists or the designated Vessel Safety Officer shall be responsible for obtaining the "Survey Personnel Data Sheet" form from survey personnel within their area of control. Forms will be presented to the vessel's captain/master and will be kept on file onboard the vessel.

Vessel Crew Physical Examinations

Every crew member shall be required to have a physical examination as follows:

- All USCG MMC Officers in the Deck and Engineering Departments are required to have and pass specific physical examinations, as specified in 46 CFR 10.215, in order to maintain a valid license.

- The same physical standards shall be used, at a minimum, for anyone not holding a valid USCG license for operating EPA **Class A** and **B** vessels if the vessel is used for underway tours and/or carries passengers.

- Any unlicensed crew member who holds a USCG MMC must meet the same 46 CFR 10.215 physical examination standards, and must meet the same physical standards as a licensed captain/master, mate or pilot. A Qualified Member of the Engine Department (QMED) must meet the same physical standards as a licensed engineer.

- The same physical standards shall be used, at a minimum, for anyone not holding a valid USCG MMC for operating EPA **Class A** and **B** vessels, if the vessel is used for underway tours and/or carries passengers.

- Current commercial best practice has been to require annual physical exams or at least at the 2.5-year point after MMC renewal. This has evolved because of the results of accident investigations, the aging of the merchant mariner community, and the potential for undiagnosed, or hidden, problems that result in death or damage.

EPA employees onboard vessels may be covered by EPA Order 1460.1 ("Occupational Medical Surveillance Program"), so ensure compliance with it if applicable.

First Aid Training

The medical training described above is required to ensure that an adequate number of trained personnel are onboard EPA vessels at all times to render assistance in any medical or safety emergency.

The following qualification requirements are established for EPA vessels:

- **For Class C Vessels:** Twenty percent of each vessel's crew shall maintain current CPR and first aid certifications and will comply with the requirements of 46 CFR 10.215 for licensed officers and holders of USCG MMCs for unlicensed personnel. At least one mate or the captain/master shall hold a certification in medical first aid.

  Additional medical/first-aid training and equipment pertinent to the class of the vessel and activities being conducted on it is required.

- **For Class B Vessels:** A minimum of one crew member shall have current CPR and first aid certifications.

  Additional medical/first-aid training and equipment pertinent to the class of the vessel and activities being conducted on it is required.

- **For Class A Vessels:** Captains/masters must hold current CPR and first aid certifications.

  Captains/masters of vessels used for electro-fishing activities must also hold a current automated external defibrillator (AED) certification, and must ensure that an AED unit is onboard during electro-fishing activities.

  Additional first-aid training and equipment pertinent to the class of the vessel and activities being conducted on it is required.

Medical Emergencies

This section is intended to provide clear procedures for addressing a serious illness or accident at sea. If the captain/master (of any EPA class vessel) deems an illness or accident at sea sufficiently serious to warrant treatment beyond the first aid facilities onboard the vessel, one of the following courses of action shall be taken (**Note:** The criteria for "sufficiently serious"

include immediate danger to life or limb; a less serious situation that cannot be handled onboard, such that the patient must go to shore facilities; or a situation in which delay of treatment may complicate the patient's condition.):

- Survey or other equipment/personnel in the water, if any, shall be immediately recovered, and the vessel shall make for the nearest port having adequate medical facilities. The highest possible speed consistent with safety shall be made. Communications (e.g., radio contact) with the USGC, port of arrival or other authorities shall be made immediately, and dockside clearance with an ambulance standing by shall be requested.

- In the case of an extreme illness or accident, immediate radio contact with the nearest medical evacuation (MED-EVAC) helicopter facility shall be established and assistance requested. Any survey equipment in the water shall be recovered, and the vessel shall travel at the highest possible speed, consistent with safety, in the direction of the MED-EVAC helicopter facility.

- The vessel shall rig for helicopter operations, and continuous radio contact shall be maintained with the helicopter base and/or the incoming helicopter.

- All EPA vessels that embark on overnight or longer voyages are encouraged to establish procedures with a medical facility onshore for obtaining medical advice via radio or telephonic means in the event of a medical emergency. Contract services can function as liaisons between medical facilities and the vessel.

- In the case of a diving emergency, confer with the onboard dive captain/master.

Medications and Medical Supplies

An onboard supply of medications and medical supplies is required for the treatment of injuries and nonemergency sicknesses. This section provides recommendations and guidance to meet this need.

First Aid Kit for Class A Vessels: A small, commercially available first aid kit will be carried on all EPA **Class A** vessels. Contents should be appropriate to the geographical location, number of personnel onboard, and operations carried out on the vessel.

First Aid Kit for Class B and C Vessels: Instructions for the use of first aid supplies should be listed in legible type on a durable surface and securely attached to the inside of the cover. The following kit contents are recommended; contents should be adjusted, as necessary, based on the geographical location and operations carried out on the vessel:

Table 8-1. First Aid Kit Contents

Item	Number Recommended
Bandage compress – 4"	5
Bandage compress – 2"	8
Waterproof adhesive compress – 1"	32

Table 8-1. First Aid Kit Contents

Item	Number Recommended
Triangular bandage – 40”	3
Eye dressing packet, 1/8 ounce ophthalmic ointment, adhesive strips, cotton pads	3
Bandage, gauze, compressed, 2” × 6”	2
Head dressing	2
Forceps	1
Scissors	1
Safety pin	12
Wire splint	1
Ammonia inhalant	10
Iodine applicator, 1/2 milliliter swab	10
Aspirin, phenacetin and caffeine compound, 6.5 gram tablets, vial of 20	5
Sterile petroleum gauze, 3” × 18”	7
Trauma dressing	5

Nonprescription Medicines: In addition to the first aid kit(s) described above, **Class B** vessels and **Class C** vessels on overnight or longer cruises should maintain a supply of nonprescription medications and medical supplies in a readily accessible location. The medical cabinets must be updated every month and shall be well organized. Expired medications must be disposed of immediately. A list of contents and any necessary instructions must be posted inside the medical cabinet door.

The vessel captain/master or first mate, if assigned, is responsible for replenishing stocks, discarding expired medications, updating listings, posting use instructions and keeping the cabinet well organized.

The following inventory of nonprescription medicines is recommended:

Table 8-2. Nonprescription Medication Inventory

Type of Illness/Injury/Complaint	Medication
Aches/pains	Aspirin tablets Extra-strength Tylenol tablets Flexeril tablets Advil tablets
Acid indigestion/upset stomach	Kaopectate solutions Donnagel solution Mylanta solution/tablets Maalox liquid Rolaids tablets Pepto-Bismol liquid/tablets Lomotil tablets

Table 8-2. Nonprescription Medication Inventory

Type of Illness/Injury/Complaint	Medication
Sting/allergic reaction (over-the-counter antihistamine)	Chloraseptic gargle Cepacol throat lozenges Contact capsules Coricidin capsules Triaminicin capsules Drixoral capsules/tablets Dristan capsules/tablets Alka-Seltzer Plus tablets Benylin expectorant Vicks VapoRub Cough calmers Benadryl ointment
Cold remedies	Chloraseptic gargle Cepacol throat lozenges Contact capsules Coricidin capsules Triaminicin capsules Drixoral capsules/tablets Dristan capsules/tablets Alka-Seltzer Plus tablets Benylin expectorant Vicks VapoRub Cough calmers
Cold sores/cuts	Camphophenic liquid
Constipation	Milk of Magnesia solution
Eye solutions	Eye pads Eye irrigation solutions Normal saline solution Neosporin ophthalmic ointment
Motion sickness	Dramamine tablets Bonine tablets
Scrapes/minor cuts	Alcohol preparation
Burns/splinters	Neosporin ointment Bacitracin ointment A&D ointment Caladryl ointment Water gel dressing Iodine liquid Betadine wash Hydrogen peroxide

Table 8-2. Nonprescription Medication Inventory

Type of Illness/Injury/Complaint	Medication
Skin problems	Petroleum jelly Polysporin salve Tinactin salve Vinegar (acetic acid) or alcohol for first aid treatment of jelly fish stings
Sprains/strains	Ace bandages Cold packs Ben-Gay ointment Arm and leg splints
Bandages/supplies	Band-Aids Telfa pads Cotton balls Kling 3" and 4" bandages Adhesive tape 4×4 dressing Scissors Tweezers
Miscellaneous	Ammonia inhalant Isotonic saline solution Suction machines

Prescription Medication: In addition to the nonprescription medicines described above, **Class B** vessels and **Class C** vessels on overnight or longer cruises should maintain a supply of prescription medications suitable for its operation and location. All prescription medications shall be kept in a locked box in the captain's/master's quarters or in the vessel hospital, if so equipped. The captain/master is responsible for inspecting medical supplies on a monthly basis and disposing of expired medications immediately. *Any use of prescription medications must be under medical supervision, which can be received through the USCG.* The captain/master must authorize the use of any prescription medications, and any authorization and use shall be documented in the deck log by the vessel's captain/master. *A medical doctor's approval is required for obtaining and stocking prescription medicines.* The following list of medications should be considered for storing onboard EPA Class B and C vessels:

Table 8-3. Prescription Medication Inventory

Type of Medication	Generic Name
Analgesic	Ibuprofen, 600 mg Darvocet N, 100 mg Tylenol with codeine
Anaphylactic (bee sting)	Epinephrine/Ag-adrenalin
Anti-asthmatic	Metaproterenol sulfate, inhalation aerosol

Table 8-3. Prescription Medication Inventory

Type of Medication	Generic Name
Antibiotic	Amoxicillin, 500 mg Erythromycin, 250 mg
Anti-motion sickness	Meclizine ICl, 25 mg Promethazine HCl, 25–50 mg
Coronary vasodilators	Nitroglycerine 0.4 mg Nitroqual spray
Sedatives	Phenobarbital, 32 mg
Urinary problems	Pyridium tablets, 100 mg

Figure 8-1.

ENVIRONMENTAL PROTECTION AGENCY

SURVEY PERSONNEL DATA SHEET

Name_____Phone_____

Home Address_____

Mailing Address_____

Rating_____License Held_____ Z or License No._____

Blood Type_____ Medic Alert Tag? (Y/N)_____ Last Tetanus Shot_____

Physician's Name_____ Phone _____

Date and Place of Last Physical Exam_____

Height_____ Weight_____ Eye Color_____ Hair Color_____

Contact Lenses (Y/N)_____ Allergies_____

Current Medication_____

Other Relevant Medical Considerations_____

_____

Typical Blood Pressure Reading_____ Scars or Marks_____

In Case of Emergency, Notify:

Name_____ Relationship_____

Address_____

Phone Number_____

Signature _____

Note: This form has been designed to obtain information necessary in the event of an emergency, while still preserving an individual's privacy. In the interest of your personal safety and well-being, it is vital that someone onboard be aware of any significant medical condition you have that might require the knowledgeable action of someone onboard to assist you. This information will be kept strictly confidential and will be stored in a secure, locked location.

9. LIFESAVING AND SAFETY, COMMUNICATIONS AND POLLUTION CONTROL EQUIPMENT

9.1 Life Saving and Safety Equipment

9.1.1 Approved Equipment

Lifesaving equipment (original or replacement) (e.g., PFDs, rafts, signaling equipment) onboard all EPA vessels shall be approved by the USCG and be SOLAS-compliant. Where lifesaving equipment is not required but installed, the use of such equipment shall also meet the same requirements.

9.1.2 Required Equipment

Minimum outfitting of lifesaving equipment onboard all EPA vessels will be as prescribed in 46 CFR Parts 25 and 199.

9.1.3 Instruction in Use of Lifesaving Equipment and Survival at Sea

The following requirements are established for providing instructions in the use of onboard lifesaving equipment and survival at sea:

Class C Vessels

- For new crew members, new members of the science team, and visitors for at-sea operations, safety and familiarization training must be provided prior to the vessel getting underway or shortly thereafter.

- The captains/masters shall conduct such drills and give such instructions as are necessary to ensure that all hands are familiar with their duties as specified in the station bill.

- The captains/masters shall conduct a fire drill and boat drill weekly while underway on extended missions beginning within 24 hours of leaving port. Drills should simulate actual emergencies, and all fire and emergency equipment should be exercised on a regular basis.

- Every crewmember must participate in at least one abandon-vessel drill and one fire drill every month. The drills must take place within 24 hours of the vessel leaving a port if more than 25 percent of the crew has not participated in abandon-vessel and fire drills onboard that particular vessel in the previous month.

- At least once per year, an in-port fire drill should be conducted with shore side fire units participating.

- While underway, a man overboard (MOB) drill shall be conducted at least once monthly on extended cruises, or at random during sporadic cruise periods.

- Backup rescue boats should be launched with their assigned crew onboard and maneuvered in the water, at times determined by the captain/master, to ensure boat readiness and crew training.

- In addition, refresher training on all the vessel's lifesaving equipment (e.g., survival suits, PFDs) and emergency procedures must be completed bimonthly for the crew and science team. If necessary, biweekly (in-port and short at-sea periods) or weekly (extended at-sea) drills may be converted to a training session to meet this requirement. Lifesaving equipment shall be used and demonstrated during weekly in-port and at-sea training drills. If a training session is substituted for a drill, the weekly inspection of inflatable life rafts, rescue boats, and launching appliances; operation of the rescue boat motors; and testing of the emergency alarm, as applicable, is still required.

- A record of all drills and tests of alarms will be documented in the vessel's log and also recorded in a separate training file. The documentation must include a description of the exercise and the names of all participants.

Class B Vessels

- Captains/masters, because of the limited number of personnel onboard and relatively short and intermittent mission schedules, will assemble all people onboard prior to leaving port and inform and review emergency situations that may arise and the signals and action that will take place. Demonstrations on the use of survival suits, if appropriate, life vests, and other lifesaving equipment must be reviewed. Captains/masters shall have a detailed written policy regarding compliance with this paragraph.

Class A Vessels

Captains/masters will conduct training to ensure that their passengers/crew are familiar with lifesaving, MOB, fire, and emergency equipment and procedures prior to getting underway.

9.1.4 Instructions and Repairs

Lifesaving Training Manual for EPA Class B and C Vessels

The lifesaving systems and equipment training manual, assembled from manufacturers' information and other survival training information, is required to be kept on the vessel and the captain/master and crew must be familiar with it. Loose-leaf format in a ring binder is suggested so that additional or revised information can be added as it is received. Audiovisual training material is encouraged. A copy of the manual should be kept in each mess area or lounge so that it is available for review by the crew and science team. The following should be explained in detail:

- Donning of PFDs and immersion suits, as appropriate

- Muster at the assigned stations

- Boarding, launching and clearing the survival craft and/or rescue boats

- Method of launching the survival craft and release from launching appliances
- Methods and use of devices for protection in launching areas, where appropriate
- Illumination in launching areas
- Use of all survival equipment
- Use of all detection equipment
- Use of radio lifesaving appliances
- Use of drogues and sea anchors
- Use of engine and accessories
- Hazards of exposure and the need for warm clothing
- Best use of survival-craft facilities in order to survive
- Methods of retrieval, including the use of helicopter rescue gear (slings, baskets, stretchers), breeches buoy, shore lifesaving apparatus and vessel's line-throwing apparatus
- All other functions contained in the muster list, including emergency instructions
- Instructions for emergency repair of lifesaving appliances

Instructions for Maintenance Onboard EPA Class B and C Vessels

Instructions for onboard maintenance of lifesaving equipment should be easily understood, should be illustrated wherever possible, and, as appropriate, shall include the following for each piece of equipment:

- A checklist for use when carrying out the periodic inspections required
- Maintenance and repair instructions
- Schedule of periodic maintenance
- Diagram(s) of lubrication points with the recommended lubricants
- List of replaceable parts
- List of sources of spare parts
- Log for records of inspections and maintenance

EPA Class B and C Vessel Spares and Repairs

Maintenance shall be in accordance with manufacturer's specifications. Spares and repair equipment must be kept onboard. If the various maintenance manuals do not specify lists of spare parts recommended to be onboard, the vessel must have the parts most frequently used in onboard maintenance. Permanent repairs to the inflated components of inflatable life rafts must be carried out at approved servicing stations for the make and model of the inflatable life raft.

9.1.5 Life Rafts

All inflatable life rafts shall be of an approved type. Each inflatable life raft shall have a carrying capacity of no fewer than six or more than 25 persons. All stowage and embarkation areas shall have adequate emergency lighting. All EPA vessels that operate in the ocean, on the Great Lakes or more than 5 nautical miles from the nearest shore shall be provided with sufficient inflatable life rafts so that 100 percent of the people onboard can be accommodated.

Life rafts shall be readily available in any emergency, kept in good working order, and available for immediate use at all times when the vessel is being navigated or underway. The decks on which life rafts are stored shall be clear of any obstructions that would interfere with the immediate launching of them. Each inflatable life raft must be stowed so that it:

- Can be launched within 10 minutes.
- Does not impede the launching or handling of other lifesaving equipment.
- Does not impede the marshaling of persons at the embarkation stations.
- Is capable of being put in the water safely and rapidly even under unfavorable conditions of list and trim.
- Will float free if the vessel sinks.

Every EPA vessel equipped with inflatable life rafts shall have placards containing instructions for launching and inflating life rafts posted in conspicuous places, readily accessible to the crew, science team, and passengers. There shall be at least one such placard, and it shall be sufficient in quality, in the opinion of the captain/master, to serve the instructional purpose intended. Placards are available from the life raft manufacturers. Placards are also required at each life raft station.

In a conspicuous place in the immediate vicinity of each inflatable life raft, the following marking shall be stenciled in 2-inch-high letters:

INFLATABLE LIFE RAFT NO.

PERSONS CAPACITY

Note: This marking shall *not* be on the life raft container.

Life rafts must be fully equipped before the vessel is navigated, and remain that way throughout their use. Equipment shall be stowed onboard and used in accordance with 46 CFR Part 199. Loose equipment must be securely attached to the appropriate lifesaving appliance.

Where the freeboard at an embarkation point is such that embarkation devices are necessary, sufficient ladders or other suitable devices must be available to facilitate embarkation into inflatable life rafts when waterborne.

Provisions shall be made for readily and continuously available illumination on the vessel for life raft launching and embarkation areas. The power source for this lighting shall be either the emergency generator or emergency batteries.

All inflatable life rafts must be annually inspected and certified by a USCB-approved facility (see "Inflatable Life Raft Overhaul" in section 9.1.14). In addition, inflatable life rafts that have been held in storage onshore without inspection for over six months shall be re-inspected per USCG guidelines before reinstallation onboard vessel.

9.1.6 EPA Class B and C Backup Rescue Boats

General Criteria

EPA **Class B** and **C** vessels shall be equipped with at least one small boat that can be used for rescue purposes. The intended mission of this boat is for backup rescue of individuals accidentally falling over the side when the captain/master determines that the vessel cannot maneuver sufficiently to affect an MOB recovery. This boat need not be dedicated for rescue only and may be used for other purposes, as determined by the VMO and the captain/master. A written backup rescue boat policy, operating procedure including communications, maintenance and state of readiness, crew training, and procedure during MOB drills shall be prepared for each vessel. Included in this procedure will be identification of lifesaving equipment to be carried and readily available, as well as boat markings.

A designated backup, rigid-hull inflatable boat is required for rescue. At a minimum, the boat shall be large enough to be operated by two trained crew members: a captain/master and either a linesman (if power-operated) or an oarsman, with sufficient capacity for ***a minimum*** of two rescued individuals. The selection of the boat, power and quick-launching method should be consistent with the most accessible location on the vessel.

Operation

Boats designated as backup rescue boats must be maintained in a state of continuous readiness during all times the vessel is underway. The boats must be fully complemented with all required safety equipment commensurate with the vessel's size according to this manual. A target

launching time of within five minutes is recommended. A boarding ladder shall be available and accessible in case of emergency as well as a tending line (painter) securing the rescue boat beside the vessel to safely embark personnel. During MOB drills, the backup rescue boat will be made ready for launch upon the order of the captain/master. Actual over-the-side exercises shall be made at the discretion of the captain/master to ensure crew and boat readiness. This shall be done in accordance with the policy established for each applicable vessel.

9.1.7 Personal Floatation Devices for All EPA Vessels

General

All PFDs shall be USCG-approved:

- Type I for ocean and Great Lakes operations
- Type I, II or III for rivers, harbors, bays and lakes other than the Great Lakes

All EPA vessels shall be provided with ***serviceable*** Type I, II or III PFDs, properly fitted and appropriately sized for each person onboard (**Note:** "Serviceable" is defined under "Definitions" at http://www.uscg.mil/hq/cg5/cg5214/pfdselection.asp.) EPA **Class A** vessels greater than 16 feet long shall also carry at least one Type IV PFD (throwable). PFDs shall also be provided for personnel on watch in the engine room, pilothouse, bow lookout, plotting room and any other space normally requiring the stationing of personnel away from their assigned PFDs. In any case, the total number of PFDs shall not be less than 100 percent of the vessel's onboard count, excluding PFDs for rescue craft. If an EPA vessel embarks children, as on tours or demonstration missions, provisions shall be made to provide PFDs compatible with the size of the embarked children (46 CFR 199.70).

Captains/masters of **Class A** open style vessels must require all occupants to wear a PFD at all times while the vessel is underway. This requirement does not apply to occupants inside the cabin.

Distribution and Storage

PFDs must be distributed throughout the quarters for vessel and scientific personnel and other places readily accessible for each person onboard. The storage of an additional number of PFDs required by these regulations shall be such that they are readily accessible to personnel on watch. PFDs shall be stored away from heat, oil and corrosive substances.

PFDs stored overhead must be supported so that they can be quickly released and distributed. Where PFDs are stowed more than 7 feet above the deck, efficient means for quick release must be provided, with the release capable of being operated from the deck.

Marking

Each PFD must:

- Be clearly stenciled with the vessel's name or number, as applicable, or the program or region who owns it. **Note:** The purpose of this requirement is to help identify equipment from an EPA vessel that may be lost or overdue.

- Have retroreflective markings if night-time operations are conducted. Retroreflective material shall have at least 200 square centimeters on its front and back. The retroreflective material must be equally divided between the upper quadrants and attached near the shoulder area of the life preserver in accordance with 46 CFR 25.25-15.

In addition, each PFD storage locker (if installed) shall be clearly and distinctly marked in 3-inch red letters stating the number of preservers contained therein, such as "25 ADULT PERSONAL FLOTATION DEVICES."

PFD Lights and Whistles

Each PFD and exposure suit must have a personal marker light (PML) that is USCG-approved and fully operable. The date of expiration of the battery shall not be exceeded. If no expiration date is available, then the battery should be replaced annually. Each PML light required must be securely attached to the front shoulder area of the life preserver or exposure suit.

Additionally, each PFD and exposure suit must have a whistle of the ball or multi-tone type that is in good working order and of corrosion-resistant construction. The whistle must be attached by a lanyard long enough to permit the whistle to reach the mouth of the wearer.

9.1.8 Exposure Suits

General

All exposure suits must be USCG-approved. Because some designs of exposure suits will not turn an unconscious wearer face up in the water, the SOLAS convention continues to require that traditional life preservers be carried in addition to exposure suits.

Number Required

The captain/master is responsible for ensuring that exposure suits are onboard and in the appropriate number when conditions warrant. A rule of thumb that is currently used for **Class A** vessels is: if the water temperature plus the air temperature is less than or equal to 100°F, then exposure suits must be carried. EPA vessels are required to carry one exposure suit for each bunk, which must be sized to fit the person occupying the bunk. (**Note: Class A** vessels may not have a bunk.) In addition, the engine room, pilothouse, bow lookout (if applicable), and each work station not readily accessible to cabins, staterooms and berthing areas should have enough exposure suits to equal the number of people normally working there at one time. Each exposure suit required for a work station should be stowed in a readily accessible area in or near the station.

Marking

Each exposure suit shall be clearly stenciled with the vessel's name and the suit's number. Neither the suits nor the storage bags shall be marked with an individual's name.

PFD Lights and Whistles

Each PFD and exposure suit must have a personal PML that is USCG-approved and fully operable. The date of expiration of the battery shall not be exceeded. If no expiration date is available, then the battery should be replaced annually. Each PML light required must be securely attached to the front shoulder area of the life preserver or exposure suit.

Additionally, each PFD and exposure suit must have a whistle of the ball or multi-tone type that is in good working order and of corrosion-resistant construction. The whistle must be attached by a lanyard long enough to permit the whistle to reach the mouth of the wearer.

9.1.9 Work Vests

USCG-approved buoyant conventional work vests are items of safety apparel, and may be carried onboard EPA vessels of any size to be worn by individuals when working near or over the water under favorable working conditions. The vessel captain/master shall determine when work vests are required.

When work vests are carried:

- They are not accepted in lieu of any of the required number of approved PFDs and must not be worn during drills and emergencies.
- On **Class B** and **C** vessels, the approved buoyant work vests must be stored separately from PFDs and in locations where they will not be confused with PFDs.
- They must be equipped with retroreflective material in accordance with 46 CFR 25.25-15. On each upper front section, 100 square centimeter strips are required, and a 200-square-centimeter strip is required on the upper back portion of the vest.
- They shall be periodically inspected. Any work vest whose material condition no longer supports its intended purpose shall be immediately disposed of.
- Hybrid PFDs are permitted for use within the requirements of 46 CFR 160.077.

9.1.10 Ring Lifebuoys, Water Lights and Smoke Pots

All ring buoys must be of a 30-inch (**Class A** and **B**) or 24-inch (**Class A**) USCG-approved type and have retroreflective material markings (i.e., four sections, each 2 inches wide, on both sides of ring buoy) per 46 CFR 25.25-15. The following USCG requirements apply to all non-recreational vessels larger than 26 feet: 46 CFR Part 199 (SOLAS) and 46 CFR Part 180 (Non-SOLAS).

Ring life buoys must be distributed so that they are readily available on both sides of the vessel and, as far as practicable, on all open decks extending to the vessel's side. At least one shall be placed near the stern. All units shall be stowed so that they are capable of being rapidly cast loose and not permanently secured in any way.

One of the ring life buoys on each side of the vessel must be secured to a buoyant line at least 15 fathoms (i.e., 90 feet) long. On EPA vessels 100 feet or greater in length, at least two of the USCG-approved lighted ring buoys shall also be provided with an approved self-activating smoke signal. The smoke signal service life is three years and six months from the date of manufacture.

Ring life buoys must be orange with black lettering marked with the name of the vessel and designator in 1½-inch block letters. A grab line, secured at four points, must hang free from the life ring. Stenciling over the retroreflective material is not permitted.

9.1.11 Line-Throwing Appliances

EPA **Class B** and **C** vessels shall carry a Navy MARK 87 Line-Throwing Appliance or equivalent. Each vessel will have 10 projectiles, 25 cartridges and four shot lines per unit. The line-throwing appliance should be tested at least quarterly. EPA **Class A** vessels shall carry a manually thrown line-throwing device. The following USCG requirements apply to line-throwing appliances: 46 CFR Part 179 for lines and 46 CFR 160.40 for rocket assisted devices.

9.1.12 Deck Safety Equipment

Vessel's Distress Signals/Pyrotechnic Locker

EPA **Class B** and **C** vessels shall carry, in the vicinity of the vessel's navigation bridge or pilothouse, not less than 12 approved handheld rocket-propelled parachute red flare distress signals. Such distress signals must be stored in a portable watertight container labeled "DISTRESS FLARES." The service use of the distress signals is limited to a period of 42 months from manufacturer's date**.** With the exception of unpowered vessels such as canoes and kayaks, all **Class A** vessels will be equipped with USCG-approved Visual Distress Signals, as follows:

- Pyrotechnic devices – day and night, at least three of each. These may be handheld or aerial flares or handheld or floating smoke. Combinations that meet the USCG requirement are three handheld red flares (day and night), one handheld flare and two red meteors (day and night), one handheld orange smoke signal (day), or two floating orange smoke signals (day) and one electric light (night only).

- Nonpyrotechnic devices – such as an orange distress flag, an electric distress light that automatically flashes SOS and a flashlight, or mirrors.

Any **Class A** vessel 40 feet or more in length must also be equipped with a-noise producing device (i.e., a horn, bell, and maybe a gong) in accordance with 33 CFR 83.33. Powered vessels less than 40 feet long do not have to carry sound-making devices, but they still must be able to make an efficient sound signal (e.g., manual horn).

Hard Hats

Approved head protection conforming to ANSI Z89.1-2003 shall be provided to all individuals involved in deck operations that require the use of hard hats. The captain/master or safety manager can advise on the type of head gear required based on the involved tasks.

Tethers (Lifelines)

Vessel captains/masters shall make tethers available for use by individuals in deck operations, as appropriate. These must be of easy-release belt or shoulder type with adequate buoyant line. A safety harness with lifeline shall be worn by all personnel when going aloft in rigging or on masts or when working topside in heavy weather.

Safety Goggles

Eye protection conforming to ANSI Z87.1-2003 shall be worn during dirty deck work, such as grinding and paint removal; any work involving acids, caustics or solvents; anchor windlass operation; work involving machine tools; or any other work presenting an eye hazard. The captain/master or the safety manager can advise on the type of eye protection required based on the involved tasks.

Signal Lights

An EPA **Class C** vessel, when on an international voyage, must have a daylight signaling light that, as a minimum, is a handheld portable light of at least 60,000 foot-candles, with a means for rapidly switching on and off, while being energized from a self-contained storage battery that can operate the light continuously for two hours without recharging.

9.1.13 Emergency Breathing Apparatus

All EPA **Class C** vessels will be equipped with a minimum of two demand-type SCBAs, in accordance with section 7 of this manual. Requirements for outfitting SCBAs on other EPA vessels will be determined by EPA vessel management and the vessel captain/master. SCBAs shall be distributed throughout the vessel in such a manner that a single shipboard casualty will not prevent access to all the units. Each unit shall be stowed with a complete set of instructions and a safety line consisting of a 50-foot length of 3/16-inch steel wire equipped at each end with a snap hook.

SCBA

SCBAs currently authorized for shipboard use must be units previously approved by the USCG or be units certified by the National Institute for Occupational Safety and Health (NIOSH). NIOSH-certified equipment that meets the following requirements is approved for shipboard use:

- Be capable of pressure demand or positive pressure operation
- Be open circuit equipment

- Have 30 minutes minimum duration
- Be provided with a full face piece

Steel SCBA air cylinders shall be hydrostatically tested at least every five years, and the date of the test shall be stamped on the cylinder. Fully wound composite air cylinders (aluminum liner fully wrapped with high-strength glass filaments, except for the thick neck area) and hoop-wound composite air cylinders (aluminum liner wrapped on sides only) shall be hydrostatically tested at least every three years, and the date of the test shall be affixed on the cylinder with a sticker. Because of the degradation of the composite material's strength over time, composite cylinders have a service life of 15 years from the date of manufacture.

Steel and composite SCBA air cylinders shall receive a visual internal and external inspection annually by an authorized servicing facility. Air cylinders that pass this inspection shall be affixed with a dated visual inspection sticker.

Any vessel equipped with a diver's air compressor shall maintain the capability for recharging SCBA cylinders. Vessels with no recharging capability must carry spare SCBA cylinders.

People designated to use SCBA must be trained and receive medical approval for such use. This training and medical approval is referenced in both 29 CFR 1910.134 and in EPA Order 1460.1.

Emergency Escape Breathing Apparatus (EEBA)

EEBAs are low-duration (less than 15 minutes); self-contained breathing devices intended as "one-time use only" escape systems. They are not intended for use as firefighting or rescue breathing apparatus and shall not be used to supplement or replace breathing equipment required for those purposes. EEBAs may be located in berthing spaces, engineering spaces and other locations onboard vessels where sudden egress during a fire may be necessary. Although EEBAs are not required equipment, vessels having them in their inventory must maintain and service them according to the manufacturer's recommended policy and according to 29 CFR 1910.134. EEBAs shall be NIOSH or Navy approved.

9.1.14 Lifesaving Equipment Test and Inspection

The following tests and inspections of lifesaving equipment shall be conducted:

Inflatable Life Raft Overhaul

Inflatable life rafts shall be serviced at an approved servicing facility (see USCG COMDTINST M16714.3, "Equipment List") every 12 months. The period for servicing is computed from the date of the last servicing. Except in emergencies, no servicing should be done onboard vessels. If at any time external damage is found to the container or straps, or if the seal is broken, the rafts shall be serviced by an approved servicing facility. After each servicing, the date, port, and initials of the inspector are to be stamped on the metal tag. The dates of the more extensive five-year servicing shall also be clearly marked on the life raft servicing tag.

Hydrostatic Release Overhaul

A hydrostatic release used in the deployment of any inflatable life raft, life float or buoyant apparatus shall undergo periodic servicing and testing, normally every 12 months from the date of installation, as determined by its inspection tag. The spring of a spring-tensioned gripe used in such an installation shall be replaced when the accompanying hydrostatic release is serviced and tested.

Sealed, disposable hydrostatic releases are approved for use and have a service life of two years from their date of installation. These hydrostatic releases shall be disposed of after reaching their expiration date.

PFD/Survival Suit/Work Vest/Float Coat Inspection

Each unit shall be examined annually to determine its serviceability. (Note: "Serviceable" is defined under "Definitions" at http://www.uscg.mil/hq/cg5/cg5214/pfdselection.asp). If not in serviceable condition, the PFDs and work vests shall be destroyed and removed from the vessel. Any survival suit or float coat that is not serviceable shall be returned for service. Any hardware attached to a survival suit shall not impede the safe operation of the suit or cause any external damage.

9.1.15 Other Safety Equipment Applicable to Class A Vessels

Unpowered vessels such as canoes and kayaks only require PFDs and handheld VHF receivers; if intended to operate at night, they also require a 360 degree white light. It is also strongly recommended that operators take a safe boating course. As an example, a list of classroom and online safe boating courses is available at http://www.boatus.com/courseline/default.asp.

In addition to the equipment specified in other sections of this manual, each **Class A** craft shall be equipped with:

- USCG-approved visual distress signals. These may be:
  - Pyrotechnic devices – day and night, at least three of each. These may be handheld or aerial flares or handheld or floating smoke.
  - Nonpyrotechnic devices – such as an orange distress flag, an electric distress light that automatically flashes SOS and a flashlight, or mirrors.
- Fire extinguishers. The number and type of USCG-approved fire extinguishers required for powered **Class A** vessels with no fixed fire-extinguishing equipment in a machinery space is:

Table 9-1. Fire Extinguishers for Class A Vessels

Less than 16 feet	One B-I
16 to 26 feet	One B-I
26 to 40 feet	Two B-I or one B-II
More than 40 feet	Three B-1 or one B-1 and one B-II

- Operable navigation lights
    - Red and green running lights, a white masthead light and a white stern light. A 360 degree, visible combined masthead and stern light can be substituted, as authorized in the International Regulations for Preventing Collisions at Sea (COLREG) Rule 23 and 33 CFR 83.23.
    - An efficient sound signaling device, as described in COLREG Rule 33 and 33 CFR 83.33.
- Bailing device
    - An effective bailing device, in addition to any installed electric bilge pumps.
- First aid kit
- Paddle
- Marine band VHF radio
    - With capability for channels 16, Wx channels, 21A Coast Guard information, and other appropriate local channel requirement.
- Anchor and anchor rode (as appropriate)
- Cellular phone
- EPIRB is recommended, but not required.

9.1.16 Navigation Equipment

For all EPA vessels, the captain/master should ensure that the vessel has all the necessary charts and navigation equipment to safely navigate the vessel and maintain risk of collision situational awareness, as dictated by the waters to be navigated. As a general rule, this equipment should meet or exceed the navigation equipment requirements specified in SOLAS 1974, regulation 12, and 46 CFR Sections 195.17 (Radar), 195.19 (Magnetic/Gyro Compass), and 195.27 (Fathometer).

All EPA vessels should carry and use Global Positioning System (GPS) receivers for determining navigational and scientific position based on the geographical location, size and operations carried out by the vessel. Use on **Class A** small craft that are tenders or rescue craft for a **Class B** or **C** vessel is optional.

Note: The accuracy of the equipment necessary to document the vessel's location for science purposes may exceed the accuracy requirements for safe navigation. When practicable, if such equipment is installed, it should be rigged to also facilitate the navigation of the vessel.

Class C vessels are required by 33 CFR 164.43 to have installed and to use an Automatic Identification System (AIS) that can provide navigational identification and location information on vessels within VHF range. AIS is also mandatory for **Class B** vessels when transitioning a Vessel Traffic Service (VTS) in accordance with 33 CFR 164.46.

9.2 Communications Equipment

The vessel captain/master should ensure that the vessel has all the necessary communications equipment to maintain reliable communications as dictated by the distances and locations involved. The requirements for communications equipment onboard EPA vessels are as follows:

- Radio communications for operating on the Great Lakes is regulated by the Agreement between the United States of America and Canada for Promotion of Safety on the Great Lakes by Means of Radio, 1973, and contained in 29 CFR Subpart T. Requirements include:
    - All **Class B** and **C** vessels must have fixed marine band VHF transceiver capability with the antenna system as high as practicable. These vessels radio installations must be inspected and certified every 13 months.
    - **Class B** and **C** vessels less than 124 feet long must have at least one fixed marine VHF radio station.
    - **Class B** and **C** vessels greater than 124 feet long must have at least two separate fixed marine VHF radio stations.
    - **Class A** vessels shall have capability for communicating on the marine VHF channels.
    - Cellular phone.
    - EPIRBs are recommended for **Class A** and **B** vessels.
- **Class C** vessels outside the Great Lakes and U.S. inland waters are subject to the GMDSS, which requires the following minimum equipment:
    - A VHF radio installation capable of transmitting and receiving Digital Selective Calling (DSC) on marine channel 70. It must be able to initiate the transmission of

distress alerts on channel 70 from the position from which the vessel is typically navigated.

- Radiotelephony on marine channels 6, 13 and 16.

- A dedicated, non-scanning radio installation capable of maintaining a continuous DSC watch on VHF channel 70.

- A radar transponder capable of operating in the 9 GHz band, which must be stowed so that it is easily used (this transponder may be one of those required on a survival craft).

- A receiver capable of receiving international NAVTEX service broadcasts.

- If the vessel is engaged on voyages in any area of International Maritime Satellite System (INMARSAT) coverage in which an international NAVTEX service is not provided, a radio facility for reception of maritime safety information by the INMARSAT enhanced group calling system (e.g., SafetyNet).

- A satellite EPIRB, which must be capable of transmitting a distress alert through the polar orbiting satellite service operating in the 406.0–406.1 MHz band (406.0-406.1 MHz EPIRB).

- For service in sea area A2, in addition to above, a high-frequency (HF) medium frequency (MF) transceiver using DSC on voyages within coverage of MF coast stations equipped with DSC capable of transmitting and receiving, for distress and safety purposes, on the frequencies 2187.5 kHz using DSC and 2182 kHz using radiotelephony. It must also be capable of maintaining a continuous DSC watch. This requirement may be fulfilled by an INMARSAT vessel earth station capable of two-way communication through the INMARSAT geostationary satellite service, if within INMARSAT coverage, and able to initiate transmission of distress alerts.

- For service in sea area A3, in addition to above, a HF MF transceiver using DSC on voyages within coverage of MF coast stations equipped with DSC capable of transmitting and receiving, for distress and safety purposes, on the frequencies 2187.5 kHz using DSC and 2182 kHz using radiotelephony, and also capable of maintaining a continuous DSC watch on the working frequencies in the bands between 1605 and 4000 kHz or between 4000 and 27500 kHz on the frequency 2187.5 kHz. This requirement may be fulfilled by an INMARSAT vessel earth station capable of two-way communication and of transmitting and receiving, for distress and safety purposes, on the frequencies.

- For service in sea area A4, in addition to above, an INMARSAT vessel earth station capable of transmitting and receiving distress and safety data communications; initiating and receiving distress priority calls; maintaining watch for shore-to-vessel distress alerts, including those directed to specifically defined geographical areas; and transmitting and receiving general radio communications using either radiotelephony

or direct-printing telegraphy. Also, an MF radio installation capable of transmitting and receiving for distress and safety purposes on the frequencies 2187.5 kHz using DSC and 2182 kHz using radiotelephony.

- At least three fixed or portable two-way marine band VHF radiotelephone apparatus must be available. These VHF radiotelephones must be stowed in locations such that they can be rapidly placed in any survival craft other than life rafts.

- At least one radar transponder must be carried on each side of the vessel. Such radar transponders must be stowed in locations such that they can be rapidly placed in any survival craft other than installed life rafts.

- Survival craft equipment must be tested at intervals not to exceed 12 months. Any battery used for survival craft equipment must be permanently marked with the month and year of its manufacture. Also, the month and year upon which 50 percent of its useful life will expire must be permanently marked on both the battery and the outside of the transmitter. Batteries must be replaced if 50 percent of their useful life has expired or if the transmitter has been used in an emergency situation.

- Each vessel equipped with DSC, AIS and/or INMARSAT communications capability will have a unique Maritime Mobile Service Identity (MMSI) assigned. An MMSI is a nine-digit number used by maritime DSC, AIS and certain other equipment to uniquely identify a vessel or a coast radio station. Guidance on how to obtain an MMSI for both federal and non-federal vessels can be obtained from the USCG at http://www.navcen.uscg.gov/?pageName=mtMmsi.

- At a minimum, **Class A** and **B** vessels will have the following communications capability:

  - For **Class A** vessels: A marine band VHF transceiver that is capable at a minimum of operating on channels 16, Wx channels, 21A Coast Guard information, and other appropriate local channel requirements that have DSC capability. Unpowered vessels such as canoes and kayaks only require a handheld VHS receiver.

  - For **Class B** vessels: A marine band VHF transceiver that can at least operate on channels 16, 6 and 13, and have DCS capability.

  - At least one portable two-way marine band VHF radiotelephone transceiver. This transceiver must be stowed in such locations that they can be rapidly placed in any survival craft.

  - Additional communications capability deemed necessary for the vessel to safely complete a scientific mission.

9.2.1 Internal Communications and Alarm Systems

The following equipment is required on all EPA **Class B** and **C** vessels (VMOs may require this equipment on smaller vessels based on their design and operation):

- **Emergency Communications:** Two-way communications between emergency controls, muster and embarkation stations, and strategic positions onboard the vessel shall be provided. These two-way communications can be either fixed or portable equipment.

- **General Alarm:** A fully functional general emergency alarm system shall be provided for summoning the crew to muster stations and to initiate the actions included in the muster list. The system shall be supplemented by either a public address system or another suitable means of communication.

9.2.2 Emergency Power

Any EPA vessel with an emergency generator must have the following radio and navigation equipment, if installed, powered by the emergency power source:

- Bridge-to-Bridge VHF radio
- HF transceiver
- Gyrocompass
- Bridge fathometer
- Radar
- INMARSAT
- Charging panel for general alarm batteries
- General alarm

9.2.3 Radio Watches and Logs

The following is the required recordkeeping associated with all EPA vessels in accordance with 29 CFR 804.09 (VMOs may require these procedures on smaller vessels based on their design and operations.):

- GMDSS Watch: Each vessel that is fitted with a VHF DSC, INMARSAT and HF radiotelephone must, for safety purposes, be alert for any notifications and distress traffic. Only licensed GMDSS operators or maintainers may operate/maintain GMDSS systems. The captain/master and mates are typically the assigned GMDSS operators.

- VHF Radiotelephone (Bridge-to-Bridge Radio) Watch: All non-GMDSS EPA vessels, while underway, must maintain a continuous guard on VHF channel 16 (156.8 MHz) distress and channel 13 (156.65 MHz) Bridge-to-Bridge or other locally applicable USCG-assigned vessel control frequencies. Continuous watch shall be maintained on the bridge by means of dual receivers, except while handling traffic on other VHF frequencies.

- Vessel GMDSS Log: All entries shall be logged, dated and signed by the GMDSS captain/master or maintainer using the radio or performing the maintenance and test functions. The following information must be logged:
    - All distress and alerts transmitted or received and all related communications transmitted.
    - A summary of communications between the vessel and land or mobile stations.
    - Daily test results.
    - Any malfunctions to the GMDSS components.
    - Results of all station inspections.
    - All tests and maintenance on portable radio equipment for survival craft. The model and serial number of the equipment must be logged.
    - Radiotelephone logs are retained for at least two years and for three years if they contain entries concerning distress or disaster action.
- INMARSAT Log: A satellite communications log shall be maintained onboard each EPA vessel having an INMARSAT system installed. All entries shall be dated and signed by the individual using the system. The following information shall be logged:
    - Who placed the call
    - Destination and number called
    - Purpose of the call
    - Call duration

9.2.4 Radio Frequency (RF) Radiation Hazards

As appropriate for the installed equipment, the following safety precautions shall be followed to reduce the hazards presented by RF radiation:

- All HF transmitters shall be secured while cranes or booms are in operation. This restriction shall be clearly posted at the HF radio operating station. Burn hazard warning signs shall be posted on cranes and booms.
- All HF transmitters and radars shall be secured while refueling operations are underway.
- Personnel in the vicinity of HF antennas shall be warned by signage and safety enforcement in accordance with 29 CFR 1920.97 when HF transmitters are transmitting.

- Minimum safe distances from sources of radiation, as established by a radiation safety survey, shall be adhered to. An RF radiation survey can be obtained from marine electronics maintenance providers that comply with the 29 CFR 1910.97. Minimum safe levels are currently established as a power density of 10 milliwatts per square centimeter for periods of six minutes or more, and/or an energy density of 1 milliwatt-hour per square centimeter during any six-minute period.

- Protective barriers shall be installed around HF transmitter antennas and coupler connections to prevent accidental personnel contact. Barriers shall either consist of a life rail or a chained-off area, positioned 4 feet from the hazard, or a protective cage mounted in such a way as to prevent physical contact with the hazard. Antenna/coupler installations in the vicinity of inflatable life rafts, search lights, signal lights or other work areas where a life rail or chain will not prevent accidental contact by personnel must have protective cages installed. Radiation and burn hazard warning signs shall be installed on the barrier. A burn hazard warning sign shall also be installed on the coupler. For best transmission characteristics, the barrier should be constructed of Kevlar or glass-reinforced plastic. If a metallic barrier is used, it must be thoroughly grounded to prevent the buildup of induced RF voltage.

- Access to HF locations shall be restricted, and RF hazard warning signs shall be posted at all access points (e.g., ladders and steps leading to the flying bridge) in accordance with 29 CFR 1910.97.

- Signs warning of a "RF BURN HAZARD" shall be posted in the vicinity of cranes, booms and boat davits shown to be potential burn hazards by a radiation safety survey.

9.3 Pollution Control Equipment

9.3.1 Purpose

This section sets forth the policy, standards, procedures and equipment requirements for all EPA vessels concerning the transfer and/or disposal of oil and oily waste. Solid waste (garbage), sewage and medical waste abatement and control have been a continuing concern of the EPA. (These concerns are expressed in subsection 9.3.2, "Background.") This section will be updated and redefined with specific EPA vessel requirements as indicated. Because the EPA is empowered by Congress to establish acceptable pollution standards, it is incumbent upon all VMOs (or appropriate designees) to *set an example of compliance* with these pollution abatement objectives onboard EPA-owned and EPA-leased vessels with a positive and willing determination.

9.3.2 Background

International concern of marine pollution culminated in development of the International Convention for the Prevention of Pollution from Ships (1973) and its Protocol, known collectively as MARPOL 73/78, under the auspices of the IMO. MARPOL currently includes six annexes:

Annex I (Oil), Annex II (Noxious Liquid Substances), Annex III (Packaged Goods), Annex IV (Sewage), Annex V (Garbage), and Annex VI (Air Pollution).

The EPA participated in an extensive study and survey with the USCG, NOAA and other government agencies and private industry, for the Committee on Shipboard Waste, Marine Board, Commission on Engineering, and Technical Systems of the National Research Council. This study resulted in an extensive report, *Clean Ships, Clean Ports, Clean Oceans.* The study was predominately concerned with implementation of Annex V. The committee concluded that:

- There is a need to ensure accountability of both vessel captains/masters and port operators.
- Vessel recycling programs need to be promoted.
- The EPA is the logical agency to establish the overall framework for improving the vessel/shore interface, due to its expertise in and authority for national management of solid waste.
- The implementation of MARPOL on U.S. vessels is summarized in 46 CFR Part 151.

9.3.3 EPA Vessel Operating Policy

All EPA vessels operating on the Great Lakes will be zero discharge vessels. No solids or liquids of any sort will be discharged from the vessel into the lake waters. Accordingly, to accomplish scientific missions, "at sea" time is limited to the holding capacity of the vessel. The abovementioned objectives regarding reduction of waste material onboard must be vigorously pursued.

EPA **Class A** vessels are encouraged to adopt a zero discharge policy at all times. While performing maritime operations, EPA vessels should set the example for the general public and are held accountable for inappropriate discharge practices.

EPA **Class B** vessels not operating on the Great Lakes will be zero discharge of all solids, including garbage of any sort, and will comply with USCG and local laws governing sewage discharge.

EPA **Class C** vessels not operating on the Great Lakes will meet the EPA objectives stated above and comply with 33 CFR Parts 151, 153, 155 and 156.

Various sea and local areas are set aside as zero discharge zones. EPA vessels will comply with those designation restrictions.

9.3.4 Oily Waste Pollution Standards and Equipment Requirements (Applicability – Class C Vessels Not Operating on the Great Lakes)

- When less than 12 nautical miles from the nearest land, no discharge is allowed.

- When more than 12 nautical miles from the nearest land, ensure that any oily discharge from the vessel does not exceed 15 parts per million (ppm).

- When discharging bilges or oily ballast overboard, have in operation an oily water separator capable of producing a discharge with oil concentrations less than 15 ppm. The separator's discharge line must have a sensor that alarms when the concentrations exceed 15 ppm. Alternatively, retain all oily wastes onboard for discharge ashore.

- Vessels larger than 400 GT that engage in voyages to, or operate near, land under the jurisdiction of other parties to MARPOL 73/78 must have onboard a valid International Air Pollution Prevention Certificate issued by the USCG or ABS in accordance with 33 CFR 151.19 to verify compliance with MARPOL Annex VI.

9.3.5 Requirements for Fuel Oil Transfer Operations (Applicability – Class B and Class C Vessels Operating in All Waters)

The vessel chief engineer, under the direction of the captain/master, shall ensure that fuel oil transfer procedures, precautions and preparations, as set forth below, have been met before beginning fuel oil transfer operations. These requirements are based on 33 CFR Parts 155 and 156.

The vessel captain/master shall establish and maintain current written fuel oil transfer procedures and ensure that they are used during each oil transfer operation. A legibly printed copy of the procedures must be posted or available at a place where the procedures can be easily seen and used by those crew members engaged in the transfer operation.

The chief engineer shall designate a person or persons to be in charge of each oil transfer to or from the vessel, from tank to tank within the vessel, and for each vessel-cleaning operation. No person shall be so designated without having been instructed in the duties or without having a thorough knowledge of the oil transfer system, oil transfer procedures, and federal water pollution laws and regulations applicable to the vessel.

9.3.6 Oil Transfer Procedures

All EPA class vessels with a fuel capacity of more than 250 barrels of oil are required to have written oil transfer procedures. These procedures must be available during a USCG inspection and must be permanently mounted where the procedures can be easily seen and used by crew members engaged in oil transfers. These procedures must apply to both bulk fuel oil transfers to or from another facility and internal transfers between vessels. The requirements for these procedures are contained in 33 CFR 155.720, 33 CFR 155.730 and 33 CFR 155.740.

9.3.7 Vessel Fuel Oil and Lubricating Oil Handling Equipment: Discharge Containment Provisions (Applicability – Class B and Class C Vessels)

Requirements for the containment of accidentally discharged fuel oil or lubricating oil through tank vents, overflows and fill pipes during oil transfer operations, as detailed in 33 CFR 155.320, include:

- For each **Class C** vessel, there shall be a fixed container or enclosed deck area under or around each fuel oil or bulk lubricating oil tank vent and overflow and fill pipe that has a capacity of at least one-half barrel (21 gallons) for vessels less than 300 GT and one barrel (42 gallons) for vessels greater than 1,600 GT.

- For **Class B** vessels, each fuel oil or bulk lubricating oil tank vent and overflow and fill pipe shall be equipped with a portable container of at least 5 U.S. gallon capacity during oil transfer operations. If a larger container is necessary, use best judgment to determine the size needed. Plastic refuse containers secured under the pipes during fueling operations will, in most cases, meet this requirement.

9.3.8 Oil Discharge Placard (Applicability – All EPA Vessels > 26 feet)

Per 33 CFR 155.450, each vessel must have a placard of at least 5 by 8 inches, made of durable material, fixed in a conspicuous place in each machinery space, or at the bilge and ballast pump control station, stating the following (or similar wording):

DISCHARGE OF OIL PROHIBITED

The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon the navigable waters of the United States, or the waters of the contiguous zone, or which may affect natural resources belonging to, appertaining to, or under the exclusive management authority of the United States, if such discharge causes a film or discoloration of the surface of the water or causes a sludge or emulsion beneath the surface of the water. Violators are subject to substantial civil penalties and/or criminal sanctions including fines and imprisonment.

9.3.9 Oil Pollution Reporting (Applicability – All EPA Vessels)

Federal regulations contained in 33 CFR Part 151 require that *any* spill of petroleum or hazardous materials be reported to the USCG. Accordingly:

- In the event of a spill, notify the nearest USCG Marine Safety Unit (verbally and in writing) or contact the USCG National Response Center at (800) 424-8802 or (202) 267-2675, or http://www.nrc.uscg.mil.

- Spills reported to the USCG will also be reported verbally and in writing to the local SHEMP manager, the VMO and SHEMD Director at (202) 564-1640.

- A written notice shall be available in the pilothouse detailing specific instructions in the event of an oil spill.

9.3.10 Sewage Pollution Control (Applicability – All EPA Vessels Not Operating on the Great Lakes)

No discharge of sewage within 3 nautical miles of nearest land is allowed unless discharge is permitted and the vessel is fitted with an approved Type II or Type III Marine Sanitation Device (MSD), in accordance with 40 CFR Part 140 and 33 CFR Part 159.

9.3.11 Refuse Pollution Control (Applicability – All EPA Vessels)

To provide a systematic approach for controlling overboard trash and garbage in the marine environment, and to be consistent with the objectives outlined in 9.3.2 on page 9-19, a vessel-specific Garbage Management Manual will be prepared to conform to the MARPOL 73/78, Annex V, requirements, and 33 CFR 151.51 through 151.77. (Note: The *Lake Guardian,* due to operations only on the Great Lakes, is a Zero Discharge Vessel. As a Public Vessel operating solely on the Great Lakes, it is exempt from the Garbage Management Manual requirements of MARPOL 73/78 as specified in 33 CFR 151.09.)

The Garbage Management Manual will include laboratory and medical waste pollution control requirements. As a general rule, no laboratory waste materials will be discharged overboard or disposed of. Instead, the materials will be properly managed once the vessels return to shore. The Garbage Management Manual will be submitted to the SHEMD Director for approval.

The captain/master or person in charge of each vessel shall comply with 33 CFR 151.59 and ensure that one or more refuse placards are displayed in prominent locations and in sufficient numbers so that they can be read by the crew and science team. These locations must be readily accessible to the intended reader and may include embarkation points, food service facilities, garbage handling spaces and common spaces on deck, and they must comply with the following:

- Each placard must be at least 9 inches wide by 4 inches high, made of a durable material, and labeled with letters at least 1⁄8 inch high.
- State that the discharge of plastic or garbage mixed with plastic into any waters is prohibited.
- The discharge of all garbage is prohibited in the navigable waters of the United States and in all other waters within 3 nautical miles of the nearest land.
- The discharge of dunnage, lining and packing materials that float is prohibited within 25 nautical miles of the nearest land.
- Other unground garbage may be discharged beyond 12 nautical miles from the nearest land.
- Other garbage ground to less than 1 inch may be discharged beyond 3 nautical miles of the nearest land.

A person who violates the above requirements is liable for a civil penalty for each violation and the criminal penalties of a class D felony.

9.3.12 Air Pollution

MARPOL, Annex VI, establishes requirements for reducing air pollution from ships, especially nitrogen oxide (NO_x) contaminants. Specific requirements for vessel air pollution prevention requirements are contained in Annex VI and in forthcoming federal regulations related to specific reductions in air pollution.

All **Class C** vessels larger than 400 GT that engage in voyages to or operate near land under the jurisdiction of other parties to MARPOL 73/78 must have onboard a valid International Air Pollution Prevention (IAPP) certificate issued by the USCG or ABS to verify compliance with Annex VI in accordance with USCG Policy Letter CG-543 of February 4, 2009.

An engine IAPP certificate is the internationally accepted documentation that a specific engine meets the international NO_x emission limits for marine diesel engines required by Regulation 13 of Annex VI for ships with engines over 130 kW or 175 horsepower. Some states may require a carbon monoxide hazard warning sticker, though there are no USCG standards requiring this.

9.3.13 Ballast Water Management for Control of Nonindigenous Species in Waters of the United States

Captains/masters, owners and operators of vessels equipped with ballast water tanks that operate in the waters of the United States must, in accordance with 33 CFR 151.1520 through 151.3000:

- Avoid the discharge or uptake of ballast water in areas within, or that may directly affect, marine sanctuaries, marine preserves, marine parks or coral reefs.
- Minimize or avoid uptake of ballast water in the following areas and situations:
    - Areas known to have infestations or populations of harmful organisms and pathogens (e.g., toxic algal blooms).
    - Areas near sewage outfalls.
    - Areas near dredging operations.
    - Areas where tidal flushing is known to be poor or times when a tidal stream is known to be more turbid.
    - In darkness, when bottom-dwelling organisms may rise up in the water column.
    - Where propellers may stir up the sediment.
    - Areas with pods of whales, convergence zones and boundaries of major currents.
- Remove fouling organisms from hull, piping and tanks on a regular basis, and dispose of any removed substances in accordance with local, state and federal regulations.

- Maintain a ballast water management plan that has been developed specifically for the vessel, which will allow those responsible for the plan's implementation to understand and follow the vessel's ballast water management strategy.

9.3.14 References

- 33 CFR Part 151, Pollution Regulations
- 33 CFR Part 155, Oil Pollution Prevention
- 33 CFR Part 159, Marine Sanitation Devices
- 33 USC 407, The Refuse Act of 1899
- 33 USC 2501, U.S. Public Vessel Medical Waste Anti-Dumping Act of 1988
- IMO (MARPOL 73/78) Annex I, Regulations for the Prevention of Pollution by Oil
- IMO (MARPOL 73/78) Annex IV, Regulations for the Prevention of Pollution by Sewage from Ships
- IMO (MARPOL 73/78) Annex V, Regulations for the Prevention of Pollution by Garbage from Ships
- IMO (MARPOL 73/78) Annex VI, Regulations for the Prevention of Air Pollution from Ships

10. VESSEL OPERATIONS, RECORDS, REPORTS, AND EMERGENCY NOTIFICATION

10.1 Introduction

Other sections of this manual contain additional requirements for records and reports than those listed here. In addition, other records are required that relate to the operation of vessels by licensed officers trained in these areas. It is not the intent of this section to index all events and subsequent recordkeeping. This section is intended to highlight those documents and reporting procedures considered pertinent to safety-related matters.

10.2 Station Bills

All **Class B** and **C** vessels shall have posted, in conspicuous places, station bills setting forth the duties of the crew and scientific personnel under emergency situations. New personnel should be indoctrinated in their duties as soon as they report for duty or a visit.

10.3 Log Books

A properly kept log is a recognized part of a well-operated vessel. All EPA **Class B** and **C** vessels will maintain a formal log book in which all appropriate records and data are entered. If in doubt, it is much better to log too much than too little information. In addition to the purely operational considerations, the vessel's log is often a useful adjunct source of information for the scientific program. The log should include sufficient notations on the research operation, especially its impact on the vessel's operational activities.

Other records can be retained in addition to the vessel's log to duplicate and supplement safety and firefighting training events, as reflected by good marine practice for documenting equipment history, maintenance and operating procedures.

10.4 Cruise and Float Plans

Cruise and float plans are used to track the movement of EPA vessels while on passage or conducting scientific operations. Details on each of these plans are provided below and on page 10-2 of this manual.

Cruise Plans

Captains/masters of EPA **Class B** and **C** vessels shall file a cruise plan with their home port prior to getting underway. At a minimum, the plan will contain the following information:

- The names, ages, addresses and phone numbers of all crew members (unless recorded elsewhere).
- The names, ages, addresses and phone numbers of scientific personnel (including technicians).
- Designation of captain/master and chief scientist.

- Date/time and place of departure.
- Estimated date/time and place of ports of call.
- Cruise track and operating area(s).
- Capsule summary of science planned.
- Communications instructions to comply with subsection 10.5 below.
- Other information, as appropriate, regarding fuel quantity onboard, hazardous material, and explosive and/or radioactive material, as may be pertinent to safe and effective vessel operations and rescue.

A copy of the cruise plan shall be provided to the VMO (or appropriate designee) and a copy retained onboard. It is the responsibility of the captain/master to ensure that any changes and the termination of the cruise or a port arrival are reported.

Float Plans

Captains/masters of EPA **Class A** vessels must use an appropriate float plan prior to operating. This plan provides a system to track each time an EPA small craft departs and returns from a day's operation. An example template that provides the elements of a detailed float plan is provided by the USCG Auxiliary and is located at http://www.floatplancentral.org/download/USCGFloatPlan.pdf. Other examples of float plans are provided in Appendix D.

Note: The purpose of these float plans is to ensure that supervisors (in particular the supervisors of individuals who "check out" a small craft) know where employees and contractors are and when they are expected back. If they do not return, a knowledgeable search can be initiated after a reasonable period of time. The vehicle type and trailer should be referenced in the float plan for identification purposes if a search is needed.

10.5 Reporting – All EPA Class Vessels

Daily Reports

EPA marine facilities that operate vessels on frequent cruises should establish secure communications methods to ensure prompt and positive communications, or make positive arrangements to use an existing method, such as email, to ensure timely receipt and delivery of reports its program or regional office. All vessels, while operating, should make the following email or telephone reports to its program or regional office once daily when underway:

- When any change in the cruise plan affects the planned position or estimated time of arrival at any previously designated point.
- When any equipment failure adversely affects the capability of the vessel.
- When adverse weather or other factors affect the planned operations of the vessel.
- On arrival and departure from an overnight or other designated stop.

Loss of Communications

If there is loss of email, radio or telephone contact, then, as required by 46 CFR 4.04-3, the EPA-designated base facility representative, having reason to believe (because of the lack of daily communications for two successive days, 48 hours, or nonappearance of a vessel, or other unusual instance) that the status of a vessel is uncertain or imperiled, shall notify the cognizant USCG Rescue Coordination Center and the SHEMD Director. This representative shall continue to use all available methods to establish communications with the vessel to determine its status. The person notifying the USCG and SHEMD Director shall provide complete information concerning the vessel's itinerary, identification and communication capabilities. The purpose of notification is to make the USCG and SHEMD Director aware that some uncertainty exists concerning the status of the vessel and to save time if and when it becomes necessary to declare an emergency. **Class A** and **B** vessels on one-day missions that cannot communicate with any station for six hours will terminate all operations and proceed to the nearest point where communications can be re-established. **Class B** and **C** vessels on transits or missions out of port over 36 hours must follow the same procedure if they cannot communicate with any station for 24 hours. Normally, the vessel will proceed to the nearest port having communications capability.

10.6 Weather Reports

EPA **Class B** and **C** vessels, while underway, should make frequent weather checks. The use of an all-band receiver and Web access to weather information and weather maps is required for vessels engaged in deep ocean research and extensive Great Lakes' missions. Weather reports will be provided to the vessel captain/master prior to leaving port and periodically as necessary.

10.7 Emergency Crisis and Accident Reporting Requirements

Applicability

This element is applicable to all EPA vessels.

Procedures

If any accident on an EPA vessel results in: death and/or hospitalization, an OSHA-recordable injury or occupational illness to any person onboard, any damage to non-EPA property, or damage to EPA property, damage to the EPA vessel or any other vessel through contact with the EPA vessel, or which significantly impacts the Agency's mission, then the following reporting is required:

- The captain/master shall immediately report it verbally to the appropriate local SHEMP manager, the VMO (or appropriate designee) and the SHEMD Director. Under no circumstances is this verbal notification to be made more than eight hours after the incident should immediate reporting not prove to be feasible. The following must be included in this initial verbal reporting: vessel name, name of the person reporting the incident, date and time of the incident, vessel location, summary of the emergency, type and severity of the emergency, any fatalities, injuries, or illnesses, any vessel damage, mission impact, or SHEM concerns, and what assistance may be needed. Appendix F of this manual provides an initial verbal reporting checklist template. The chief scientist and/or the injured party shall confirm the details of the incident in writing within 48 hours after the accident occurs. Such written reports shall be sent to the appropriate local SHEMP manager, VMO, and SHEMD Director to provide full details of the accident, including witnesses' statements.

- The SHEMD Director will determine the need for additional reporting, notifications and/or investigations. Based on the circumstances, vessel ownership, who is injured, what is damaged and other factors, notification to the USCG and/or the Department of Labor under the OSH Act may be required.

Note: Accidents involving a death or the inpatient hospitalization of three or more employees must be reported to OSHA within eight hours.

In addition, EPA personnel shall complete Form CA-1, "Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation," following any applicable injury onboard an EPA vessel. This form shall be filed with the employee's supervisor for appropriate action. The CA-1 Form and the CA-2 Form, "Federal Employee's Notice of Occupational Disease and Claim for Compensation," are located at http://intranet.epa.gov/ohr/benefits/workerscomp/forms.htm.

Recordable work-related injuries and illnesses must be recorded on the OSHA and EPA 301 – Injury, Illness and Near Miss Report/Form located at http://intranet.epa.gov/oaintran/shemd/national/i2p2/reporting/injury.htm. A host employer must record the recordable injuries and illnesses of contract employees who are supervised on a day-to-day basis, even if such employees are not carried on the employer's payroll. Day-to-day supervision occurs when, "in addition to specifying the output, project, or result to be accomplished by the person's work, the employer supervises the details, means, methods, and process by which the work is to be accomplished" (see 29 CFR 1904.31). Therefore, if the EPA is providing day-to-day supervision of contract employees, then the EPA would be required to record the recordable injuries and illnesses of contract employees on the OSHA and EPA 301 Report/Form. (**Note:** An injury or illness is recordable if it results in death, days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or loss of consciousness. A case may also meet the general recording criteria if it involves a significant injury or illness diagnosed by a physician or other licensed health care professional, even if it does not result in any of the items listed above.)

The OSHA and EPA 301 – Injury, Illness, and Near Miss Report/Form (CA-1) and the Notice of Occupational Disease and Claim for Compensation Form (CA-2) are provided in Appendix E of this manual.

11. SOLAS INTERNATIONAL SAFETY MANAGEMENT (ISM) SYSTEM

11.1 Background

SOLAS, 1974, International Management Code for the Safe Operation of Ships and for Pollution Prevention ISM Code, as required by 46 U.S. Code Chapter 32 and implemented by 33 CFR Part 96, establishes a mandatory safety protocol for the owners and operators of vessels larger than 500 GT operating outside the U.S. inland waters and Great Lakes. Additionally, 33 CFR Part 96 establishes a voluntary safety protocol for the owners and operators of vessels of any size operating outside U.S. inland waters and Great Lakes.

11.2 Applicability

The ISM is mandated for all EPA **Class C** vessels that operate outside U.S. inland waters and Great Lakes and are manned by civilian contractor mariners.

In implementing ISM, this manual establishes the minimum standards that a **Class C** vessel safety management system must meet for certification and to comply with the requirements established in accordance with 33 CFR Part 96.

The ISM will be consistent with the functional standards and performance elements of IMO Resolution A.741(18) and include the following elements:

- Document the designated owner and shipboard responsible persons
- Safety and pollution prevention policy
- Functional safety and operational requirements
- Recordkeeping responsibilities

11.3 Safety Management System

The safety management system must:

- Provide for safe practices in vessel operation and a safe work environment onboard the type of vessel for which the system is developed.
- Establish and implement safeguards against all identified risks.
- Establish and implement actions to continuously improve safety management skills of personnel ashore and onboard vessels, including preparation for emergencies related to both safety and environmental protection.
- Ensure compliance with mandatory rules and regulations, taking into account relevant national and international regulations, standards, codes and maritime industry guidelines, when developing procedures and policies for the safety management system.

The functional requirements of a safety management system must include the following elements, as listed in 33 CFR Part 96, table 96.250, and this manual:

- A written statement from the responsible person stating the EPA's safety and environmental protection policy.

- Instructions and procedures to provide direction for the safe operation of the vessel and protection of the environment in compliance with the applicable CFR and international conventions to which the U.S. is a party (e.g., SOLAS, MARPOL).

- Documents showing the levels of authority and lines of communication between shoreside and vessel personnel, as stipulated in 33 CFR Part 96, table 96.250.

- Procedures for reporting accidents, near accidents, and nonconformities with provisions of the EPA's and vessel's safety management system as well as the ISM Code.

- Procedures to prepare for and respond to emergency situations by shoreside and vessel personnel.

- Procedures for internal audits on the operation of the vessel safety management system by the EPA's Designated Person Ashore (DPA).

- Procedures and processes for management review of the EPA's internal audit reports and correction of nonconformities that are reported by these or other reports.

11.4 ISM Safety Management Systems Certification and Enforcement

The vessel and owner must hold a valid Document of Compliance certificate issued by the USCG or by an authorized organization acting on behalf of the U.S., in accordance with 33 CFR 96.440, after an initial audit, as follows:

- A valid Document of Compliance certificate covers the type of vessel(s) on which the safety management system initial safety management audit was based. The validity of the Document of Compliance certificate may be extended to cover additional types of vessels after a satisfactory safety management audit is completed on the owner's safety management system that includes those additional vessel types.

- A Document of Compliance certificate is valid for 60 months. The owner's safety management system must be verified annually by the USCG or by an authorized organization acting on behalf of the U.S. through a safety management verification audit, within three months before or after the certificate's anniversary date.

- Only the USCG may revoke a Document of Compliance certificate from the owner of the U.S. vessel.

- A copy of the vessel's valid Safety Management Certificate must be held onboard.

- An Interim Document of Compliance certificate may be issued for 12 months to help set up the vessel's safety management system when:
    - An owner is newly set up or in transition from an existing company into a new company.
    - A new type of vessel is added to an existing safety management system and Document of Compliance certificate for the owner.
    - The owner can demonstrate to an auditor that it has a safety management system that meets 33 CFR 96.230.
    - The owner can provide a plan for full implementation of a safety management system within the period that the Interim Document of Compliance certificate is valid.

The ISM must be audited by the USCG or an authorized organization acting on behalf of the U.S., in accordance with 33 CFR 96.440, on a routine basis to ensure compliance as follows:

- An initial audit must be accomplished before a Document of Compliance certificate or a Safety Management Certificate is issued.
- A renewal audit is carried out before the renewal of a Document of Compliance certificate or a Safety Management Certificate.
- An annual verification audit is conducted, as described in 33 CFR 96.330(f).
- An intermediate verification audit is conducted, as described in 33 CFR 96.340(e)(2).

A satisfactory audit means that the auditor agrees that the requirements of 33 CFR Part 96 are met, based on review and verification of the procedures and documents that make up the safety management system.

Actions required during safety management audits for an owner and its vessel(s) include:

- Review and verify the procedures and documents that make up a safety management system, as defined in 33 CFR Part 96 Subpart B.
- Make sure the audit complies with 33 CFR Part 96 and is consistent with IMO Resolution A.788(19), Guidelines on Implementation of the International Safety Management (ISM) Code by Administrations.

Make sure the audit is carried out by a team of USCG auditors or auditors assigned by a recognized organization authorized to complete such actions by 33 CFR Part 96 Subpart D. If non-conformity with a safety management system is found during an audit, it must be reported in writing by the auditor to the owner, DPA, and the vessel’s captain/master.

12. HEAVY WEATHER

12.1 Discussion

Heavy weather is any weather condition that results in high winds; extreme sea states; and heavy rain, snow and/or hail. Weather of this type can result in extremely uncomfortable conditions onboard the vessel. Additionally, excessive rolls, yaws and pitches, coupled with taking on water, can increase the hazards involved with the scientific work being performed, as well as normal working and living conditions.

Many hazards can occur in heavy weather. Objects can slide or fall on personnel, causing injury. Personnel can fall into machinery or equipment. Personnel exposed to the weather can be washed overboard or against fixed objects. Heavy weather is as dangerous now as it was during the days of sailing vessels, and all personnel must be aware of potential hazards and safety requirements.

12.2 EPA Class A Vessel Weather Restriction

The following weather restriction is applied to decrease the risks associated with smaller EPA vessels encountering heavy weather. **Class A** vessel operators should consider cancelling operations if a Small Craft Advisory (winds 18-33 knots or hazardous waves) is in effect, there are conditions that could lead to one, or there is a greater warning in effect for the body of water involved. Vessel operators should receive a weather forecast prior to operations commencing as well as during operations. Vessel operators should not depart unless localized weather, geography, and the vessel allow for safe operations. If underway, the vessel operator should consider cancelling operations if such an advisory is issued or local weather conditions warrant a cancellation. Captains/masters of these vessels are counted on to not "push" to complete the mission in the face of adverse weather.

12.3 Safety Precautions During Heavy Weather Conditions

The following is offered as a general review of some of the steps that can be taken to reduce risk during heavy weather conditions. As weather conditions, crew experience, and vessel design and capabilities vary widely, the captain/master of the vessel must decide the proper steps to take as dictated by the conditions at hand.

General

- Be aware of stowage locations of all equipment necessary for rigging heavy-weather lifelines.
- Inspect tie-down equipment such as cables, turnbuckles, deck pads and bolts at frequent intervals to ensure their security.

- Only use the fittings provided on the equipment to be transported to secure the item to the vessel.

- Do not use excessive force to place a tie-down onto a fitting.

- Ensure that the arrangement of individual tie-down assemblies is in strict conformance with design requirements.

- Ensure that when lashing and tie-down equipment is not in use, it is stowed in its proper location.

Lifelines

- Keep lifelines or rails rigged at all times along all boundaries. Keep permanent lifelines in good repair.

- Keep unguarded openings adjacent to life rail or lifeline sections or next to an end section and adjacent structures to a minimum, in no case greater than 5 inches.

- Wherever lifelines or life rails and safety nets are installed adjacent to one another, ensure that a safety net overlaps the area protected by lifelines or life rails by a minimum of 3 feet, or that the space between the lowered safety net frames and the lifelines or life rails is fitted with a section of safety netting.

- Keep clear of the lifelines when maneuvering alongside a dock or during drills.

- Use portable single lifelines. These lines shall be set up along one side of walkways in traffic areas of weather decks, which are subject to green seas. They may also be set up in areas that are not provided with lifelines, grab rails or equivalent means of safety within reasonable accessibility of the walkways.

- Ensure that lifeline netting (snaking) or lifelines are installed along the weather decks of vessels subject to green water from heavy seas.

- Do not dismantle any lifeline on the vessel without specific permission of the captain/master of the vessel, and only then if temporary lifelines are rigged before dismantling.

- Inspect lifelines daily for proper installation and material condition. Report any unsafe conditions to the immediate supervisor and correct them immediately. The supervisor is the management official who is directly above the person finding the unsafe condition and is also responsible for the day-to-day activities of that person.

- Keep weather decks, which are subject to weather and seas, clear of personnel except those required for urgent duties. Communicate this every 30 minutes during heavy weather. Publicize locations where entry is forbidden.

Tie-Downs

- Use tie-downs or lashing to secure moveable shipboard items such as deck cargo against the motion of the vessel and exposed areas against the forces of wind and waves.

- Seize or tie down shackles, hooks, turnbuckles and release devices to prevent them from becoming loose. Check them for security more frequently in heavy weather.

At Sea

- Secure all booms, brace skids as necessary, secure all cargo, and stow and lash down all movable equipment and covers. Rig in ready lifeboats and gripe down, and add heavy weather gripes to these and other types of boats.

- Close all unnecessary topside hatches and access openings and be prepared to close off ventilation openings.

- Station the navigational detail, and/or anchor detail, as appropriate, if the vessel is in dangerous waters.

- Inspect all lifelines, and rig additional lines as required for topside safety.

- At all times, wear a standard safety harness, which shall be attached to the lifeline by means of the "D" rings provided on the belt. An inherently buoyant life jacket shall be worn over the safety harness. Hard hats shall also be worn.

- Use a minimum of two people when required for a weather deck detail, and send them out only when necessary.

- Remain below deck unless required to be topside to perform essential duties.

- Do not go topside without permission of the captain/master of the vessel.

At Anchor

- Hoist in all boats.

- Check vessel for loose gear, proper lashings, or movable equipment and covers.

- Take in gangway.

- Close all unnecessary topside access openings, and close watertight doors to ensure maximum watertight integrity below the water line.

- Station anchor watch.

- Be prepared to veer chain or put out another anchor if available.

- Keep anchor chain detachable link in a position so that the anchor may be slipped if necessary. Have detachable-link tool kit available.

Moored to a Pier or Vessel

- Lower bow anchor so that it lays on the ground underneath the bow ("Place an anchor under foot").

- Stow all loose gear and properly lash down all movable equipment and covers.

- Close all unnecessary topside openings.

- Check all mooring lines and remove the slack to keep the movement of the vessel to a minimum.

- Lines tending in the same direction should be made to take the strain simultaneously. When slacking lines, attempt to slack all lines taking a strain at the same time to prevent a line from taking undue strain and parting.

- Be prepared to put out additional lines or wires.

- Place fenders along the hull at frame locations (fenders located on shell plating between frames will not protect sides from damage).

- Be prepared to get underway.

13. VESSEL SECURITY

13.1 Introduction

As an element of safety, the security of the crew, embarked personnel and the vessel is of extreme importance. The threats involved range from a thief on the pier while loading stores to a person or group wanting to sabotage the EPA fact-finding process to piracy and terrorism. To mitigate these threats, specific procedures must be in place to ensure the security of the vessel, crew and embarked personnel.

13.2 Background

EPA-owned and -operated vessels are exempt from the vessel security requirements of SOLAS Chapter XI and 33 CFR Part 104. Additionally, the embarked scientific team is not classified as passengers for determining manning, vessel status and security requirements. However, the type, areas and ports related to EPA vessel operations, as well as the transient nature of the scientific team, dictate a requirement for a security program similar to that required under 33 CFR Part 104.

13.3 Security Requirements for EPA Vessels

All EPA vessels will take reasonable steps to provide security for the vessel and embarked personnel from acts of theft, terrorism or piracy, and other situations that may be encountered on the high seas or in port. In this regard and prior to the beginning of a cruise, the captain/master of the vessel should become thoroughly acquainted with the nature of the cruise from a security standpoint and should share this knowledge with members of the crew. During the cruise, precautions considered necessary and appropriate by the captain/master should be exercised, including, for example, approaching any vessel or small craft requesting assistance with extreme caution, increasing the deck watch in port, posting additional lookouts in restricted waters, limiting or restricting shore leave, and other measures. The vigilance of all hands onboard is necessary to ensure the well-being of the vessel, crew and embarked personnel, and mission from a security standpoint

All EPA **Class C** vessels, in addition to the above, will develop a vessel security plan (VSP) based on 33 CFR Part 104 to include the following elements (**Note: Class B** vessels have the option of developing a vessel security plan.):

- Developing a VSP that will, at a minimum:
    - Identify potential security threats.
    - Include procedures to ensure that vessel security measures are maintained.
    - Include, as an appendix, the security threats for each port and operating area that has, or will be, visited.
    - Include a plan to prevent unauthorized access to the vessel and its restricted areas.

- Communicate a sound approach and routes when in-port general visiting is allowed.
- Deter the introduction of prohibited weapons, incendiaries, or explosives onboard the vessel.
- Encourage vigilance, as well as general awareness of security, onboard the vessel.
- Provide adequate training to members of the crew for security onboard the vessel.
- Coordinate responsibilities for security with the operator of each port where the vessel embarks or disembarks crew or members of the science team.
- Provide information to members of the crew and the science team, and to law enforcement personnel, in case of an incident affecting security.
- Include procedures to notify the USCG or law enforcement organizations if there is a security incident and there is no INMARSAT installed onboard. The USCG can be notified at the nearest Coast Guard Marine Safety Office, or through the Coast Guard National Response Center at (800) 424-8802, (202) 267-2675, or http://www.nrc.uscg.mil.
- Include procedures to notify the USCG or law enforcement organizations if there is a security incident by using the installed INMARSAT Security Alert feature on INMARSAT C, Mini-C and D+ services.
- Include procedures for internally reporting security incidents to the EPA's Directors of SHEMD and SMD.
- All crew members must have a valid TWIC.
- Conduct security drills at least monthly with details to be entered in the vessel's log.
- Establish specific security procedures for each of the Department of Homeland Defense Security National Terrorism Advisory System (NTAS) or USCG Maritime Security (MARSEC) alert levels.
- Establish security procedures to be used for the on-load of stores, fuel or scientific equipment.
- Instruct all embarked to report suspicious or terrorist activity to the captain/master and by calling 877-24WATCH.

- In assigning a vessel security officer as a collateral duty for the captain/master or another crew member, the person needs to perform the following duties:
  - Regularly inspect the vessel to ensure that security measures are maintained.

- Ensure the coordination and handling of vessel stores, fueling operations and loading science team equipment and personal effects.
- Propose modifications to the VSP.
- Ensure that any problems identified during audits or inspections are reported to the responsible EPA program or regional office, and promptly implement any corrective actions.
- Ensure security awareness and vigilance onboard the vessel.
- Ensure adequate security training for vessel personnel.
- Ensure the reporting and recording of all security incidents.
- Ensure the coordinated implementation of the VSP with the relevant program or regional office security officer, when applicable.
- Ensure that security equipment is properly operated, tested, calibrated and maintained.
- Ensure consistency between security requirements and the proper treatment of vessel personnel affected by those requirements.
- Ensure that Transportation Workers Identification Credential (TWIC) programs are in place and implemented appropriately.
- Ensure creation and implementation of a Vessel Security Plan (VSP) and any amendments.

The VSP will be reviewed during each vessel audit for compliance with the intent of 33 CFR Part 104.

14. CHARTERING NON-EPA-OWNED VESSELS

14.1 Background

Particular attention should be paid to the safety, material condition and crew competency of vessels chartered for ocean survey or research. The VMO requiring a chartered vessel should use the expertise of marine operations individuals to ensure that all applicable USCG or state marine documentation, inspections and licenses are complete and current. The correction of any deficiencies shall be insisted on before entering into a charter agreement.

The overall goal is to ensure that each chartered vessel meets the same safety standards expected of comparably sized EPA vessels. The VMO (or appropriate designee) responsible for the charter shall ensure safe, effective operations while in service under charter. In all cases, chartered vessels must comply with USCG or state marine laws and regulations, as applicable.

To help meet this goal, this chapter provides recommended procedures and inspection criteria for the charter of any size vessel.

14.2 Pre-Charter Evaluation

Vessel Background

Collect and assess data on the vessel being considered for charter, including a description, radio call sign, owner, operator, licenses, inspections, surveys, safety equipment, communications equipment, navigation equipment and any other relevant records. Investigate any information related to the stability and watertight integrity of the vessel.

USCG Inspections

Longer Than 65 Feet: Vessels 65 feet long and greater are required to obtain and carry onboard for the time of the charter a USCG letter of designation as an oceanographic research vessel or an appropriate USCG-issued Certificate of Inspection. Inspected vessels that possess a current USGS and SOLAS inspection certificate have been physically inspected by competent marine personnel, and such inspections may be used to satisfy this manual's safety objectives. A current inspection is one that has been performed within 12 months of the vessel's charter date.

Less Than 65 Feet Long: If the vessel is less than 65 feet long, it does not need to be inspected and can carry up to six passengers. If it carries more than six passengers, it needs to be inspected. A small vessel that carries six passengers or fewer, and that has a current USCG safety inspection performed under the USCG and USCG Auxiliary Vessel Safety Check Program (http://www.safetyseal.net) or the Commercial Fishing Industry Biannual Dockside Safety Examination, may also satisfy this inspection requirement if these safety requirements are considered sufficient for the expected area of operation and mission by the VMO (or appropriate designee).

Uninspected Vessels: If the vessel has not been otherwise USCG-inspected, inspect it prior to charter, particularly if any questions exist as to its condition, stability or general seaworthiness. Or, if appropriate, request a USCG or USCG Auxiliary Vessel Safety Check. If a more detailed examination is required, engage a commercial surveyor to conduct a thorough survey and provide a survey report of discrepancies. The purpose of this inspection is to ensure that the subject vessel meets the requirements contained in this manual and is otherwise suited for the intended purpose. Ensure that discrepancies are corrected before entering into a charter agreement; vessels that do not meet the standards should not be chartered.

Charter Crew Qualifications: Conduct whatever inquiry may be necessary, including examination of licenses, to establish the competency of captain/master or crew to provide for a safe voyage. All charter vessels are required to have a licensed operator. If there is an exchange of money for services, the operator must hold a USCG license. If the charter vessel is less than 65 feet long and carries six passengers or fewer, the operator must have an Operator of Uninspected Passenger Vessel license. If the charter vessel has more than six passengers, there must be a USCG-licensed captain, regardless of vessel size.

Charter Approvals: Establish a formal procedure for documenting approvals of charters. Ensure that the chief scientist is aware of these, especially the safety-related terms of the charter.

14.3 Recommended Inspection Checklist for Chartering Non-EPA-Owned Vessels

Check each category listed below, as appropriate, for the charter mission and operating area. Ensure that necessary equipment is onboard and operates properly.

- Bridge and navigation equipment
    - Compass
    - GPS
    - Depth sounder
    - Radar/Automatic Radar Plotting Aid (ARPA)/Automatic Identification System (AIS)
    - Navigation lights
    - Vessel's bell
    - Whistle or sound device
    - Emergency alarm
    - Pyrotechnics (make sure the expiration date has not been passed)
    - Navigational or electronic charts and publications
- Communications equipment
    - Selective calling VHF radio
    - Area-appropriate Global Marine Distress Safety System (GMDSS) communications equipment
    - Navigation Telex (NAVTEX)
    - Cellular phone (optional and not a substitute for legislated GMDSS requirements)
    - Emergency radio with backup battery or power
    - Emergency Position Indicating Radio Beacons (EPIRBs)

- Documentation

    - Ensure that the vessel can be legally chartered based on certificate of inspection, letter of designation or limitation of charter to fewer than six people.
    - Ensure that the documentation, ownership, inspection certificate, load line certificate and stability letter are current and appropriate for planned mission.
    - Ensure that the captain's/master's license is current and appropriate for vessel being chartered.
    - Ensure that the crew size and credentials are appropriate for the charter's mission.
    - Ensure that the insurance coverage meets the chartering institute's minimum requirements for charter duration.

- Life-saving equipment

    - PFDs
    - Immersion suits
    - Inflatable life rafts
    - Life ring buoys
    - Rescue boats

- Exterior decks and equipment

    - Anchors and associated equipment
    - Watertight doors and hatches
    - Freeing ports
    - Deck vents
    - Cargo and weight handling equipment (safe work load posted and tested)
    - Non-skid deck surfaces
    - Life lines and safety chains

- Firefighting equipment

    - Fixed and portable fire extinguishers properly sized and installed, with inspection dates current
    - Smoke and fire detectors
    - Fire stations and hoses
    - Self-contained breathing apparatus (SCBA)
    - Fire and damage control locker
    - Emergency stations bill

- Engineering

    - Gas engines: Check flame arrestor, vents, fuel hoses, no sparking devices in bilges.
    - Diesel engines: Check oil and for exhaust leaks, starting system, maintenance, hours since last overhaul.
    - Inspect overall cleanliness and condition of power sources.
    - Check emergency lights.

- Check bilge and ballast systems and pumps.
- Check fueling system and pumps.
- Check refrigeration systems.
- Check fire pump.
- Check engine room fire suppression capability.
- Check all manifolds for saltwater, fuel, etc.

- Miscellaneous

  - First aid kits and medical supplies
  - Damage control equipment
  - Emergency steering
  - General appearance and cleanliness
  - Oil pollution placard and other required notices posted
  - Sanitary system operations
  - Vessel's overall stability
  - Vessel's overall ability to perform charter mission (this assessment should include laboratory and deck space, berthing and feeding capability, scientific equipment and winches, etc.)

APPENDIX A
VESSEL SAFETY OVERVIEW

This appendix was adapted from Chapter 1 of Safety Training Manual prepared by the University – National Oceanographic Laboratory System (UNOLS) Research Vessel Operators Committee. It was written to provide basic safety information for those crew members and scientists who are serving onboard an EPA vessel for the first time.

This appendix is written to apply to all research vessels and should be used as a guide to prepare a specific safety overview for all EPA vessels.

Introduction

EPA research vessels are unique; they may be away from home port for extended periods, operate independently – often in remote areas away from shipping lanes – and travel great distances. For all these reasons, safety should be a personal priority for each crew member and researcher onboard.

This appendix is provided so that you can easily digest many important factors that will soon become part of your everyday life. It lists the more common elements contributing to accidents on research vessels, such as the shipboard environment, equipment and materials, training and experience, and communications, as well as the basic tenets of accident prevention. This appendix does not profess to make anyone an immediate expert. It will, however, enable the novice to become familiar with the safety aspects of vessel life in a very short time.

Accident Prevention and Safety at Sea – An Overview

Safety Philosophy

The environment and working conditions onboard seagoing vessels pose additional hazards not found onshore. The responsibility to avoid accidents flows from the top down, from the shore establishment to the captain/master, to each and every individual onboard. “Safety awareness” is the biggest single factor in reducing accidents.

As an EPA employee, you pride yourself in being knowledgeable and proficient in the demands of your discipline. You have undoubtedly acquired patience and a demand for attention to detail. The demand for such attributes is no less great when learning to live safely onboard a research vessel.

The old cliché, “It’s not my job” does not apply at sea. Onshore, you can go home and forget about work and the safety-related aspects of your work surroundings. You can easily travel a different route if there is construction work on your normal route. A power failure at home is an inconvenience. You are aware of any medical emergency only by the ambulance sirens. Onboard a vessel, not only will you need to be aware of any construction or deck operations, you must be able to determine when and where it is safe to pass. A power failure onboard a vessel can be catastrophic. A medical emergency onboard a vessel affects everyone – you may be the only person available to respond.

Accident-Causing Factors

Vessel Environment. As a researcher, you must learn to live and work safely in a potentially dangerous vessel environment. Factors such as motion, noise, vibration, temperature extremes, close living conditions, rotating machinery and lines under tension are not normally encountered onshore. Almost all who go to sea will, at one time or another, be seasick. A seasick person should be given only light duties until they have recovered and should never be assigned duties that require alertness, caution or agility. Be aware that medicines that prevent motion sickness can sometimes cause drowsiness. Vessel motion can cause fatigue in two ways. First, it's sometimes very difficult to sleep when the vessel is pitching and rolling. Even in fairly calm seas, it takes a newcomer one or two nights to adjust. Secondly, just moving about on a vessel in angry seas takes physical effort, which in time, will wear down even the most fit. Fatigue promotes carelessness.

When temperature extremes are too great, overall performance is impaired. Besides the debilitating effects of sunstroke, heat exhaustion, frostbite, hypothermia and other conditions, lesser physical impairments are possible. These include increased reaction time, decreased mental awareness, loss of dexterity and coordination, and fatigue.

Noise can have both a physiological and a psychological effect. Permanent hearing loss can be the result of sustained high noise level as well as extreme loud noises of short duration. Confinement onboard a vessel in fog can be unnerving with the constant sound of the fog horn hour after hour and even days on end. Similar detrimental effects can be caused by days of air gun firing. These noises create tension and an atmosphere that could promote an accident. Working around noisy equipment for an extended period of time can cause physical and psychological damage. It is important that you recognize and avoid these potential dangers.

The sun shines brightly at sea, causing glare conditions. Proper eye shading is a necessity. At the other end of the spectrum is night vision. A bright light on a dark bridge or other working area can be blinding. It takes several minutes to readjust your eyes. It is important that you determine the time needed to establish your night vision; it is equally important that you learn to avoid blinding others (with an unmindful flashlight in the face or any bright white light) who have already established their night vision. Red lights do not have a blinding effect and must be used when maintaining night vision.

In a vessel environment – especially confined spaces – you may be exposed to chemical agents in the air. Containing and exhausting laboratory fumes presents an additional challenge onboard vessels. Recognize these potential hazards! What is acceptable in an onshore lab may not be suitable in a much more confined vessel environment.

There are a number of factors that contribute to accidents; few accidents have a single cause. The immediate cause is usually the most apparent, but is not necessarily the underlying cause, which may be harder to pinpoint and usually answers the question "why?" for any accident. Some of the major factors contributing to accidents on research vessels are:

- Shipboard environment

- Equipment and materials
- Training and experience
- Communications

At sea, slips and falls are the leading causes of injury. Do you know how to properly climb a ladder? Developing "sea legs" not only involves gaining experience in navigating wet decks but also knowing what footwear to wear and learning to be wary and cautious.

Learn how to steady yourself without placing your hands on the doorjamb (the knife edge) when traveling through watertight doors.

Equipment and Material. Defective, improperly installed or improperly used equipment is a major contributing cause of accidents. When conducting research from a vessel at sea, a lot of faith is placed in machinery and equipment. Whether deploying science packages, working in the labs, or going about your daily routine, you must rely on properly functioning vessel and scientific equipment. The sudden failure of equipment due to overloading or defective materials almost always leads to an injury. Many pieces of machinery are inherently dangerous and are therefore provided with safety guards and warning signs and are assigned safe working loads. Ignoring these safety features defeats their purpose. Always remember to keep all machine guarding in place when using this equipment.

Training and Experience. A lack of skill, experience and knowledge concerning vessel procedures can easily lead to accidents. During your initial exposure to a procedure or a piece of equipment, extra care and supervision may be necessary until everyone is far enough along on the "learning curve" to make for a safe operation. By paying attention and learning proper procedures, you can eliminate unnecessary accidents.

Communications. People react to what they think they hear, not necessarily what the person speaking actually says. Poor communication due to factors such as language barriers, unfamiliar terminology, background noise, or failure to speak distinctly leads to misunderstanding, mistakes, and ultimately, accidents. The person in charge must establish and maintain good communication in order to coordinate the efforts of a team. Listen so that you clearly understand the hazards you face and their possible consequences. There are no "dumb" questions.

Accident Prevention

An effective accident prevention program is built on the tenets of management and supervisory commitment, safety awareness and training.

Management and Supervisory Commitment. This includes budgeting time and funds for safety-related activities and equipment; the willingness to reject unsafe practices that might at times, especially under pressure, seem expedient; and exhibiting a positive reaction when risks and/or safer ways to do things are pointed out by crew members.

Shipboard living onboard a research vessel is not a passive exercise – if you are not constantly aware of your surroundings, you can endanger yourself and other crew and scientific members.

Although your circumstances as a research party member may not allow you to participate in most shipboard duties, the limited amenities and services of a research vessel require that, at the very least, you be able to take care of yourself.

Safety Awareness. Safety aspects of every operation should be routinely considered by all hands. Learning to move around your vessel will provide you with many new challenges. When climbing vertical ladders, always face the ladder – do not attempt to go backwards. Always hold onto the rails with both hands. Avoid using portable ladders unless absolutely necessary – and even then, only if it is lashed to an immovable object. When two or more people are using the ladder at the same time, the second person should stay far enough below so as not to get kicked in the head, and the person should not look upward in case of falling dirt or rust. Avoid carrying large objects up or down ladders or stairs; instead, pass or hoist them in assembly-line fashion. Avoid blocking stairwells while stopped in conversation or by placing an object in front of the stairs or ladders.

Corridors and passageways should be kept free and clear. While entrance and exit passageways serve as travel routes from one end of the vessel to another, they also serve as emergency exit routes. Never block entrance and exit passages with objects. When objects are stored in a passageway, they should not block or be on top of any emergency escape hatch.

Watertight doors normally remain closed, even during calm seas. Watertight doors that are required to be open are done so by latching them in an open position (even in calm seas, be very wary of watertight doors that "swing" with the vessel motion). During heavy weather, dog all watertight doors. Dog the side opposite the hinge side first.

Vessel crew and researchers must be trained in both emergency procedures and safe practices.

Orientation

Indoctrination

Immediately prior to or immediately after departure, the research party and new crew members, upon hearing the general alarm, gather at a central location with their life jackets and survival suits. At this time, you will receive an orientation briefing for new people regarding shipboard safety.

The following are normally included in an orientation for new people regarding shipboard safety:

- An explanation of the general alarm signals and where and how personnel should proceed to assigned stations.
- An explanation of station bill and bunk cards.
- How to don life jackets and survival suits.
- What to do in case of MOB, fire and other emergencies.
- Requirements for hard hats, shoes, exposure suits, work vests, harnesses and safety lines.

- When, how and who to notify for over-the-side research.
- Discussion of other matters of general safety interest.
- Vessel drills or exercises.

Station Bill

A vessel's station bill assigns each person onboard with various duties associated with emergencies. It also assigns individuals to muster stations and survival craft. On many research vessels, the station bill is specifically for vessel crew members while a subset of the station bill, as well as emergency procedure information (also referred to as a bunk card), are posted in research party staterooms. Everyone is given an orientation of the vessel and instructions. Part of your orientation is to ensure that you know your assigned stations and duties as listed on the station bill and, if applicable, your bunk card. Examine these documents carefully and memorize your duties and muster station. You should know two routes for getting out of your living and working spaces in the event of emergency situations; know how to exit these spaces in the dark.

The station bill lists the various emergency signals to be used for calling the crew and the research party members to their stations or giving instructions while at their stations. Your vessel uses standard signals, commonly used in the merchant fleet and required for regulatory agencies. The captain/master of your vessel may establish additional emergency signals that ensure that all crew members and research party members take positive notice of the emergency.

Emergency Stations (Fire, Flooding)

The first alarm signal is a continuous blast of the whistle for a period of not less than 10 seconds, supplemented by the continuous ringing of the general alarm bells for not less than 10 seconds.

For dismissal from fire stations, there are three short blasts of the whistle and three short rings on the general alarm.

Boat Stations or Boat Drills

The signal for boat stations or a drill is a succession of more than six short blasts followed by one long blast of the whistle, supplemented by a comparable signal on the general alarm bells.

Where whistle signals are used for handling the lifeboats, they are as follows:

- To lower lifeboats, one short blast.
- To stop lowering the lifeboats, two short blasts.

For dismissal from boat stations, there are three short blasts of the whistle and three short rings on the general alarm.

General Safety Precautions

Many injuries and accidents can be avoided by using the proper tools and following safety precautions. The extra 10 minutes saved by not following procedures may result in a long-term injury. Most general safety precautions typically are routine practices that we often neglect when we are in a hurry.

Most staterooms and corridors have smoke detectors similar to those used in homes. Learn what to do and where to go when you hear its shrill alarm.

The following are a few examples of common vessel safety practices:

- When sea conditions are rough and topside work is being performed, everyone works in pairs. You should always wear a work vest.
- Because lines, deck openings or wet surfaces can cause falls and slips, one eye should always be kept on the deck while walking.
- Bare feet and flip flops are allowed only in staterooms.
- Examine all labels and warnings before using any equipment or products. If there is a question as to how the use a tool, product or piece of machinery, consult the proper authority before proceeding.
- Always know the function of anything before touching it.
- Wipe up any spill immediately – the decks are slippery enough.

APPENDIX B
SEAMANSHIP/DECK AND SCIENCE OPERATIONS

Revision dated April 2012

Small Boats

All personnel embarked on small boats should have a basic knowledge of seamanship. You should be aware of the particular dangers associated with small boats, with stability of the boat and safety of all personnel being considered foremost. When you board a small boat prior to removal of the hoisting equipment, you must wear a hard hat. Wear a lifejacket when boarding or debarking. The boat should not be hoisted until all personnel have debarked. Your conduct onboard a boat should emphasize safety. Become familiar with basic emergency radio procedures. Learn the emergency response procedures prior to any voyage.

When transferring from a small boat to the research vessel, time your "jump" to the boarding ladder. Make the jump at the time you are able to reach the highest point on the boarding ladder. Keep your hands inside to avoid crushing them between the boat and vessel's side.

Loading and Stowage

A vessel's officer is responsible for loading, handling and stowage of cargo and scientific gear; the chief mate is responsible for securing deck areas, the chief engineer for engineering spaces, and the chief steward for commissary, galley and dining spaces. The chief scientist is responsible for securing gear and equipment in science laboratories and storage areas; however, because some researchers may not be experienced mariners, the work is checked by the chief mate and the marine technicians prior to getting underway. On research ships, gear is loaded either by hand or cranes. Before heavy lifts are made with shipboard cranes, the captain/master is informed so that steps can be taken, if necessary, to ensure adequate stability for the operation. The captain/master is also consulted for the placement of heavy items, such as winches and vans.

Because storm tracks are far from predictable, everyone should be prepared for the worst. The vessel should be battened down. Battening down includes securing heavy topside pieces of science equipment with wire or chain; checking all spaces for loose gear; dogging down weather doors, hatches, and vents; and generally increasing watertight integrity. Lifelines are rigged, "no-go" areas are designated, and a system is implemented to account for personnel who must go out on weather decks. You will need to secure gear in your stateroom and work area.

Deck Operations

Deck Machinery. Deck machinery and deck systems are used to move cargo, handle mooring lines and anchors, and launch and recover scientific apparatus and boats to support the missions of oceanographic research vessels. The inherent hazards of working near tensioned cables, rotating machinery, and heavy moving weights are increased when these operations are conducted on the heaving deck of a vessel at sea. Individuals can be injured by cables or machinery, knocked overboard (possibly unconscious), or injured by flying debris if safety precautions are not followed.

Frames. Extreme care must be exercised when working in the vicinity of frames to ensure that personnel are not knocked overboard or pinned between the frame and other structures when rigging the frame in or out.

General Rigging

Snapback results from the energy stored in a line as it is stretched. If a tensioned line parts or is released suddenly, the line "snaps back" to its original length – much like an elastic band. You should stay well clear of potential recoil paths of any line or cable in use.

The following safety precautions should be observed during all deck operations:

- Observe all posted safety precautions.
- Keep clear of loaded lines, wires and cables.
- Avoid getting hands, feet or loose clothing caught in bights of line, wire or cables, or rotating machinery such as moving frames.
- Keep loose gear away from open cargo hatches. Personnel below could be injured by falling objects.
- Keep noise to a minimum – confusion and misunderstanding between captains/masters and workers can lead to serious injury and damage to equipment.
- Do not permit horseplay.
- If you are not a member of the deck operation crew, keep clear of deck operations.

General safety precautions for weight handling equipment:

- Stay clear of moving equipment such as cranes, frames, booms and davits.
- Wear adequate foot protection.
- Wear hard hats.

In addition to the safety considerations for each individual system, the following general safety precautions should be observed at all times while in the vicinity of operating specialized oceanographic deck systems:

- Keep clear of the wire or cable on deck leading over the side. The weight of the wire or cable plus the weight of the package result in high tension, which creates a potential personal hazard should the cable part.
- The abrupt movement of the cable or rigging in and out of frames can cause serious injury to unsuspecting personnel.

Leather gloves should be worn when handling wire rope, except when it is moving. Gloves, if snagged, can drag the wearer into danger.

Science Operations

Much of research vessel time is spent performing science operations, which include towing instruments, working gear over the side or fantail, or placing heavy objects on the seafloor. On a large vessel, there may be many independent groups working on different projects at the same time. Nothing goes over the side unless permission from the watch officer is obtained – whether launching scientific gear or disposing of garbage.

When scientific gear goes under the vessel, it could entangle the vessel's rudder or propeller. This can be extremely dangerous when line or cable is going over the side. As it becomes wound up in the propeller, the attached equipment may whip off the deck, injuring people in the process. If during launching or pickup of towed gear, it appears that the propeller or rudder may be fouled, the watch officer will immediately stop the screw.

When working over the side, observe proper safety precautions at all times. Wear a safety harness with a lifejacket or work vest over it. Double-check all knots. This should be done by another crew member who is fully qualified in marlinespike seamanship. Watch out for the "Might Knot" – the knot that might NOT hold!

Possible towing hazards include:

- Entangling gear in the rudder or screw.
- Engaging gear with other gear off the same vessel, a nearby vessel, or a mooring.
- Becoming "hung up." When the science gear breaks loose, locked-in potential energy in the towline becomes kinetic energy. People in the path of the towline can be hurt. Stay clear of a towline when it is hung up; nonessential personnel should leave open decks.

Health and Medical

Personal Care

Proper diet, rest, hygiene and attitude are all contributing factors to maintaining a healthy body – both physically and mentally. When you are not in the proper physical or mental state, your actions may adversely affect the well-being of other personnel.

Attitude. When onboard a vessel, adjust your attitude to adapt to tight working and living quarters and many different types of personalities. It is important to be considerate when others are asleep; noise level should be kept to a minimum at all times.

Due to the close quarters of shipboard living, a clean body and clothing are a must.

Rest. The ability to function properly and maintain the body's resistance to disease and infections depends on adequate rest. When fatigue sets in, strength, coordination, judgment and attitude are adversely affected. If you feel fatigue setting in, inform your supervisor; failing to do so could put the vessel and crew in jeopardy.

Diet. A proper diet is necessary to maintain the body's energy level. Without proper eating habits, fatigue sets in at a quickened pace, and resistance to diseases, colds and infections is lowered. While at sea, the sun and salt air deplete the body's fluid and salt levels. To compensate for this loss, increase your intake of liquids and salt. If you are on a special diet due to a medical reason (e.g., diabetes, high cholesterol), report this information well in advance of the cruise so that meals and provisions can be properly planned.

Personal Hygiene. Personal hygiene is important. It makes a statement to others about your attitude. An unclean body fosters unpleasant odors and a greater chance of the development of skin ailments and/or diseases, especially in humid and cramped quarters.

Drugs and Alcohol. The use of illegal drugs and/or alcohol is absolutely forbidden onboard EPA vessels, as they affect the way you perform. Emergencies are usually unannounced and unexpected; a functionally impaired individual would be more of a hindrance than a help. When an individual is drunk or impaired, there is an increased chance of the person falling overboard, falling off a ladder or slipping on a wet deck. Many prescription and nonprescription medicines (e.g., antihistamines, cough syrups) have side effects that can impair judgment and the ability to function properly. If taking medication, you should consult a physician or pharmacist to find a medication that alleviates the problem while causing the least amount of side effects. If you are required by a physician to take prescription medication, notify your supervisor and bring an adequate supply of the medication for the duration of the cruise.

All EPA vessels have a zero tolerance policy toward illegal drugs and support federal regulations concerning the use of alcohol.

Proper Clothing. Bring appropriate clothing. Sun block and clothing that provide protection against the sun are recommended when traveling to warm climates. Colder climates naturally require warmer clothing. Wool and polypropylene materials provide warmth and repel moisture. These materials also retain their insulating properties when wet. In either climate, proper head covering is necessary. Footwear should fit properly. Tired or sore feet can cause considerable problems, such as backache and general discomfort. Shoes should have nonslip soles, and steel toes are recommended for deck operations, cargo handling or other heavy jobs. Foul weather gear should include a jacket, pants, head covering and proper footwear. Because vessel space is limited, the amount of clothing, as well as the type, should be considered when planning a cruise. Bring enough underclothing to last 10 days without laundry facilities.

Flip flops, sandals or open-toed shoes are absolutely forbidden to be worn anywhere on the vessel except in your cabin.

Vessel Sanitation

Vessel sanitation is critical to the health and attitude of personnel as well as the smooth operation of a vessel. The careless disposal of materials not only poses a safety hazard, but also detracts from the appearance of the vessel. Personnel should clean up work areas, dispose of trash in the proper containers and wash down work surfaces when work is complete. Mops should be rinsed in hot soapy water and left out to dry before stowing – this prevents odors and germs from forming. Liquid spills and/or broken objects should be cleaned up at once. It is imperative to

inform the captain/master immediately if a container of hazardous material breaks or spills. The spillage could cause damage to the vessel or injury to the crew. Personal living spaces serve as home for the duration of the cruise. Shared living quarters must be kept neat as a courtesy to fellow members. Dirty laundry may cause offensive odors and should be put away; bed linens should be changed at least once a week. Toilet/shower facilities must be kept clean and drains unclogged.

Medical

Immediately report any injury or medical problem, no matter how small, to the vessel's designated crew member trained to provide medical first aid. This individual is available 24 hours a day and is there to provide care.

When medical problems occur at sea, more attention is needed than when in port because of the distance from qualified medical personnel. Small problems, left unattended, can become major emergencies.

General Precruise Medical Requirements. All personnel should have a complete physical, as required by their institution. A dental exam is also highly recommended. The above may seem like a waste of time and money, but you should remember that as the vessel undergoes an overhaul periodically, so should you. All appropriate inoculations (including tetanus) that are necessary for ports of call should be up to date. If you need inoculations – whether daily or in an emergency (for diabetes or allergic reactions) – ensure that another person knows how to administer the medication. General personal medical information should be provided by each person onboard. This should include any past or current medical problems (e.g., diabetes, high blood pressure), inoculation record, allergy information, prescription drug usage and dosage, and generic names for prescription drugs. Eye prescriptions should be listed for personnel who wear eyeglasses, and an extra pair of eyeglasses should be carried onboard, as should prescriptive sunglasses.

If, during orientation, you somehow missed being introduced to the crew member who acts as the vessel's corpsman (normally one of the mates), find out now who he or she is and the location of the dispensary.

General Information. The names of personnel who are qualified to administer general first aid, CPR, or emergency medical treatment are posted. At the beginning of the cruise, you will be informed of the location of emergency equipment (e.g., eyewash stations, wash-down showers, fresh water, emergency oxygen) and how to use it.

First Aid Kits. First aid kits are located throughout the vessel and are equipped with basic medical supplies, including Band-Aids, eyewash solutions, ointments and other materials.

Seasickness. Medications may be carried onboard and dispensed as needed for seasickness. If you get seasick, drink plenty of fluids to prevent dehydration.

Sunburn. Sunburn can be very painful and bothersome and may occur quickly. It only takes about four hours to get second-degree burns in the tropics. In the case of mild sunburn, moisturizing creams such as aloe vera should be applied. The affected area should be covered to

avoid further exposure to the sun. Also, drink plenty of fluids to avoid dehydration. Exposure to direct sun should be increased gradually. Clean the burn area and apply cold water to relieve severe sunburn pain. The best way you can avoid sunburn is to use a sunblock, wear protective clothing and limit exposure time to direct sunlight.

First Aid

Proper administration of first aid can mean the difference between life and death, short- or long-term recovery, and permanent or temporary disability. First aid is an interim step until professional medical treatment can be sought. There are two steps that should occur as quickly as possible in a medical emergency: first, ensuring the victim's immediate survival, and second, summoning assistance. Before going to sea, all personnel should have a basic knowledge of the more serious medical emergencies that can develop and the first steps in treatment.

When approaching an accident victim, survey the area before entering. There may still be danger (e.g., live electrical lines, rotating machinery, hazardous materials, and lack of oxygen).

Hypothermia

The condition of hypothermia results when body temperature is reduced because of exposure to cold water or air. While at sea, it is important to remember that exposure to cold water causes heat loss 20 times faster than exposure to cold air. Even a few minutes of exposure under these conditions can cause hypothermia. Hypothermia can even take place in tropical waters. A victim of hypothermia should be treated at once. The first step is to get the victim to a warm area. Secondly, all cold, wet clothing should be removed and the extremities wrapped in blankets.

The torso area should be covered and a hat should be placed on the victim's head. The first area to warm up is the torso, as this area contains all the vital organs of the body. A good way for the rescuer to warm this area is to remove his or her clothing (shirt) and jump around for a few minutes to elevate the body temperature, and then lie down chest to chest with the victim. This method transfers the heat from one body to the other. A warm or hot shower should never be used to warm a victim of hypothermia. The circulatory system to the extremities has been shut down by the body to keep the warm blood near the vital organs. A warm or hot shower would make the body resume full blood circulation throughout the body before the blood in the extremities is warm enough. The shock of the cold blood from the extremities to the vital organs could be more than the body could withstand. Shivering is a good sign because it means the body's natural defense mechanism is working. The body or limbs of a hypothermia victim should not be rubbed due to the possibility of more damage occurring to a circulatory system that is already in severe shock.

Even if a hypothermia victim is not breathing when found, treatment must be initiated at once. It is the body's natural defense mechanism to shut down as much as possible.

Lifesaving Equipment and Survival Procedures

Introduction

The sea can be a fierce, unforgiving force of nature, capable of sending a vessel to the bottom and its crew into the water. Without the proper equipment to protect you from the weather, provide sustenance, signal rescue resources, and above all, keep you afloat, the odds are heavily against your ability to survive. The only defense you have is the proper amount and type of lifesaving equipment, ready for immediate use. This equipment is vital to survival. Survival at sea depends on sufficient and properly maintained lifesaving equipment coupled with training in survival procedures and the proper use of the equipment.

Primary Lifesaving Equipment

Primary lifesaving equipment means "a lifeboat or an acceptable substitute." The acceptable substitutes include inflatable life rafts, rescue boats and, under certain conditions, buoyant apparatus and life floats. However the vessel is equipped, these lifesaving appliances are the first line of defense.

Inflatable Life Rafts. EPA **Class B** and **C** vessels carry sufficient numbers of life rafts to accommodate 100 percent of the people onboard. They are mounted as far outboard as possible, free of overhead obstructions, and high enough to be protected from heavy seas. A hydrostatic release and weak link are provided on each container to allow for automatic deployment and inflation of the raft should the vessel sink before the rafts can be deployed. Rafts may be removed from cradles, moved to opposite sides and launched by hand if necessary.

Instruction cards for the proper stowage and launching of inflatable life rafts are posted in various locations throughout the vessel.

Buoyant Apparatus. A buoyant apparatus is a flat, box-like flotation device with grab lines installed around its edges; the life float is similar to the buoyant apparatus, except it is open in the center and fitted with a net and wooden floor suspended from the center of the float. Buoyant apparatus and life floats are stowed on an open deck or in racks in such a manner to be float-free in case of emergency.

Small Boats. The handling of oceanographic equipment creates a potential risk of falling overboard. Because a vessel with equipment over the side is usually unable to maneuver freely for a recovery, the small boat may provide a rapid means of rescuing the victim. It is also ideal for marshaling all the vessel's inflatable life rafts or buoyant apparatus in the event the vessel has sunk and motor lifeboats are not available.

Secondary Lifesaving Equipment

While primary lifesaving equipment is provided for the entire crew and is designed for extended survival, Secondary Lifesaving Equipment is provided for individual survival in distress situations. These items will allow a person to remain afloat until rescued.

Personal Flotation Devices (PFDs). All vessels are required to carry one Type 1 adult PFD for every person onboard. A Type 1 PFD is designed to turn a person face up in the water. Additional PFDs are accessible in the engine room, bridge and science labs in sufficient numbers to accommodate all individuals normally on watch or working in these areas.

Ring Lifebuoys. Ring lifebuoys are the first means of rescue for the person who falls overboard. Lightweight and round, the ring buoy is easy to toss to the victim and will keep him or her afloat until help can arrive.

Lifejackets are distributed throughout the crew's and scientists' quarters, providing one lifejacket per bunk, and stowed so that they are readily accessible.

All lifejackets are provided with a light, whistle and reflective tape.

Survival Suits (Immersion, Exposure, or Gumby Suits). Prolonged exposure to the elements of the sea, especially in cold waters, presents many challenges to an individual's survival, not the least of which is hypothermia – the rapid and continued loss of body heat. Immersion suits are designed to provide full-body thermal protection similar to a diver's wet suit, as well as built-in flotation, and are required to be on vessels operating in higher latitudes. You will find a survival suit in your cabin. Know where it is and how to put it on. On EPA **Class C** vessels, there will be additional survival suits stored on deck by the life raft muster station. If you have never worn a survival suit before, you will be given instruction in the procedure and will be required to demonstrate that capability.

Work Vests. Precautions should be taken to avoid unnecessary lifesaving situations. A work vest may be used by individuals working on deck or in small boats where the bulk of a regular Type 1 lifejacket would be confining. The work vest is not a substitute for a lifejacket!

When working near or over the water during science operations, a work vest may be the deciding factor in your survival.

Thermal Protective Aids (TPAs). The TPA is a multi-purpose item of lifesaving equipment. The TPA is a bag or suit made of waterproof material with low thermal conductivity. Its function is to minimize the effects of hypothermia or aid in the recovery of a hypothermia victim. It may be used as an alternative for an immersion suit while in a life raft or lifeboat, or a person suffering from hypothermia may be placed inside so that body heat is maintained inside the bag. The TPA does not provide any flotation support.

General Lifesaving Equipment and Information

Not all casualties at sea result in "taking to lifeboats." Distress situations are more often limited to vessel breakdowns, personnel evacuations, or other instances that require that the vessel be located and assisted by a search and rescue resource. To facilitate the rescue efforts, research vessels carry various devices for location and signaling.

Distress Signals. When a mariner sees a flare displayed in the night sky or unusual smoke rising from the horizon, the first thought is that of a vessel in distress. Not only do these displays indicate a distress, but they mark the location of the vessel. For this reason, distress signals are a

necessary part of a vessel's lifesaving equipment. All EPA **Class B** and **C** vessels carry two red rocket flares. They may also carry additional visual signals, such as searchlights, international code flags and signaling lights.

Line-Throwing Appliance. In situations where a line must be passed over some distance, the line-throwing appliance may save considerable time and effort while providing a greater margin of safety than the conventional heaving line. A line-throwing appliance may be considered when attempting to pass a line to a person overboard. In such cases, only the lightweight, plastic-tipped form of projectile should be employed.

Emergency Position Indicating Radio Beacon (EPIRB). EPIRB is a battery-operated, self-activating emergency transmitter. The unit is stowed in a rack, inverted, with the power switch in automatic. When righted, the EPIRB sends out a radio signal to search and rescue resources. An aircraft or vessel can hone in on the signal and follow it to a disabled vessel's exact location.

Survival Procedures

Having to abandon vessel is a traumatic experience – gone are the comforts and security of the vessel. Exposed to the elements, either in lifeboats or rafts, or immersed in the water with only a lifejacket, survival at sea in a distress situation depends on an individual's knowledge and training in survival procedures. This is NOT a hopeless situation. Modern technology now makes distress communications and location by rescue resources a routine operation.

General. The station bill is where preparations for distress situations begin. It is here that the crew is assigned various duties associated with emergencies (including what equipment to bring, such as an EPIRB) and individuals are assigned to muster stations and survival craft.

Abandon Vessel. When the time arrives for the ultimate in survival procedure – having to abandon vessel – conduct the process in a calm, orderly manner – without panic! With adequate preparations and training, there should be no difficulty in carrying out a safe evacuation.

Training. Being properly prepared is the best way to ensure survival at sea. Because it is somewhat impractical to actually sink a vessel for practice, the alternative is training. Crew members and research personnel should be thoroughly trained in all aspects of survival techniques, from the station bill to launching lifeboats. You should participate in the weekly emergency drills as if they were the real thing. Report to stations fully clothed, wear shoes, put on your lifejacket, and bring your immersion suit. In an actual emergency, you may not have time to go back to your quarters.

When the command "Prepare to Abandon Vessel" is passed, along with the appropriate emergency signal, the crew instantly begins a planned series of actions similar to the following scenario:

Note: Never put on your life jacket or survival suit while still inside the vessel's interior! If the vessel should sink, you will not be able to escape from the interior of the vessel due to the positive flotation of the life jacket or survival suit.

- Muster at your assigned station; provide all equipment to the scene as assigned on the station bill; come to your station fully clothed and carrying your life jacket and immersion suit. The suit provides flotation and protects you from the elements.

- Prepare all survival craft for immediate launching. Swing out lifeboats or prepare life rafts according to standard procedures. DO NOT LAUNCH any equipment until instructed to do so by the captain/master. Stand by calmly at your station and await further orders.

- When the captain/master orders to abandon vessel, launch all survival craft. Enter boats and rafts using ladders rather than jumping over the side. Keep calm and organized.

- Once boarded, all rafts or boats are tethered and towed away from the vessel by a motor lifeboat or the rescue boat. Keep all craft together in the vicinity of the vessel's last position.

- While waiting for rescue units to arrive, maintain a continuous visual and radio communication watch. Your lifeboat or life raft is well stocked with equipment and provisions to sustain life comfortably. Use the supplies in the survival craft with care – they may have to last a while. Just sit back, relax and await rescue.

Fire Prevention and Control

Introduction

Immediately report to the bridge or a vessel crewmember the discovery of smoke or a fire. Immediately set off any emergency fire signaling alarms, and use the intercom system or the sound-powered phones to notify the bridge. Assign someone to go the bridge to notify and provide information on the casualty. Yell "FIRE" very loudly to notify others in the area.

Fire prevention should be part of everyday shipboard routine. Because accidents do happen, the ability to control and extinguish a fire quickly is essential to the safety of the vessel and everyone onboard. Individuals onboard a research vessel are particularly at risk because their vessel often operates independently in remote areas and is at sea for long, extended periods. Should a fire occur, they must be self-sufficient, as the nearest assistance from shore or another vessel may well be hundreds of miles and several days away. Therefore, knowledge, training and experience with regard to fire safety are imperative to the EPA fleet.

Keep combustibles and hazardous materials off the vessel. "If it isn't there, it won't burn" – this philosophy applies to materials brought onboard the vessel as well as those used in its construction.

Prevention

There are some basic principles of vessel design that can reduce the risk of fire. To prevent fire from spreading, most vessels are divided into zones that typically coincide with subdivision watertight bulkheads. Main vertical zone boundaries consist of insulated steel bulkheads

designed to contain fire, smoke and heat within limits. Spaces in which fire is most likely to occur, such as laboratories, galleys and machinery spaces are required to be separated by similar boundaries. Many materials used in the construction of research vessels are noncombustible. Some EPA vessels have permanently installed detection systems that sound an alarm in a normally manned space such as the pilothouse. These devices are similar to smoke alarms found in modern homes. Doors are fitted on all spaces, and ventilation systems are segregated by fire zones to assist in containing any fire. Spaces having greatest fire risk have a fixed extinguishing system. Ships are designed so that two fire hoses will reach any part of the vessel.

Two means of escape are provided from every space that is normally occupied. If one access is blocked by fire, another is always available.

Smoking can be particularly hazardous onboard vessel. An improperly disposed cigarette or cigar butt can ignite other materials. Smoking is prohibited within enclosed or indoor portions of vessels and is only permitted in designated areas established by the captain/master as safety and operational requirements permit.

Many fires have been started by bunk lights. Light bulbs generate a great deal of heat and under certain conditions can cause surrounding materials to catch fire. Fires have been started from bedding placed over the top of bunk lights.

Classification of Fire

Fires are classified by the National Fire Protection Association (NFPA). Fire classification is used to select the proper type of fire extinguisher. There are four basic fire classifications: A, B, C, and D.

Class A fires are those fueled by combustible solids such as wood, paper, clothing, bedding and some plastics (i.e., any material that leaves an ash). These fires can be extinguished through the use of water, ABC dry chemicals or CO_2.

Class B fires involve flammable or combustible liquids, flammable gases, greases, and similar products. These fires can best be extinguished by smothering agents, such as foam, CO_2 and dry chemicals. Water spray can also be used, but only by crew members who have had specialized training in the proper application of water to a flammable-liquid fire.

Class C fires are fueled by energized electrical equipment, conductors or appliances. To protect personnel from shock, nonconducting extinguishing agents such as CO_2, halon or dry chemicals must be used. Secure electrical power to the circuit causing the problem.

Class D fires involve combustible metals (e.g., sodium, potassium, magnesium, titanium, aluminum). These fires are extinguished through the use of a heat-absorbing extinguishing agent, such as certain dry powders (different from dry chemicals) that do not react with the burning metals. Specific firefighting agents are used for certain metals.

Knowing the classifications of fire and what type of extinguisher to use on each type of fire is not enough information to fight a fire effectively. You should know where extinguishers are, how to activate them, where to aim the agent, how much to use, and how and when to notify

others. Anyone using fire extinguishers must have the required fire extinguisher training on an annual basis.

Firefighting Equipment

Portable fire extinguishers are used for a fast attack to knock down flames. However, because they are small, continuous application can be sustained for only a few seconds. Dry chemical extinguishers will discharge for 10–12 seconds, halon extinguishers will discharge for 12–15 seconds, and CO_2 extinguishers will discharge for 30–40 seconds. Portable extinguishers are classed with one or more letters and a numeral. The letters correspond to the class/classes of fire on which the extinguisher is effective. A Class A extinguisher should be used on a wood or bedding fire, a Class B extinguisher should be used on burning flammable liquids, and a Class C extinguisher should be used on an electrical fire. A Class AB extinguisher should be used on fires involving common combustibles, such as wood, and also on fuel oil, or both. The NFPA rates portable extinguishers with Arabic numerals according to their efficiency. For example, an extinguisher rated 4A extinguishes twice as much Class A fire as a 2A extinguisher. The USCG uses Roman numerals to indicate the sizes of portable extinguishers, with I being the smallest size and V being the largest size.

Safety Rules for Portable Extinguishers

- If you discover a fire, call out the discovery, sound the fire alarm and summon help. Close the door to isolate the fire if it can be done quickly and safely.
- Never pass a fire to get to an extinguisher. A dead-end passageway can trap you.
- If you must enter a room or compartment, don't let the fire get between you and the door.
- If you enter a room or compartment and your attack with a portable extinguisher fails, get out immediately. Close the door to confine the fire and wait for the help you called. Your knowledge will help them.

Water Extinguishers. Water extinguishers use water or a water solution as the extinguishing agent. In general, water extinguishers have application for only Class A fires, except for the foam-type extinguishers, which may be used on Class A and B fires. These extinguishers hold 2.5 gallons of liquid and discharge their contents in less than a minute. The stored-pressure extinguisher is activated by first pulling the ring pin. The hose is then directed with one hand while the discharge lever is squeezed with the other hand. The stream is aimed at the base of the fire and moved back and forth for complete coverage. Short bursts can be used to conserve water.

Carbon Dioxide Extinguishers. Portable carbon dioxide extinguishers are used primarily for Class B and C fires, with the most common sizes having 5 to 20 pounds of CO_2. These extinguishers have a range of about 3 to 8 feet and will discharge their contents in 30 seconds or less. A CO_2 extinguisher is activated by removing the locking pin and squeezing two handles together while holding the hose handle (not the horn) in the other hand. For combating a Class B fire, the horn should be aimed at the base of the fire nearest the operator and then "swept" slowly

back and forth across the fire. To combat a Class C fire, the electrical equipment should be de-energized and the horn discharge aimed at the base of the fire. It is important that the hose handle be held and not the horn so that ice or frost that forms on the horn cannot become a current path to the operator if the horn should come in contact with live electrical parts.

Dry Chemical Extinguishers. Dry chemical portable extinguishers, available in several different sizes, use any one of five different dry chemical agents as an extinguishing medium. These extinguishers have at least a BC rating, while some have an ABC rating. Portable cartridge-operated extinguishers range in size from 2 to 30 pounds, while semi-portable models contain up to 50 pounds of extinguishing agent. Units under 10 pounds have a discharge duration of 8–10 seconds; the larger units have up to 30 seconds of discharge time. The cartridge-operated extinguisher uses a small cartridge filled with inert gas mounted on the side of the cylinder to propel the extinguishing agent. The extinguisher is activated by removing the ring pin and depressing the puncturing pin. These actions release the propellant gas, which forces the extinguishing agent up to the nozzle. The discharge should be directed at the bottom of the fire, starting at the near edge. The stream should be moved from side to side with rapid motions, to sweep the fire off the fuel. The initial discharge should not be directed onto the burning material at close range (3 to 8 feet), as the stream of extinguishing agent may scatter the fire or spray burning liquid about. The agent may be applied in short bursts by opening and closing the nozzle with the squeeze grips.

When activating a cartridge-operated dry chemical extinguisher, aim the top of the cylinder away from you. If the top has not been screwed on properly, it may come off violently and cause injury when the propellant gas charges the cylinder. Also, test the extinguisher before taking it into a fire by giving the hose nozzle a quick squeeze – then you'll know whether it will work or not.

Halon Extinguishers. Halon portable fire extinguishers come in two types – Halon 1211 and Halon 1301 – and in several sizes from 1 to 20 pounds. They are rated for Class B and C fires. Some Halon 1211 extinguishers are also rated for use on Class A fires. The discharge range from these extinguishers is from 4 to 15 feet, and they are discharged quickly. Halon 1211 is not affected by the wind as much as CO_2 or Halon 1301, and on a weight-of-agent basis, is at least twice as effective as CO_2. Individuals should avoid breathing the extinguishing agent or the gases produced by the thermal decomposition. Halon 1301 is at least as effective as CO_2 on a weight-of-agent basis, is suitable for cold weather operation, and leaves no residue. On Class B fires, Halon from portable extinguishers is applied in the same manner as CO_2.

Semi-Portable Fire Extinguishers. A semi-portable fire extinguisher (or extinguishing system) is one from which a hose can be run out to the fire. The two types of semi-portable systems include CO_2 hose-reel and dry chemical hose systems. Semi-portable fire extinguishers provide a means of getting a sizable amount of extinguishing agent to a fire rapidly. These systems have greater capacity and have slightly more range (nozzle to fire distance) than hand-portable extinguishers. As the name implies, fires may be fought only within the range allowed by the discharge hose. They cannot be carried about the vessel like hand-portable extinguishers.

Fixed Fire-Extinguishing Systems. Fixed fire-extinguishing systems are usually built into the vessel at the time of its construction. These systems are carefully designed; they consider the fire risks onboard the vessel, must meet exacting regulatory standards and are available for use in an

emergency. If a large fire develops, such as one in a machinery space, these systems may be the best means to extinguish it. There are four types of fixed systems common to research vessels: the fire main system, CO_2 system, Halon 1301 system and galley range system.

Combating the Fire

When a fire is noticed, the first thing to do is sound an alarm. The pilothouse must be notified of the location, and if known, the type of fire. This is important no matter how small the fire. It can be done by intercom, sound-powered phone, going to or sending someone else to the pilothouse, or by yelling.

Don't be a hero and try to fight a fire without sounding an alarm first. A fire can quickly get out of control and you could be trapped or overcome.

If the fire is small, the previous information is designed to help you choose the right extinguisher and put it out. If the fire is larger or gets out of control, then the training, coordination, efficient use of manpower and a more thorough assessment of the situation that comes with the crew's damage control team will be necessary.

If you do fight the fire, remember the word "PASS"

PULL the pin...some extinguishers require releasing a lock latch, pressing a puncture lever, or other motion.

AIM low...pointing the extinguisher nozzle (or its horn or hose) at the base of the fire.

SQUEEZE the handle...this releases the extinguishing agent.

SWEEP from side to side...at the base of the fire until it appears to be out. Watch the fire area. If fire breaks out again, repeat use of the extinguisher.

Most portable extinguishers work according to these directions, but some do not. Read and follow the directions on your extinguisher – on each one if you have more than one make or model.

Protect yourself at all times! Stay low. Avoid breathing the heated smoke and fumes or the extinguishing agent.

If the fire starts to spread or threatens your escape route, get out immediately.

If your first indication of a possible fire is the sight or smell of smoke coming from a closed compartment, you must be careful before opening that space. Feel the door or hatch for heat (cautiously, with the back of your hand). If it is hot or warm, do not open it. Notify the pilothouse or firefighting party immediately.

Stability and Watertight Integrity

Stability

The stability of a vessel depends on the hull form chosen by the designer and how the weights, such as fuel, stores, provisions and scientific equipment, are distributed about the vessel. Vessel captains/masters have little control over the vessel's form. They do, however, have great control over how much weight is taken onboard, how and where that weight is stowed, and the consequent effects on vessel stability.

As a research party member, you have the responsibility of making known to the crew the nature and amount of weight you have brought onboard and strictly abiding by the captain's/master's instructions regarding weight stowage and locations, particularly liquid weights and weights stowed high in the vessel. Because all stability assessments assume a watertight shell and weather deck, everyone must keep watertight fittings closed at all times. Report any damaged or inoperative fittings to the captain/master.

Water on deck increases the probability of down flooding through any opening. Freeing ports are fitted in bulwarks to allow water from boarding seas to drain overboard quickly. Ensure that freeing ports are unobstructed. Do not block freeing ports!

The act of lifting or hanging any weight from the vessel's crane, boom, A-frame, J-frame or other component raises the vessel's center of gravity. As soon as the weight is lifted clear of the deck, the downward force of the weight acts at a point at the top of the weight-handling equipment. If a crane is hoisting a weight over the side, the center of gravity is also shifted off center, introducing a list. When planning heavy lifts or over-the-side science operations, consult with the captain/master to ensure that effects of the vessel's stability from such operations are within acceptable limits.

Science operations, such as towing instruments, working gear over the side or fantail, or placing heavy objects on the seafloor, can influence stability in several ways:

- The vessel may be constrained from assuming the course and speed most favorable to stability and may be subjected to icing, boarding seas, beam winds and other conditions.
- Working heavy weights over the side reduces stability.
- The tension of the towline or gear line may introduce a heeling moment similar to that of a beam wind.

Watertight Integrity

A vessel's form and subdivision are calculated to provide adequate stability and resistance to damage in accordance with the design draft. These design features are defeated if the skin of the vessel and subdivision bulkheads are not watertight. The original watertight integrity of a vessel is determined by its design and the quality of its construction. The proper maintenance of that integrity is a vital part of any vessel's preparations to resist damage. Each undamaged tank or

compartment onboard the vessel must be kept watertight if flooding is to be controlled and not become progressive after damage.

Know the importance of watertight fittings – strive to keep them closed when not in use. It is equally important to keep freeing ports clear. Report inoperative, damaged, or leaking fittings to the captain/master.

Electrical Systems/Equipment

Introduction

Individuals who work with shipboard electrical equipment must be particularly vigilant about safety, as injuries from electric shock and short circuits are too often fatal. A shipboard environment is particularly dangerous with regard to electrical systems. Because decks are made of steel and form a direct electrical path to seawater, a person touching live electrical parts would normally become a part of this circuit. The body's resistance to current flow falls with an increase in moisture level in the skin. For example, a perspiring individual working in a hot machinery space coming in contact with live electrical components would have minimal resistance to current flow and would receive much more current than a person with dry skin. This adds to the hazards of working around machinery.

Because short circuits are usually accompanied by arcs and sparking, there is always the possibility of a resulting fire. When working with electrical installations, be attentive to the risk of fire.

Less than a 100 milliampere current can be fatal – this is about 1/1,000 of the current regularly flowing through a household light bulb. Ventricular fibrillation – the uncoordinated actions of the walls of the heart's ventricles – occurs when current flowing through the body approaches 100 milliamperes, which in turn causes the heart to stop pumping. Ventricular fibrillation will usually continue until some force is used to restore the heart's movements to a coordinated pumping action. Current flow of 200 milliamperes or higher through the body will cause severe burns and unconsciousness. It will also cause a clamping action of the heart muscles, which prevents the heart from going into ventricular fibrillation. If breathing can be restored immediately, victims will often recover from these injuries.

Ungrounded Electrical System

Most shipboard electrical distribution systems are not grounded, and in that respect, are different from household or shore systems. Neither of the two conductors in a shipboard system is grounded, while the potential between them is about 120 volts. If an individual, while grounded, were to touch either of these two conductors, that person would receive a severe shock. All live electrical circuits are always treated as potential hazards.

Personal Scientific Equipment

Electrical equipment brought onboard for personal use (e.g., for music systems, hair dryers) should be examined by the chief engineer. This examination determines whether they are wired

with one conductor connected to the chassis, as is common with some electronic equipment. If such equipment is used onboard a vessel, it provides a hazardous path to the ground for the electrical distribution system and must be rewired to the satisfaction of the chief engineer.

Scientific equipment (including power supplies and clean power sources) and the metal racks usually erected for stowage of scientific equipment should be properly grounded. Any discrepancies found should be reported to the chief engineer and remedied before such equipment is energized. Temporary electrical cables rigged for scientific equipment should be arranged to the satisfaction of the chief engineer. This includes marking the cable for identification and ensuring the cable is properly supported, free from possibility of chaffing, properly protected by an over-current device, and of proper size and construction for the application. Further, such cables should be removed after they have served their purpose.

Electrical Safety Practices

- Consider the results of each act. There is absolutely no reason for individuals to take chances that will endanger their lives or the lives of others.

- Assume circuits are live. Don't take the word of others. Stored capacitance can be fatal. Take time to test/discharge circuits before starting work.

- Test your tester. When testing circuits to see if they are live, test a known voltage source first to see if your tester works.

- Heed warning signs. If a sign warns that there may be two sources of power to a cabinet, take time to identify and secure both sources before reaching into the cabinet.

- Use your senses. Be alert to smoke, overheating and an "electrical smell," which are signs that trouble might not be far off.

- Authorized personnel only. Only personnel authorized by the chief engineer should work on installed shipboard electrical equipment. Researchers should coordinate their requirements with the chief engineer before proceeding with work that might impact a vessel's distribution system.

- Keep covers closed. Close covers to fuse panels, junction boxes, and other equipment when not in use. Covers are there to keep moisture and debris out; do not block electrical disconnects and panel boxes.

- Count tools. When working in cabinets or other equipment, count the tools you take in with you and be certain that you remove the same number when you leave.

- Beware of dual voltages. Some switchboard panels have both 450-volt and 120-volt circuits. If servicing a 120-volt circuit, beware that a higher voltage circuit is close by.

- Remove jewelry. Don't wear jewelry when working with electrical equipment or moving machinery. Remove rings, necklaces, and bracelets when you need to work near live

components. The jewelry may serve as a path to ground or cause a short circuit, which could be fatal or cause injury. The same applies to metal zippers on clothing.

- Tagged-out equipment. The vessel's electricians and engineers place equipment out of service if it could jeopardize safety of personnel or cause equipment damage if started. Know how to secure all sources of possible power to such equipment.
- Leave equipment in working order, or tag it out of service before you leave.
- Do not service high-voltage equipment alone.
- Do not ground yourself. Make sure you are not grounded when adjusting equipment or using measuring equipment. Use only one hand when servicing energized equipment. Keep the other hand behind you or in your pocket.
- Don't energize wet equipment.
- Use only properly grounded and/or double insulated power tools.
- Use a fuse puller when pulling fuses.
- Examine extension cords and portable cords.

Engineering Safety and Practices

Introduction

Danger to personnel exists to some degree in every shipboard engineering operation. Because that danger is a constant companion, you may tend to discount the disastrous possibilities and ignore measures necessary to prevent accidents. Hazards to personal safety exist in virtually every system in the engineering department. High pressures and temperatures; volatile fluids; and rotating machinery, which may start without notice, are waiting for the unsuspecting crew member to make a mistake.

Gasoline presents a far greater hazard than diesel fuel. It must only be stored and transferred topside on weather decks. Exercise great care when fueling.

Fueling Small Boats and Engines

Fueling procedures for small boats and small engines depend on specific equipment. Fuel may be transferred from a vessel's tanks or drums to the boat tank by hose (diesel boats); gasoline cans may simply be placed in a boat and connected to the engine by hose (outboard-motor-driven boats); or gasoline or a gas/oil mixture may be poured from storage cans to a built-in fuel tank (portable pumps, chain saws). Whatever the method, take precautions to avoid spills, fires or injuries. When using a transfer hose from the vessel's tanks, ensure proper alignment of valves, adequate communications, and pre-established emergency procedures.

For drum or can transfers, provide drip pans under the transfer points and be cautious of overflows. When refueling portable equipment, use good judgment to prevent spills on deck or on the equipment. Never refill a tank over a hot engine. A small amount of gasoline spilled on the engine may flash and ignite the whole can with disastrous results. Contain and clean up any spills immediately.

Become familiar with the following precepts of safety:

- Report unsafe conditions. Notify your supervisor or a vessel's officer if you feel a condition, equipment or material is unsafe.
- Warn others. Take the time to remind shipmates of safety precautions.
- Use protective equipment. Ear and eye protection, protective clothing and breathing equipment are provided for your safety – use them.
- Use safety guards. Safety guards and devices are placed on tools and equipment to prevent injury – use them correctly. If you find a safety guard missing or misaligned, inform the chief engineer.
- Report injury or ill health. Report any injuries or evidence of impaired health to your supervisor or a vessel's officer.
- Exercise caution. Be alert to the hazards of the workplace and take all necessary precautions.

Trailering Small Craft

The EPA has a 2012 "Trailer Towing Safety " PowerPoint Presentation that is located on the SHEMD website at: [URL to be added later].

EPA regions and program offices report more operational problems, injuries and property damage from small craft trailering activities than from other on-water boat usage. Successful trailering requires four things: 1) A proper trailer in serviceable condition; 2) The correct hitch; 3) A tow vehicle with adequate power, braking, and cooling capacity; and 4) A properly loaded trailer with the craft properly secured on it. Additionally, the operator must have the skills to launch and retrieve the boat from the trailer. The following safe trailering data have been adopted from the USCG Safe Boating Course:

The Trailer

- More damage can be done to a boat by the stresses of road travel than by normal water operation. A boat hull is designed to be supported evenly by water. When transported on a trailer, the boat should be supported structurally as evenly across the hull as possible. This will allow for even distribution of the weight of the hull, engine and equipment. It should be long enough to support the whole length of the hull, but short enough to allow the lower unit of the boat's engine to be extended freely.

- Rollers and bolsters must be kept in good condition to prevent scratching and gouging of the hull. Tie-downs and lower unit supports must be adjusted properly to prevent the boat from bouncing on the trailer. The bow eye on the boat should be secured with either a rope, chain or turnbuckle in addition to the winch cable. Additional straps may be required across the beam of the boat. The capacity of the trailer should be greater than the combined weight of the boat, motor and equipment. The tow vehicle must be capable of handling the weight of the trailer (with boat and equipment), as well as the weight of the passengers and equipment that will be carried inside. This may require that the tow vehicle be specially equipped with the following (check your vehicle owner's manual for specific information):

The tow Vehicle:

- Engine of adequate power
- Transmission and rear end designed for towing
- Larger cooling systems for the engine and transmission
- Heavy duty brakes
- Load bearing hitch attached to the frame, not the bumper

Pre-Highway Checklist

- The tow ball and coupler are the same size, and bolts with washers are tightly secured. (Keep in mind that the vibration of road travel can loosen them.)
- The coupler is completely over the ball, and the latching mechanism is locked down and secured.
- The trailer is loaded evenly from front to rear as well as side to side.
- The safety chains are attached, crisscrossing under the coupler, to the frame of the tow vehicle. If the ball were to break, the tongue would be held up by the chains, allowing the trailer to follow in a straight line and prevent the coupler from dragging on the road.
- The lights on the trailer function properly.
- Check the brakes. Adjust electrical break controller if necessary or equipped
- The side view mirrors of the towing vehicle are large enough to provide an unobstructed rear view on both sides of the vehicle.
- Check tires (including spare) and wheel bearings. Improper inflation may cause difficulty in steering. When trailer wheels are immersed in water (especially salt water), the bearings should be inspected and greased on a regular basis.

- Rainwater or water from cleaning inside the boat is undesirable for many reasons, but mainly because a collection of it can rapidly increase weight on the trailer, often beyond its capacity. This extra weight may shift with the movement of the trailer and cause a dangerous situation.

Towing Precautions

Pulling a trailer presents problems; more time is required to brake, accelerate, pass and stop. The turning radius is also much greater; curbs and roadside barriers must be given a wide berth when negotiating corners. It is suggested that prior to operating on the open road, the vehicle operator practice turning, backing up, and other maneuvers on a level, uncongested parking area. Backing a boat trailer (in particular an empty one) is a challenge, even to more experienced drivers, and requires considerable practice.

Pre-Launching

- For the courtesy of others and to prevent rushing, **prepare the boat for launching away from the ramp**.
- Check the boat to ensure that no damage was caused during the trip.
- Raise the lower unit of the motor (remove supports) to the proper height for launching so that it will not hit bottom.
- Make sure the drain plug is in securely.
- Remove tie-downs and make sure that the winch is properly attached to the bow eye and locked in position.
- Disconnect the trailer lights to prevent shorting the electrical system or burning out a bulb.
- Attach a line to the bow and the stern of the boat so that the boat cannot drift away after launching and can be easily maneuvered to a docking area.
- Visually inspect the launch ramp for hazards such as a steep drop off, slippery area and sharp objects. (Lessons learned from experience – the size of the portion of the ramp under water may not be the same as the portion above water, and the ramp may not be as long as you expect.)
- When everything has been double-checked, proceed slowly to the ramp, remembering that the boat is just resting on the trailer and attached only at the bow. The ideal situation is to have one person in the boat and one observer at the water's edge to help guide the driver of the tow vehicle.

Launching

- Keep the rear wheels of the tow vehicle out of the water. This will generally keep the exhaust pipes out of the water. If the exhaust pipes become immersed in the water, the engine may stall.

- Set the parking brake of the tow vehicle.

- Once in the water, lower the motor (be certain there is sufficient depth as not to damage the prop) and prepare to start the engine (after running blowers and checking for fuel leaks).

- Start the boat motor and make sure that water is passing through the engine cooling system.

- Release the winch and disconnect the winch line from the bow when the boat operator is ready.

- At this point, the boat can be launched with a light shove or by backing off the trailer under power. Finish loading the boat at a sufficient distance from the ramp so that others may use the launch ramp.

Retrieval

The steps for removing the boat from the water are basically the reverse of those taken to launch it. However, keep in mind that certain conditions may exist during retrieval that did not exist during launching. When approaching the takeout ramp, take special care to note such factors as:

- Change in wind direction and/or velocity

- Change in current and/or tide

- Change in water level due to tide

- Increase in boating traffic

- Visibility

Maneuver the boat carefully to the submerged trailer; stop the engine and raise the lower unit of the engine. Secure engine, then winch the boat onto the trailer and secure it. Finally, drive the trailer with boat onboard carefully from the ramp to a designated parking area for cleanup, reloading and an equipment safety check. Practice will make launching and retrieving a simple procedure. The best advice is to just “do it cautiously with safety as a main concern.” Avoid being rushed by impatient boaters. In addition to safety, green boating includes draining bilge water from the water it was received, cleaning any weeds or other debris, inspecting for invasive weed, mussels, and clams.

Repairs

Machinery and equipment must be maintained and repaired properly. When making repairs, do it right the first time! Makeshift repairs could injure an unsuspecting person who doesn't know that the machine has been jury-rigged.

Hazardous Materials

Introduction

Research and shipboard personnel can expect to encounter hazardous materials in the form of vessel's stores, paints, laboratory chemicals, cleaning agents and other substances. Therefore, a working knowledge of these materials and their hazards will assist personnel in handling and storing them in a safe, responsible manner.

You are assumed to have experience and a good working knowledge of procedures for handling, storing and disposing of hazardous materials within an onshore laboratory. Hazardous material is any substance which, because of its chemical properties, can cause the deterioration of other materials or injury to living organisms. Hazardous materials are grouped into five major classes:

- Flammable, combustible or explosive
- Corrosive (acids and caustics)
- Reactive
- Toxic or poisonous
- Cryogenic

Protection

For hazardous materials or chemicals to harm the body, they must first gain entrance. Methods of prevention include removal or confinement of hazards, use of protective equipment or a combination thereof

Procedures for handling hazardous material onboard a research vessel may be different than what you are used to. Plan your experiments with minimal waste – you are limited to the storage onboard for disposal; you just don't heave hazardous materials overboard! Containers are prone to spilling when the deck is moving. While at sea, some of your procedures that used to be "automatic" will have to be altered to accommodate the new environment.

Hazard Removal. The best way to protect yourself from hazardous materials is to eliminate the possibility of contact. Hazard removal may be accomplished by physically removing the hazardous substance or rendering it harmless. You can try substituting a less harmful chemical. Potential hazards can be removed or reduced by limiting the types and quantities of hazardous materials stowed and used onboard and properly disposing of hazardous waste.

When presented with a spill or other hazardous situation, try to:

- Limit the spread of the hazardous material to the smallest area possible with physical barriers.
- Limit access of personnel to the hazard area and vicinity.
- Shut down or plug up the source of the hazardous material.
- Neutralize the hazardous material with other chemicals.

Hazard Containment. Hazardous materials that are carried must be properly packaged and stored to prevent injury. Storage and use areas are designed to contain or limit the spread of any spilled materials.

Personal Protective Devices. Personal protective devices are worn when working with any known or unknown hazard. The skin and the respiratory tract provide only limited natural protection against harmful substances. Personal protective equipment provides a barrier between the person and the environment to prevent harmful effects from hazardous chemicals. Be sure to wear personal protective equipment composed of material that is compatible with the chemicals that you are using.

Laboratory Chemicals

Various forms, types, mixtures, and quantities of chemicals will be found in a laboratory. The most important factor in the use of laboratory chemicals onboard a research vessel is safety. Due to the mixture of chemicals in a laboratory, there are increased hazards in these areas. There are chemicals that react with each other, water, metals and other common items. The storage and handling of laboratory chemicals must be done carefully and by trained personnel.

When working in the lab, wear proper clothing when necessary: goggles, lab coat or coveralls, and gloves. Know the location and how to use the protective equipment onboard: ventilation hoods, eye wash stations, fresh water, personal showers, neutralization kits and disposal units. All chemicals in the lab must be properly marked and stored in appropriate containers. Acids and caustics, which are highly corrosive, cannot be stored in metal containers. Some solvents can dissolve plastic containers. Any chemicals brought onboard in large quantities should be stored in the appropriate lockers until they are needed. Chemicals that react with each other must not be stored in the same place; acids should not be stored with alkalis; organic acids should not be stored with mineral acids; nitric acid should be stored away from organics; and oxidizers should be kept separate from flammables. .

Any chemicals used or created onboard and ready for disposal should be placed in a clearly labeled disposal unit and properly stored until port is reached. All labels must be in compliance with the requirements for satellite waste storage containers under the Resource Conservation and Recovery Act (RCRA). Dispose of chemicals in accordance with applicable regulatory requirements when you reach shore.

If a spill occurs in the lab, the personnel cleaning up the spill should know what was spilled and what substances react with the spilled chemicals before cleaning. There are chemicals that will react violently with water and should be cleaned up with dry cloths. Use the appropriate chemical neutralization kit if available. If personnel are splattered with a chemical, the affected areas should be washed with copious amounts of and water and medical attention sought.

Personal Protection

- Eye protection against irritating fumes or corrosive liquid chemicals should consist of face mask or goggles.
- Spaces that have been closed for significant periods of time should not be entered without respiratory protection until it has been established that a safe atmosphere exists.
- Full face shields, rubber gloves, rubber boots and aprons should be worn when handling corrosive materials.
- Lab coats and goggles should be worn in the laboratories when necessary.
- Exposure to particulate matter requires the use of a respirator with an appropriate filter for protection against dust, fumes, mists, fogs, liquids and solids.
- Protective skin cream or gloves or both should be used by handlers of sensitizers or potential skin irritants such as epoxy and polyester resins and hardeners.

Reactivity

Many chemicals that are nonhazardous in a natural state, or have a low to medium degree of hazard, can become highly hazardous when placed in contact with another chemical. The resultant mixture can be more reactive, produce more hazards, and be several times more toxic than each chemical by itself. In some cases, chemicals may react violently, even explosively, when brought together. Spontaneous explosion or heat sufficient to ignite nearby combustibles may result. Electrical currents or arcs or extreme heat can liberate or cause the formation of hazardous compounds, or the decomposition of harmless substances into hazardous materials. For example, nitrogen dioxide (NO_2) is formed by welding arcs and electrolysis in seawater releases chlorine and hydrogen gas and may produce other compounds. Oxygen in a gaseous state increases the flammable potential of other materials around it; as a liquid, it has the ability to freeze living tissue to the point of shattering. Water, when added to certain burning metals, increases the intensity of the fire and moisture in the air or perspiration can cause some chemicals to ignite spontaneously.

Compressed Gases

Compressed gases such as oxygen, helium, nitrogen and other inert gases are used onboard for many different reasons. They can be used for medical purposes, cutting and welding, weather balloons and laboratory experiments. Cylinders should always be kept secure and in an upright

position. If a cylinder ruptures it could cause an explosion, feed a fire or become a missile hazard.

Basic safety precautions for handling compressed gases:

THE ALWAYS LIST	THE NEVER LIST
Always open cylinder valves slowly to allow a gradual pressure buildup and to prevent diesel effect in the line or regulator.	Never use a cylinder or its contents for other than its intended use, and NEVER use a cylinder (not even an empty one) as a roller or support.
Always keep cylinders away from hot work (welding/cutting) areas so that sparks, slag or flames will not reach them.	Never use valve protection caps for lifting cylinders.
Always store cylinders, both full and empty, so they won't be knocked over.	Never use a magnet for lifting.
	Never use slings for lifting. Use a cradle.
Always keep valve protection caps in place and hand tight, except when in use or connected for use.	
	Never use a hammer or wrench to open cylinder valves.
Always clear the cylinder valve connections of any dirt particles by briefly opening and closing the valves before connecting regulators. Do not stand in direct line of a cylinder valve when opening it.	
	Never drop or allow any cylinder to fall, especially one that contains oxygen. Never tamper with safety plugs (safety relief valves).
Always purge manifolds in a similar manner before connecting regulators. To reduce the chance of rupturing the diaphragm, always ensure that the regulator-adjusting screw is backed out all the way before opening bottle valve.	
Always remove faulty regulators from service.	Never connect a regulator to a cylinder containing a gas other than that for which the regulator was designed.
	Never pressurize cylinder, tank or compressed gas system higher than its rated pressure.

Self-contained underwater breathing apparatus cylinders must be approved for containing compressed air by the U.S. Department of Transportation (DOT) to be used in the EPA Diving Program. Cylinder types currently in use for EPA diving include:

- 72 cubic foot steel, 2250 psi working pressure (wp)

- 50, 63, 80 cubic foot aluminum, 3000 psi wp
- High-pressure steel, 50, 65, 80, 100, 120 cubic foot, 3500 psi wp with appropriate valve and regulator design.

All SCUBA cylinders or other pressurized vessels used for breathing gases must be properly maintained, and undergo hydrostatic testing at a qualified facility at least every five years, and have an internal visual inspection by a qualified technician annually. The divemaster or designee shall check that each tank intended for dive operations has markings for current inspection and test dates. Prior to use, the yokes on all gas cylinders should be inspected for damage to the seat or O-rings. Gas pressure must not exceed the rated working pressure for any of the components of the entire diving gas supply system.

Paints and Solvents

Onboard a vessel, one can find a supply of paints, strippers, thinners and cleaners (turpentine), all of which have a hazard potential. Many of the paints and solvents have low flashpoints, which increases the risk of fire. Paints and solvents produce toxic fumes when they are applied, are drying or are removed. Wear respiratory protection and appropriate clothing (e.g., long-sleeved shirt, long pants, chemical-resistant gloves) when painting.

Maintain proper ventilation (either natural or forced with a fan), and avoid using electrical equipment when applying paint and during drying and curing.

Radioactive Material

Most science work using radioactive isotopes involves very low levels of radioactivity. Normally, even prolonged exposure would have no harmful effect on an individual. While spills could cause contamination or "dirty" a lab or van, these terms refer only to the negative effect on minute scientific measurements.

Radioactive materials are defined as any material or combination of materials that spontaneously emit alpha or beta rays (sometimes gamma rays) by the disintegration of the nuclei of atoms. Containers with radioactive materials must be labeled with the proper symbol for radioactive.

Radioactive materials can be present as tracer chemicals used in research or as sealed sources such as the Nickel 63 in the electron capture detector of a gas chromatograph.

Keep radioactive material in one area, preferably a separate van. The working surfaces should be made of a nonporous material that is resistant to seawater and radioactive materials. Any materials that have the ability to become airborne should be worked on only in an approved fume hood.

All radioactive materials should be stored in one locker clearly marked "RADIOACTIVE." Radioactive materials are kept in their original containers until they are used. Solid waste materials may be stored in cans that are properly labeled and sealed in accordance with the applicable regulations for radioactive waste, as designated by the Nuclear Regulatory Commission (NRC). Liquid radioactive waste may be stored in plastic jars or bottles. The locker

should be protected from the weather and unauthorized removal of contents. In any area where radioactive materials are being processed or handled, film badges or other exposure – measuring devices could be required and the area clearly marked "RADIOACTIVE MATERIALS IN USE." While working with isotopes, wear lab coats and gloves. Protective clothing should not leave the lab until declared radiation free. If it becomes contaminated, it must be disposed of with the radioactive waste. Eating or drinking must not be permitted in areas where radioactive materials are being handled or stored. Food and beverages should never be stored near radiological laboratories or in the same refrigeration units as radioisotopes. All radioactive waste materials and any materials suspected of being contaminated should be placed in properly labeled waste containers.

In the event of a spill of radioactive material, the following general procedures should be followed:

- Keep all personnel who were in the area of the spill together until they can be tested for contamination levels. Seek qualified medical help as soon as possible.
- Block off the area where the spill occurred.
- If the clothing of personnel has been contaminated, remove and dispose of it properly.
- Keep all unaffected personnel away from area until uncontaminated personnel in full protective clothing arrive to clean up the area.
- Perform wipe testing of the contaminated area once you reach dockside so that the exact level of contamination can be determined for decontamination purposes.

Marine Sanitation Devices (MSD)

MSD installed onboard ships are used to hold or treat raw sewage and wastewater. While these systems perform well for abating water pollution, the tanks and the chemical processes present hazards to the personnel required to operate and maintain them.

The primary hazard to personnel from marine sanitation systems is hydrogen sulfide (H_2S) gas. This gas is invisible and has a characteristic odor of rotten eggs. It is highly toxic and flammable. Although the odor is detectable at low levels (less than 1 ppm), prolonged exposure to moderate levels (30–50 ppm) or brief exposure to high levels (greater than 100 ppm) can cause olfactory fatigue, or loss of the sense of smell. Therefore, the presence of H_2S cannot always be reliably detected by its odor. At extremely high levels (500 ppm or greater), H_2S acts as a systemic poison, causing unconsciousness or death due to respiratory arrest. In addition to H_2S, other hazards associated with marine sanitation spills include the release of methane and other hydrocarbons, release of ammonia, reduction of oxygen in the space, and elevated levels of CO_2 in the air. Transfer of communicable diseases is also of great concern. If a marine sanitation leak or spill occurs, or if the odor of H_2S is detected, leave the space immediately. You may return to the area only when the space is certified to be safe.

Sources of Information

Hazardous Substance Identification Systems. Because of the need for identification of hazardous material, two systems (NFPA 704M and DOT) for hazardous substance identification have been developed.

NFPA 794M Hazardous Identification System

The NFPA 704M System is a standardized marking system that uses numbers and colors on a sign to define the three basic hazards (health, flammability and reactivity) of a specific material. The ratings for individual chemicals can be found in the NFPA Guide to Hazardous Materials. Other references are the USCG Manual; CHRIS, Volume II; and the National Safety Council's Fundamentals of Industrial Hygiene.

DOT Hazard Identification System

The DOT Hazardous Materials Transportation Administration regulates over 1,400 hazardous materials. DOT placards and labels indicate the nature of the hazard presented by the material.

Summary

Living and working onboard an EPA vessel can be safe for those who know and practice safety. Emergencies must be reported and handled properly. Are you ready for this cruise? Safety is the responsibility of every person onboard – you. In the laboratory, you have learned to control the environment to ensure consistent results of your experiments. Although you cannot totally control the shipboard environment, you can control your actions and be prepared. Have a safe and successful cruise!

APPENDIX C
DEFINITIONS

Chief Scientist: The designated member of the scientific personnel who is in overall charge of the research operations and its personnel onboard. The chief scientist also has the responsibility for ensuring that the scientific party is adequately staffed and for planning the employment of his/her personnel to ensure that unsafe conditions are not generated.

Class A Vessels: All powered EPA small craft under 65 feet, to include those carried onboard EPA vessels, berthed at a pier or carried on a trailer.

Class B Vessels: All powered EPA vessels greater than 65 feet in length but with a GT less than 300.

Class C Vessels: All powered EPA vessels with a GT greater than 300.

Coastwise: Used to describe a route or operating area that is not more than 20 nautical miles offshore, on any ocean, Gulf of Mexico, Caribbean Sea, Gulf of Alaska, and such other waters as may be designated. (46 CFR 188.10–15).

Crew: Personnel involved exclusively or primarily in the navigation and operation of a vessel.

Days Out of Service: Periods in which a vessel is laid up out of service for an extended period for reasons of economy, unemployment or being unfit for service.

EPA workers: Full-time, part-time, temporary and permanent EPA federal and contract employees, the crew and staff of leased vessels, and detailees to the EPA from other government agencies.

EPA Vessel Management Official (VMO): The designated official responsible for the oversight of employees on EPA vessels, as well as the scheduling, operation, maintenance, budgets and scientific research conducted onboard EPA vessels. In addition, the VMO is the primary point of contact for coordinating all aspects of the funding agreement with the Military Sealift Command's project manager. The VMO will also be the primary contact with the scientific survey crews/chief scientists and other users of the vessel.

Foreign Voyage: A voyage between two countries or two territories or possessions of the United States by a vessel that is not subject to the SOLAS provisions because of its size, propulsion or documentation. Vessels engaged in such voyages, if 150 GT or greater, that were built before July 21, 1968, or if 79 feet or greater in length and built on or after July 21, 1968, must comply with load line requirements. After July 1984, existing vessels over 79 feet in length and engaged in a foreign voyage must be measured under the convention measurement system. (46 CFR 42-03-5, 69.9 and 69.4)

International Voyage: A sea voyage by a mechanically propelled vessel of 500 GT or more from a country to which SOLAS applies to a port outside that country, or conversely.

Lay Days: Days in port for purposes of fitting out, cruise preparation, crew rest, awaiting staff and scientific material, and upkeep.

Maintenance Days: Days undergoing overhauls, dry-docking or other scheduled or unscheduled repairs during which the vessel is not available for service.

Marine Vessel: Watercraft designed for water transportation.

Master: The designated member of the crew of a vessel who is in charge of the operation of the vessel. The term "captain" is used almost interchangeably.

Monitor, Surveillance and Research Cruises: Cruise by a vessel primarily for the purpose of conducting marine monitoring, surveillance and/or research at sea. Commonly defined as commencing on the day of departure and terminating on the day of return to a port.

Nautical Mile (N, nm or nmi): The internationally agreed standard sea mile of 6,076 feet, commonly used in laws, regulations and treaties for specifying distance at sea or offshore.

Near Coastal: Used to describe an ocean route or operating area that is not more than 200 nm offshore. An operating limit for restricted Master Licenses.

Ocean: Used to describe an operating area or route in any ocean or the Gulf of Mexico more than 20 nm offshore.

Operating Day: All days away from home port in an operating status incident to the scientific mission.

Passenger: Every person other than the crew or other persons engaged onboard a vessel in the business of the vessel. (46 CFR 24.10–23)

Scientific Personnel: Those people onboard a vessel solely for the purpose of engaging in scientific research, or for giving or receiving instructions in oceanography or in the support of the EPA's mission. Scientific personnel are considered neither crew nor passengers. (46 CFR 188.10-71 and 46 USC 444)

Small Craft: A nonlegal description of a vessel that is usually under 65 feet in length.

Transit: Voyage of a vessel during which little or no research is being carried out, primarily for the purpose of going from one port to another, or to/from a port and an area of research.

APPENDIX D
EXAMPLE FLOAT PLANS

EPA FLOAT PLAN

This form is completed before going out on our vessel and left with a reliable person who can be depended upon to notify the Coast Guard or other rescue organization in case we don't return as scheduled. Before notifying the Coast Guard the person on shore shall make every effort to contact the people on the boat (by cell phone etc.) in order to avoid an unnecessary search!

1. Name of person filling this plan:_____
   Telephone #:_____

2. Description of boat: Registration number: _____
   Type: _____ Color:_____ Length:_____
   Make: _____ Name:_____ Name:_____

3. Name of persons onboard: Age: Address:

_____	_____	_____ Telephone#:
_____	_____	_____ Telephone#:
_____	_____	_____ Telephone#:
_____	_____	_____ Telephone#:

4. Description of engine: Type: _____ Horsepower:_____
   #of engines:_____ Fuel capacity:_____

5. Survival equipment aboard. Check as appropriate.
   □ Life preservers □Flares □ Flashlights □ Signal mirror □ EPIRB □ Anchor(s)
   □ Smoke signals □ Horn □Water □ Paddles □ Raft or dignity □ Food

6. Radio □ Yes □No Type: _____ Call sign: _____
   Cell □Yes □ No #:_____

7. Trip expectations
   Leaving from:_____ Going to: _____
   Departing on: _____ Returning:_____/_____ □am □pm
   date time
   And, in no event, returning later than: _____/_____ □am □pm
   date time

8. Other pertinent information: _____

9. Description of automobile: Trailer License#:_____
   Make:_____ Color:_____ License#_____
   Where parked_____

10. If not returned by _____/_____ □am □ pm
    Call:
    U.S. Coast guard telephone#: _____
    Local authority:_____ Telephone#:_____

Sample Float Plan

Name of vessel's operator:	
Telephone Number:	
Name of Vessel:	
Registration No.:	
Description of Vessel: Type: Make: Color of Hull: Color of Trim: Most distinguishing identifiable feature:	

Rafts/Dinghies: Number:_____ Size:_____ Color:_____

Radio: Type: _____ Frequencies Monitored: _____

Number of persons onboard:

Name:	Age:	Address & Telephone:

Note: List additional passengers on back.

Engine Type:_____ H.P.:_____ Normal Fuel Supply (days):_____

Survival equipment on board: (check as appropriate)

☐ Life Jackets ☐ Flares ☐ Smoke Signals

☐ Medical Kit	☐ EPIRB	☐ Paddles
☐ Anchor	☐ Loran/Gps	☐ _____

Food for _____ days - Water for _____ days	
Trip:	
Date & Time of Departure:	
Departure From:	
Departure To:	
Expected to arrive by:_____ In no case later than:_____	
Additional information:	

FLOAT PLAN

INSTRUCTIONS: Complete this plan before you go boating and leave it with a reliable person who can be depended upon to notify the Coast Guard, or other rescue organization, should you not return or check-in as planned. If you have a change of plans after leaving, be sure to notify the person holding your Float Plan. For additional copies of this plan, visit: **www.floatplancentral.org**

www.cgaux.org

Do NOT file this plan with the U.S. Coast Guard

www.uscgboating.org

VESSEL

IDENTIFICATION:

Name & Hailing Port _____
Document / Registration No. _____ HIN _____
Year & Make _____
Length ____ Type _____ Draft ____ Hull Mat. _____
Color _____
Prominent Features _____

COMMUNICATION:

Radio Call Sign _____
DSC MMSI No. _____
Radio-1: Type _____ Ch./ Freq. Monitored _____
Radio-2: Type _____ Ch./ Freq. Monitored _____
Cell / Satellite No. _____
E-mail _____

PROPULSION:

Primary-- Type _____ No. Eng. ___ Fuel Capacity _____
Auxiliary--Type _____ No. Eng. ___ Fuel Capacity _____

NAVIGATION: (Check all on board)

☐ Maps ☐ Charts ☐ Compass ☐ GPS / DGPS
☐ Radar ☐ Sounder ☐ _____

SAFETY & SURVIVAL

VISUAL DISTRESS SIGNALS:

☐ Electric S-O-S Light
☐ Orange Flag
☐ Orange Smoke
☐ Red Flares

AUDIBLE DISTRESS SIGNALS:

☐ Bell
☐ Horn / Siren
☐ Whistle

OTHER GEAR:

☐ Drogue / Sea Anchor
☐ EPIRB _____
☐ Fire Extinguisher
☐ Flashlight / Searchlight
☐ Food & Water for ____ days
☐ Foul Weather Gear
☐ Life raft / Dinghy
☐ Personal Locator Beacon
☐ Signal Mirror
☐ _____
☐ _____
☐ _____

PFDs: (Do not count Type IV devices)

____ Quantity On Board

GROUND TACKLE:

☐ Anchor: Line Length _____

PERSONS ONBOARD

OPERATOR:

Name _____
Address _____
City _____ State ____ Zip Code _____
Vehicle (Year, Make & Model) _____
Trailer will be parked at: _____

Age Gender Notes (Special medical condition, can't swim, etc.)

Has experience: ☐ with this Vessel ☐ with Area
Home phone _____
Vehicle License No. _____
Trailer License No. _____

PASSENGERS / CREW: Name & Address

	Age	Gender	Notes (Special medical condition, can't swim, etc.)
1.			
2.			
3.			
4.			
5.			

Attach "Supplemental Passenger List" if additional passengers or crew on board.

ITINERARY

	DATE	TIME	LOCATION / WAYPOINT	MODE OF TRAVEL	REASON FOR STOP	CHECK-IN TIME
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						
Depart						
Arrive						

Attach "Supplemental Itinerary" if there are additional locations or waypoints.

Contact 1: _____ Phone Number _____
Contact 2: _____ Phone Number _____

If you have a genuine concern for the safety or welfare of any persons on board the Vessel described above, who have not returned or checked-in in a reasonable amount of time, then follow the step-by-step instructions on the *Boating Emergency Guide*™ included with this float plan, or on the Internet at:

www.floatplancentral.org/help/BoatingEmergencyGuide.htm

Rev 2011.01.17 1 of 2

BOATING EMERGENCY GUIDE™

You will need the following items before you begin: 1) the **Float Plan** if one was given to you, 2) **Pen** or **Pencil**, 3) Clean sheet of **Paper** or **Writing Tablet**, and 4) your local **Telephone Directory**. Begin with Step 1 below.

Step 1: Do you have a genuine concern for the safety or welfare of any persons who have not returned or checked-in in a reasonable amount of time?

If YES, then continue with **Step 2**, otherwise **STOP**, no further action is required.

Step 2: Were you given a prepared Float Plan by anyone on board the vessel?

If YES, then continue with **Step 3**, otherwise got to **Step 5**.

Step 3: On the Float Plan, locate the two Contact lines at the bottom of the page. Call Contact number 1...

IF CONTACT #1	THEN
Answers phone	Take notes during your conversation. 1. Let the person know you are responding to a late return or check-in by the individuals designated on the Float Plan. 2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred. 3. Are you still concerned about the safety or welfare of any persons on board the vessel? **IF** / **THEN** Yes / Continue with **Step 4**. No / **STOP**. No further action is required.
Does not answer phone	Continue with **Step 4**.

Step 4: Call Contact number 2...

IF CONTACT #2	THEN
Answers phone	Take notes during your conversation. 1. Let the person know you are responding to a late return or check-in by the individuals designated on the Float Plan. 2. Determine if the person you are talking to, or anyone else at that location, has recently had contact with anyone on the vessel, and when and where that contact occurred. 3. Are you still concerned about the safety or welfare of any persons on board the vessel? **IF** / **THEN** Yes / Continue with **Step 6**. No / **STOP**. No further action is required.
Does not answer phone	Continue with **Step 6**.

Step 5: Take a moment to jot down the facts you know about each item in the checklist below.

DO NOT SPECULATE. Speculation about a detail may mislead Search And Rescue personnel, add to the overall search and rescue time, and adversely affect the outcome.

- ❑ Period of time the vessel has been overdue.
- ❑ Purpose of the trip or voyage.
- ❑ Description of the Vessel (type, size, color, features, etc.)
- ❑ Vessels departure point and destination.
- ❑ Places the Vessel planned to stop during transit.
- ❑ Navigation equipment on board (such as GPS, Loran C, Radar, Compass, Sounder, etc.)
- ❑ Number of people aboard the Vessel, as well as personal habits e.g. dependability, reliability, etc.
- ❑ Was the Vessel already moored, or did a vehicle tow it to the launch point?
- ❑ License plate number and description of the tow vehicle, and/or passenger transport vehicle.
- ❑ Communications equipment aboard, including type of radio and frequencies monitored, cellular or satellite telephone numbers of individuals, etc.
- ❑ Additional points of contact along the vessels planned route.
- ❑ Where there any pending commitments e.g. work, appointments, etc.

Continue with **Step 6**

Step 6:

1. Contact your local Law Enforcement agency (Police or Sheriff).
2. Let the dispatcher know that you are responding to a late return or check-in by the persons on board the vessel.
3. The dispatcher will instruct you from here.

   Note: The dispatcher will provide you with the necessary contact or agency connection to get a search and rescue mission started. This is usually handled this way because it puts you closest to the agency conducting the actual search and rescue, eliminating an unnecessary middleman.

   If the dispatcher would like a follow-up call from you on the outcome of the rescue, they will let you know.

4. Continue with **Step 7**.

Step 7: Be patient... you've done everything you can possibly do for now. It is important to keep the telephone available, so emergency personnel can contact you with additional information and/or questions concerning the search and rescue effort.

STOP -- End of Guide

Float Plan Central™ is a service of the U.S. Coast Guard Auxiliary
www.floatplancentral.org

APPENDIX E
INJURY AND ILLNESS FORMS

Federal Employee's Notice of Traumatic Injury and Claim for Continuation of Pay/Compensation

Reset Print

U.S. Department of Labor
Office of Workers' Compensation Programs

Employee: Please complete all boxes 1 - 15 below. Do not complete shaded areas.
Witness: Complete bottom section 16.
Employing Agency (Supervisor or Compensation Specialist): Complete shaded boxes a, b, and c.

Employee Data

1. Name of employee (Last, First, Middle)
2. Social Security Number
3. Date of birth Mo. Day Yr.
4. Sex ☐ Male ☐ Female
5. Home telephone
6. Grade as of date of injury Level Step
7. Employee's home mailing address (include street address, city, state, and ZIP code)
   City State ZIP Code
8. Dependents
   ☐ Wife, Husband
   ☐ Children under 18 years
   ☐ Other

Description of Injury

9. Place where injury occurred (e.g. 2nd floor, Main Post Office Bldg., 12th & Pine)
10. Date injury occurred Mo. Day Yr. Time ☐ a.m. ☐ p.m.
11. Date of this notice Mo. Day Yr.
12. Employee's occupation
13. Cause of injury (Describe what happened and why)
14. Nature of injury (Identify both the injury and the part of body, e.g., fracture of left leg)

a. Occupation code
b. Type code
c. Source code
OWCP Use - NOI Code

Employee Signature

15. I certify, under penalty of law, that the injury described above was sustained in performance of duty as an employee of the United States Government and that it was not caused by my willful misconduct, intent to injure myself or another person, nor by my intoxication. I hereby claim medical treatment, if needed, and the following, as checked below, while disabled for work:

☐ a. Continuation of regular pay (COP) not to exceed 45 days and compensation for wage loss if disability for work continues beyond 45 days. If my claim is denied, I understand that the continuation of my regular pay shall be charged to sick or annual leave, or be deemed an overpayment within the meaning of 5 USC 5584.

☐ b. Sick and/or Annual Leave

I hereby authorize any physician or hospital (or any other person, institution, corporation, or government agency) to furnish any desired information to the U.S. Department of Labor, Office of Workers' Compensation Programs (or to its official representative). This authorization also permits any official representative of the Office to examine and to copy any records concerning me.

Signature of employee or person acting on his/her behalf _____ **Date** _____

Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided by the FECA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both.

Have your supervisor complete the receipt attached to this form and return it to you for your records.

Witness Statement

16. Statement of witness (Describe what you saw, heard, or know about this injury)

Name of witness Signature of witness Date signed
Address City State ZIP Code

Form CA-1
Rev. Apr. 1999

Official Supervisor's Report: Please complete information requested below:

Supervisor's Report

17. Agency name and address of reporting office (include street address, city, state, and ZIP code) | OWCP Agency Code

OSHA Site Code

City | State | ZIP Code

18. Employee's duty station (include street address, city, state, and ZIP code) | City | State | ZIP Code

19. Employee's retirement coverage ☐ CSRS ☐ FERS ☐ Other, (identify)

20. Regular work hours From: ☐ a.m. ☐ p.m. To: ☐ a.m. ☐ p.m.

21. Regular work schedule ☐ Sun. ☐ Mon. ☐ Tues. ☐ Wed. ☐ Thurs. ☐ Fri. ☐ Sat.

22. Date of Injury Mo. Day Yr.

23. Date notice received Mo. Day Yr.

24. Date stopped work Mo. Day Yr. Time: ☐ a.m. ☐ p.m.

25. Date pay stopped Mo. Day Yr.

26. Date 45 day period began Mo. Day Yr.

27. Date returned to work Mo. Day Yr. Time: ☐ a.m. ☐ p.m.

28. Was employee injured in performance of duty? ☐ Yes ☐ No (If "No," explain)

29. Was injury caused by employee's willful misconduct, intoxication, or intent to injure self or another? ☐ Yes (If "Yes," explain) ☐ No

30. Was injury caused by third party? ☐ Yes ☐ No (If "No," go to item 32.)

31. Name and address of third party (include street address, city, state, and ZIP code)

City | State | ZIP Code

32. Name and address of physician first providing medical care (include street address, city, state, ZIP code)

City | State | ZIP Code

33. First date medical care received Mo. Day Yr.

34. Do medical reports show employee is disabled for work? ☐ Yes ☐ No

35. Does your knowledge of the facts about this injury agree with statements of the employee and/or witnesses? ☐ Yes ☐ No (If "No," explain)

36. If the employing agency controverts continuation of pay, state the reason in detail.

37. Pay rate when employee stopped work $ Per

Signature of Supervisor and Filing Instructions

38. A supervisor who knowingly certifies to any false statement, misrepresentation, concealment of fact, etc., in respect of this claim may also be subject to appropriate felony criminal prosecution.

I certify that the information given above and that furnished by the employee on the reverse of this form is true to the best of my knowledge with the following exception:

Name of supervisor (Type or print)

Signature of supervisor | Date

Supervisor's Title | Office phone

39. Filing instructions
- ☐ No lost time and no medical expense: Place this form in employee's medical folder (SF-66-D)
- ☐ No lost time, medical expense incurred or expected: forward this form to OWCP
- ☐ Lost time covered by leave, LWOP, or COP: forward this form to OWCP
- ☐ First Aid Injury

Form CA-1
Rev. Apr. 1999

Instructions for Completing Form CA-1

Complete all items on your section of the form. If additional space is required to explain or clarify any point, attach a supplemental statement to the form. Some of the items on the form which may require further clarification are explained below.

Employee (Or person acting on the employees' behalf)

13) Cause of injury

Describe in detail how and why the injury occurred. Give appropriate details (e.g.: If you fell, how far did you fall and in what position did you land?)

14) Nature of injury

Give a complete description of the condition(s) resulting from your injury. Specify the right or left side if applicable (e.g., fractured left leg; cut on right index finger).

15) Election of COP/Leave

If you are disabled for work as a result of this injury and filed CA-1 within thirty days of the injury, you may be entitled to receive continuation of pay (COP) from your employing agency. COP is paid for up to 45 calendar days of disability, and is not charged against sick or annual leave. If you elect sick or annual leave you may not claim compensation to repurchase leave used during the 45 days of COP entitlement.

Supervisor

At the time the form is received, complete the receipt of notice of injury and give it to the employee. In addition to completing items 17 through 39, the supervisor is responsible for obtaining the witness statement in Item 16 and for filling in the proper codes in shaded boxes a, b, and c on the front of the form. If medical expense or lost time is incurred or expected, the completed form should be sent to OWCP within 10 working days after it is received.

The supervisor should also submit any other information or evidence pertinent to the merits of this claim.

If the employing agency controverts COP, the employee should be notified and the reason for controversion explained to him or her.

17) Agency name and address of reporting office

The name and address of the office to which correspondence from OWCP should be sent (if applicable, the address of the personnel or compensation office).

18) Duty station street address and zip code

The address and zip code of the establishment where the employee actually works.

19) Employers Retirement Coverage.

Indicate which retirement system the employee is covered under.

30) Was injury caused by third party?

A third party is an individual or organization (other than the injured employee or the Federal government) who is liable for the injury. For instance, the driver of a vehicle causing an accident in which an employee is injured, the owner of a building where unsafe conditions cause an employee to fall, and a manufacturer whose defective product causes an employee's injury, could all be considered third parties to the injury.

32) Name and address of physician first providing medical care

The name and address of the physician who first provided medical care for this injury. If initial care was given by a nurse or other health professional (not a physician) in the employing agency's health unit or clinic, indicate this on a separate sheet of paper.

33) First date medical care received

The date of the first visit to the physician listed in item 31.

36) If the employing agency controverts continuation of pay, state the reason in detail.

COP may be controverted (disputed) for any reason; however, the employing agency may refuse to pay COP only if the controversion is based upon one of the nine reasons given below:

a) The disability was not caused by a traumatic injury.

b) The employee is a volunteer working without pay or for nominal pay, or a member of the office staff of a former President;

c) The employee is not a citizen or a resident of the United States or Canada;

d) The injury occurred off the employing agency's premises and the employee was not involved in official "off premise" duties;

e) The injury was proximately caused by the employee's willful misconduct, intent to bring about injury or death to self or another person, or intoxication;

f) The injury was not reported on Form CA-1 within 30 days following the injury;

g) Work stoppage first occurred 45 days or more following the injury;

h) The employee initially reported the injury after his or her employment was terminated; or

i) The employee is enrolled in the Civil Air Patrol, Peace Corps, Youth Conservation Corps, Work Study Programs, or other similar groups.

Employing Agency - Required Codes

Box a (Occupation Code), Box b (Type Code), Box c (Source Code), OSHA Site Code

The Occupational Safety and Health Administration (OSHA) requires all employing agencies to complete these items when reporting an injury. The proper codes may be found in OSHA Booklet 2014, "Recordkeeping and Reporting Guidelines.

OWCP Agency Code

This is a four-digit (or four digit plus two letter) code used by OWCP to identify the employing agency. The proper code may be obtained from your personnel or compensation office, or by contacting OWCP.

Form CA-1
Rev. Apr. 1999

Benefits for Employees under the Federal Employees' Compensation act (FECA)

The FECA, which is administered by the Office of Workers' Compensation Programs (OWCP), provides the following benefits for job-related traumatic injuries:

(1) Continuation of pay for disability resulting from traumatic, job-related injury, not to exceed 45 calendar days. (To be eligible for continuation of pay, the employee, or someone acting on his/her behalf, must file Form CA-1 within 30 days following the injury and provide medical evidence in support of disability within 10 days of submission of the CA-1. Where the employing agency continue's the employee's pay, the pay must not be interrupted unless one of the provision's outlined in 20 CFR 10.222 apply.

(2) Payment of compensation for wage loss after the expiration of COP, if disability extends beyond such point, or if COP is not payable. If disability continues after COP expires, Form CA-7, with supporting medical evidence, must be filed with OWCP. To avoid interruption of income, the form should be filed on the 40th day of the COP period.

(3) Payment of compensation for permanent impairment of certain organs, members, or functions of the body (such as loss or loss of use of an arm or kidney, loss of vision, etc.), or for serious defringement of the head, face, or neck.

(4) Vocational rehabilitation and related services where directed by OWCP.

(5) All necessary medical care from qualified medical providers. The injured employee may choose the physician who provides initial medical care. Generally, 25 miles from the place of injury, place of employment, or employee's home is a reasonable distance to travel for medical care.

An employee may use sick or annual leave rather than LWOP while disabled. The employee may repurchase leave used for approved periods. Form CA-7b, available from the personnel office, should be studied BEFORE a decision is made to use leave.

For additional information, review the regulations governing the administration of the FECA (Code of Federal Regulations, Chapter 20, Part 10) or pamphlet CA-810.

Privacy Act

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. 552a), you are hereby notified that: (1) The Federal Employees' Compensation Act, as amended and extended (5 U.S.C. 8101, et seq.) (FECA) is administered by the Office of Workers' Compensation Programs of the U.S. Department of Labor, which receives and maintains personal information on claimants and their immediate families. (2) Information which the Office has will be used to determine eligibility for and the amount of benefits payable under the FECA, and may be verified through computer matches or other appropriate means. (3) Information may be given to the Federal agency which employed the claimant at the time of injury in order to verify statements made, answer questions concerning the status of the claim, verify billing, and to consider issues relating to retention, rehire, or other relevant matters. (4) Information may also be given to other Federal agencies, other government entities, and to private-sector agencies and/or employers as part of rehabilitative and other return-to-work programs and services. (5) Information may be disclosed to physicians and other health care providers for use in providing treatment or medical/vocational rehabilitation, making evaluations for the Office, and for other purposes related to the medical management of the claim. (6) Information may be given to Federal, state and local agencies for law enforcement purposes, to obtain information relevant to a decision under the FECA, to determine whether benefits are being paid properly, including whether prohibited dual payments are being made, and, where appropriate, to pursue salary/administrative offset and debt collection actions required or permitted by the FECA and/or the Debt Collection Act. (7) Disclosure of the claimant's social security number (SSN) or tax identifying number (TIN) on this form is mandatory. The SSN and/or TIN), and other information maintained by the Office, may be used for identification, to support debt collection efforts carried on by the Federal government, and for other purposes required or authorized by law. (8) Failure to disclose all requested information may delay the processing of the claim or the payment of benefits, or may result in an unfavorable decision or reduced level of benefits.

Note: This notice applies to all forms requesting information that you might receive from the Office in connection with the processing and adjudication of the claim you filed under the FECA.

Receipt of Notice of Injury

This acknowledges receipt of Notice of Injury sustained by
(Name of injured employee)

Which occurred on (Mo., Day, Yr.)

At (Location)

Signature of Official Superior | Title | Date (Mo., Day, Yr.)

*U.S. GPO: 1999-454-865/00104

Form CA-1
Rev. Apr. 1999

Notice of Occupational Disease and Claim for Compensation

Reset Print

U. S. Department of Labor
Office of Workers' Compensation Programs

Employee: Please complete all boxes 1 - 18 below. Do not complete shaded areas.
Employing Agency (Supervisor or Compensation Specialist): Complete shaded boxes a, b, and c.

Employee Data

1. Name of Employee (Last, First, Middle)
2. Social Security Number
3. Date of birth Mo. Day Yr.
4. Sex
5. Home telephone
6. Grade as of date of last exposure Level Step
7. Employee's home mailing address (include street address, city, state, and ZIP code)
   City State ZIP Code
8. Dependents
   - ☐ Wife, Husband
   - ☐ Children under 18 years
   - ☐ Other

Claim Information

9. Employee's occupation
   a. Occupation code
10. Location where you worked when disease or illness occurred (include street address, city, state, and ZIP code)
    City State ZIP Code
11. Date you first became aware of disease or illness Mo. Day Yr.
12. Date you first realized the disease or illness was caused or aggravated by your employment Mo. Day Yr.
13. Explain the relationship to your employment, and why you came to this realization
14. Nature of disease or illness
    OWCP Use - NOI Code
    b. Type code
    c. Source code
15. If this notice and claim was not filed with the employing agency within 30 days after date shown above in item #12, explain the reason for the delay.
16. If the statement requested in item I of the attached instructions is not submitted with this form, explain reason for delay.
17. If the medical reports requested in item 2 of attached instructions are not submitted with this form, explain reason for delay.

Employee Signature

18. I certify, under penalty of law, that the disease or illness described above was the result of my employment with the United States Government, and that it was not caused by my willful misconduct, intent to injure myself or another person, nor by my intoxication. I hereby claim medical treatment, if needed, and other benefits provided by the Federal Employees' Compensation Act.

I hereby authorize any physician or hospital (or any other person, institution, corporation, or government, agency) to furnish any desired information to the U.S. Department of Labor, Office of Workers' Compensation Programs (or to its official representative). This authorization also permits any official representative of the Office to examine and to copy any records concerning me.

Signature of employee or person acting on his/her behalf _____ Date _____

Have your supervisor complete the receipt attached to this form and return it to you for your records.

Any person who knowingly makes any false statement, misrepresentation, concealment of fact or any other act of fraud to obtain compensation as provided by the FECA or who knowingly accepts compensation to which that person is not entitled is subject to civil or administrative remedies as well as felony criminal prosecution and may, under appropriate criminal provisions, be punished by a fine or imprisonment or both.

For sale by the Superintendent of Documents, U.S. Government Printing Office Washington, DC 20402

Form CA-2
Rev. Jan. 1997

Official Supervisor's Report of Occupational Disease: Please complete information requested below

Supervisor's Report

19. Agency name and address of reporting office (include street address, city, state, and ZIP Code) | OWCP Agency Code

OSHA Site Code

City | State | ZIP Code

20. Employee's duty station (include street address, city, state, and ZIP code) | City | State | ZIP Code

21. Regular work hours From: ☐ a.m. ☐ p.m. To: ☐ a.m. ☐ p.m.

22. Regular work schedule ☐ Sun. ☐ Mon. ☐ Tues. ☐ Wed. ☐ Thurs. ☐ Fri. ☐ Sat.

23. Name and address of physician first providing medical care (include city, state, ZIP code)

City | State | ZIP Code

24. First date medical care received Mo. Day Yr.

25. Do medical reports show employee is disabled for work? ☐ Yes ☐ No

26. Date employee first reported condition to supervisor Mo. Day Yr.

27. Date and hour employee stopped work Mo. Day Yr. Time ☐ a.m. ☐ p.m.

28. Date and hour employee's pay stopped Mo. Day Yr. Time ☐ a.m. ☐ p.m.

29. Date employee was last exposed to conditions alleged to have caused disease or illness Mo. Day Yr.

30. Date returned to work Mo. Day Yr. Time ☐ a.m. ☐ p.m.

31. If employee has returned to work and work assignment has changed, describe new duties

32. Employee's Retirement Coverage ☐ CSRS ☐ FERS ☐ Other, (Specify)

33. Was injury caused by third party? ☐ Yes ☐ No If "No," go to item 34.

34. Name and address of third party (include street address, city, state, and ZIP code)

City | State | ZIP Code

Signature of Supervisor

35. A supervisor who knowingly certifies to any false statement, misrepresentation, concealment of fact, etc., in respect to this claim may also be subject to appropriate felony criminal prosecution.

I certify that the information given above and that furnished by the employee on the reverse of this form is true to the best of my knowledge with the following exception:

Name of Supervisor (Type or print)

Signature of Supervisor | Date

Supervisor's Title | Office phone

Form CA-2
Rev. Jan. 1997

Disability Benefits for Employees under the Federal Employees' Compensation Act (FECA)

The FECA, which is administered by the Office of Workers' Compensation Programs (OWCP), provides the following general benefits for employment-related occupational disease or illness:

(1) Full medical care from either Federal medical officers and hospitals, or private hospitals or physicians of the employee's choice.

(2) Payment of compensation for total or partial wage loss.

(3) Payment of compensation for permanent impairment of certain organs, members, or functions of the body (such as loss or loss of use of an arm or kidney, loss of vision, etc.), or for serious disfigurement of the head, face, or neck.

(4) Vocational rehabilitation and related services where necessary.

The first three days in a non-pay status are waiting days, and no compensation is paid for these days unless the period of disability exceeds 14 calendar days, or the employee has suffered a permanent disability. Compensation for total disability is generally paid at the rate of 2/3 of an employee's salary if there are no dependents, or 3/4 of salary if there are one or more dependents.

An employee may use sick or annual leave rather than LWOP while disabled. The employee may repurchase leave used for approved periods. Form CA-7b, available from the personnel office, should be studied BEFORE a decision is made to use leave.

If an employee is in doubt about compensation benefits, the OWCP District Office servicing the employing agency should be contacted. (Obtain the address from your employing agency.)

For additional information, review the regulations governing the administration of the FECA (Code of Federal Regulations, Title 20, Chapter 1) or Chapter 810 of the Office of Personnel Management's Federal Personnel Manual.

Privacy Act

In accordance with the Privacy Act of 1974, as amended (5 U.S.C. 552a), you are hereby notified that: (1) The Federal Employees' Compensation Act, as amended and extended (5 U.S.C. 8101, et seq.) (FECA) is administered by the Office of Workers' Compensation Programs of the U.S. Department of Labor, which receives and maintains personal information on claimants and their immediate families. (2) Information which the Office has will be used to determine eligibility for and the amount of benefits payable under the FECA, and may be verified through computer matches or other appropriate means. (3) Information may be given to the Federal agency which employed the claimant at the time of injury in order to verify statements made, answer questions concerning the status of the claim, verify billing, and to consider issues relating to retention, rehire, or other relevant matters. (4) Information may also be given to other Federal agencies, other government entities, and to private-sector agencies and/or employers as part of rehabilitative and other return-to-work programs and services. (5) Information may be disclosed to physicians and other health care providers for use in providing treatment or medical/vocational rehabilitation, making evaluations for the Office, and for other purposes related to the medical management of the claim. (6) Information may be given to Federal, state and local agencies for law enforcement purposes, to obtain information relevant to a decision under the FECA, to determine whether benefits are being paid properly, including whether prohibited dual Payments are being made, and, where appropriate, to pursue salary/administrative offset and debt collection actions required or permitted by the FECA and/or the Debt Collection Act. (7) Disclosure of the claimant's social security number (SSN) or tax identifying number (TIN) on this form is mandatory. The SSN and/or TIN, and other information maintained by the Office, may be used for identification, to support debt collection efforts carried on by the Federal government, and for other purposes required or authorized by law. (8) Failure to disclose all requested information may delay the processing of the claim or the payment of benefits, or may result in an unfavorable decision or reduced level of benefits.

Note: This notice applies to all forms requesting information that you might receive from the Office in connection with the processing and adjudication of the claim you filed under the FECA.

Receipt of Notice of Occupational Disease or Illness

This acknowledges receipt of notice of disease or illness sustained by:
(Name of injured employee)

I was first notified about this condition on (Mo., Day, Yr.)

At (Location)

Signature of Official Superior | Title | Date (Mo., Day, Yr.)

This receipt should be retained by the employee as a record that notice was filed.

Form CA-2

INSTRUCTIONS FOR COMPLETING FORM CA-2

Complete all items on your section of the form. If additional space is required to explain or clarify any point, attach a supplemental statement to the form. In addition to the information requested on the form, both the employee and the supervisor are required to submit additional evidence as described below. If this evidence is not submitted along with the form, the responsible party should explain the reason for the delay and state when the additional evidence will be submitted.

Employee (or person acting on the Employee's behalf)

Complete items 1 through 18 and submit the form to the employee's supervisor along with the statement and medical reports described below. Be sure to obtain the Receipt of Notice of Disease or Illness completed by the supervisor at the time the form is submitted.

1) Employee's statement

In a separate narrative statement attached to the form, the employee must submit the following information:

a) A detailed history of the disease or illness from the date it started.

b) Complete details of the conditions of employment which are believed to be responsible for the disease or illness.

c) A description of specific exposures to substances or stressful conditions causing the disease or illness, including locations where exposure or stress occurred, as well as the number of hours per day and days per week of such exposure or stress.

d) Identification of the part of the body affected. (If disability is due to a heart condition, give complete details of all activities for one week prior to the attack with particular attention to the final 24 hours of such period.)

e) A statement as to whether the employee ever suffered a similar condition. If so, provide full details of onset, history, and medical care received, along with names and addresses of physicians rendering treatment.

2) Medical report

a) Dates of examination or treatment.

b) History given to the physician by the employee.

c) Detailed description of the physician's findings.

d) Results of x-rays, laboratory tests, etc.

e) Diagnosis.

f) Clinical course of treatment.

g) Physician's opinion as to whether the disease or illness was caused or aggravated by the employment, along with an explanation of the basis for this opinion. (Medical reports that do not explain the basis for the physician's opinion are given very little weight in adjudicating the claim.)

3) Wage loss

If you have lost wages or used leave for this illness, Form CA-7 should also be submitted.

Supervisor (Or appropriate official in the employing agency)

At the time the form is received, complete the Receipt of Notice of Disease or Illness and give it to the employee. In addition to completing items 19 through 34, the supervisor is responsible for filling in the proper codes in shaded boxes a, b, and c on the front of the form. If medical expense or lost time is incurred or expected, the completed form must be sent to OWCP within ten working days after it is received. In a separate narrative statement attached to the form, the supervisor must:

a) Describe in detail the work performed by the employee. Identify fumes, chemicals, or other irritants or situations that the employee was exposed to which allegedly caused the condition. State the nature, extent, and duration of the exposure, including hours per days and days per week, requested above.

b) Attach copies of all medical reports (including x-ray reports and laboratory data) on file for the employee.

c) Attach a record of the employee's absence from work caused by any similar disease or illness. Have the employee state the reason for each absence.

d) Attach statements from each co-worker who has first-hand knowledge about the employee's condition and its cause. (The co-workers should state how such knowledge was obtained.)

e) Review and comment on the accuracy of the employee's statement requested above.

The supervisor should also submit any other information or evidence pertinent to the merits of this claim.

Item Explanation: Some of the items on the form which may require further clarification are explained below.

14. Nature of the disease or illness
Give a complete description of the disease or illness. Specify the left or right side if applicable (e.g., rash on left leg; carpal tunnel syndrome, right wrist).

19. Agency name and address of reporting office
The name and address of the off ice to which correspondence from OWCP should be sent (if applicable, the address of the personnel or compensation office).

23. Name and address of physician first providing medical care
The name and address of the physician who first provided medical care for this injury. If initial care was given by a nurse or other health professional (not a physician) in the employing agency's health unit or clinic, indicate this on a separate sheet of paper.

24. First date medical care received
The date of the first visit to the physician listed in item 23.

32. Employee's Retirement Coverage.
Indicate which retirement system the employee is covered under.

33. Was the injury caused by third party?
A third party is an individual or organization (other than the injured employee or the Federal government) who is liable for the disease. For instance, manufacturer of a chemical to which an employee was exposed might be considered a third party if improper instructions were given by the manufacturer for use of the chemical.

Employing Agency - Required Codes

Box a (Occupational Code), Box b. (Type Code), Box c (Source Code), OSHA Site Code
The Occupational Safety and Health Administration (OSHA) requires all employing agencies to complete these items when reporting an injury. The proper codes may be found in OSHA Booklet 2014, Record Keeping and Reporting Guidelines.

OWCP Agency Code
This is a four digit (or four digit two letter) code used by OWCP to identify the employing agency. The proper code may be obtained from your personnel or compensation office, or by contacting OWCP.

• U.S. GPO: 2001480-204/59062

OSHA & EPA 301 - Injury, Illness & Near Miss Report

[Form completed by_____Phone#_____Date_____]

Attention: This form contains information relating to employee health and must be used in a manner that protects the confidentiality of employees to the extent possible while the information is being used for occupational safety and health purposes.

Information about the employee

1) Full Name _____

[✓] EPA Employee

[ ] Grantee or other non-EPA Employee

2) EPA Office/Division _____

Building/Room _____

3) Date of birth _____

4) Date hired _____

5) [ ] Male [ ] Female

Information about the "non-governmental" physician or other health care professional

6) Name of physician or other health care professional

_____

_____

7) If away from the worksite, where was the treatment given?

Facility _____

Street _____

City/State _____

8) Was employee treated in an emergency room?

[ ] Yes [ ] No

9) Was employee hospitalized overnight as an in-patient?

[ ] Yes [ ] No

Information about the injury/illness or near miss

10) Location of injury/illness, or near miss _____

11) Date of injury/illness, or near miss _____

12) Time employee began work _____ AM [ ] PM [ ]

13) Time of event _____ AM [ ] PM [ ]

Check if Time Cannot be Determined [ ]

14) Days of Restricted Work Activity [ ]

Days away from Work [ ]

15) **What was the employee doing just before the incident or near miss occurred?** Describe the activity, as well as the tools, equipment or material the employee was using. Be specific. Examples: "climbing a ladder while carrying materials"; "walking down hallway", etc.

16) **What happened?** Tell us how the injury, near miss occurred. Examples: "When ladder slipped on wet floor, worker fell 20 feet"; "Worker developed soreness in wrist over time."

17) **What was the injury or illness?** Tell us the part of the body that was affected and how it was affected; be more specific than "hurt", "pain", or "sore." Examples: "strained back"; "chemical burn, hand"; "carpal tunnel syndrome."

18) **What object or substance directly harmed the employee?** Examples: "floor"; "cabinet door" If this question does not apply to the incident, leave it blank.

19) **If the employee died, when did death occur?** Date and time of death

Information about the Case (To be completed by SHEMP Manager)

20) **Case Number** _____

21) Check one [ ] Near Miss or Recordable Injury or Illness [ ]

22) **Source Code** [ ] Code Description _____

23) **Injury/Illness Nature Code** [ ] Code Description _____

EPA Form 1340-1 (Rev. 07-2007)

APPENDIX F
EMERGENCY NOTIFICATION CHECKLIST

EMERGENCY NOTIFICATION CHECKLIST

Vessel Name:	
Name of the Person Reporting the Incident:	
Date and Time of the Incident:	
Vessel Location:	
Summary of Emergency:	
Type and Severity of the Emergency:	
Fatalities/Injuries/Illnesses:	
Vessel Damage/Mission Impact/SHEM Concerns:	
Assistance Needed:	