OPNAVINST 5100.19F
5 May 2019

NAVY SAFETY AND OCCUPATIONAL HEALTH PROGRAM MANUAL FOR FORCES AFLOAT

DEPARTMENT OF THE NAVY

OFFICE OF THE CHIEF OF NAVAL OPERATIONS
WASHINGTON D.C.

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OPNAV INSTRUCTION 5100.19F

From: Chief of Naval Operations

Subj: NAVY SAFETY AND OCCUPATIONAL HEALTH PROGRAM MANUAL FOR FORCES AFLOAT

Ref: (a) OPNAVINST 5100.23G

1. Purpose. To implement the Navy Safety and Occupational Health (SOH) Program Manual and the requirements of reference (a) for afloat commands. This instruction has been completely revised and should be reviewed in their entirety. Major changes are summarized in chapter A1, paragraph 3.

2. Cancellation. OPNAVINST 5100.19E.

3. Applicability. This instruction applies to all U.S. Navy afloat commands. Navy echelon 2 command responsibilities are identified to ensure U.S. Navy afloat commands receive the SOH support they need.

4. Discussion. This instruction provides naval afloat command safety standards and precautions necessary to carry out the program established in reference (a).

5. Action. All afloat commands must comply with the implementing policy guidance stated and established in this instruction. The policies, procedures, and actions prescribed here are published without the necessity for implementing instructions from the echelon 2 commands, bureaus, and offices, except where specifically directed. However, commands having significant SOH responsibilities (e.g., Military Sealift Command (MSC)) should provide appropriate supplemental guidance.

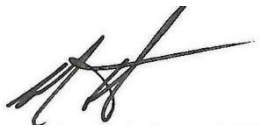
6. Records Management

a. Records created as a result of this instruction, regardless of format or media, must be maintained and dispositioned for the standard subject identification codes 1000 through 13000 series per the records disposition schedules located on the Department of the Navy/Assistant for Administration, Directives and Records Management Division portal page at https://portal.secnav.navy.mil/orgs/DUSNM/DONAA/DRM/Records-and-Information-Management/Approved%20Record%20Schedules/Forms/AllItems.aspx.

b. For questions concerning the management of records related to this instruction or the records disposition schedules, please contact the local records manager or the Department of the Navy/Assistant for Administration, Directives and Records Management Division program office.

7. Review and Effective Date. Per OPNAVINST 5215.17A, the Office of the Chief of Naval Operations (OPNAV) Special Assistant for Safety (N09F) will review this instruction annually on the anniversary of its issuance date to ensure applicability, currency, and consistency with Federal, Department of Defense (DoD), Secretary of the Navy (SECNAV), and Navy policy and statutory authority using OPNAV 5215/40 Review of Instruction. This instruction will be in effect for 10 years, unless revised or cancelled in the interim, and will be reissued by the 10-year anniversary date if it is still required, unless it meets one of the exceptions in OPNAVINST 5215.17A, paragraph 9. Otherwise, if the instruction is no longer required, it will be processed for cancellation as soon as the need for cancellation is known following the guidance in OPNAV Manual 5215.1 of May 2016.

8. Forms. Forms mandated in this instruction manual are listed in chapter A1, paragraph 9.



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Special Assistant for Safety

Releasability and distribution:
This instruction is cleared for public release and is available electronically only via Department of the Navy Issuances Web site, https://www.secnav.navy.mil/doni

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CHAPTER 1

INTRODUCTION

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(b) OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual
(c) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation Reporting, and Record Keeping Manual
(d) SECNAVINST 5030.8C, General Guidance for the Classification of Naval Vessels and Battle Force Ship Counting Procedures
(e) OPNAVINST 5100.25C, Navy Recreation and Off-Duty Safety Program
(f) OPNAVINST 5100.12J, Navy Traffic Safety Program
(g) OPNAVINST 3750.6S, Naval Aviation Safety Management System
(h) NAVSEA OP-4, Ammunition and Explosives

1. Background

a. The Navy has conducted safety and occupational health (SOH) programs for many years. These programs gained special prominence after passage of the Occupational Safety and Health Act (OSH Act) in 1970. The primary thrust of the OSH Act was directed at the private sector employer; however, section 19 of the OSH Act and several subsequent presidential executive orders directed federal agencies to establish and maintain SOH programs.

b. Reference (a) issued policy statements and outlined responsibilities for the implementation of the total SOH program for the Navy. The total SOH program includes all safety disciplines such as system safety, aviation safety, weapons and explosives safety, traffic, recreational and off-duty.

c. The Navy's OSH program manual is contained in reference (b). Due to the many unique and specific situations associated with forces afloat, reference (b) delegates this manual as the primary SOH document for implementing the SOH Program for afloat commands.

d. Reference (c) provides policy and procedures for mishap investigation, reporting, and recording.

2. Purpose and Organization of this Instruction Manual

a. The purpose of this instruction manual is to provide commanding officers, safety officers, managers, supervisors, and workers for afloat commands with a document that gives the guidance and direction to implement the SOH program.

b. This manual addresses all aspects of afloat SOH program management. In some instances, small ships (less than 200 personnel) may have to modify program management to suit the ship class. To ensure uniformity, type commanders (TYCOM) may specify how small ships under their command are to implement the program management aspects of this instruction manual.

c. United States Ship (USS) *Constitution* is a unique ship with most repair and upkeep provided by the Naval History and Heritage Command Detachment Boston. These chapters do not apply to USS *Constitution*: B1, B2, B7, B8, B9, B10, and B11. Parts of chapters A1 through A4, B3, B4, B5, B6, B12, and B13 do apply to the ship and its shore work center. Questions concerning applicability of safety requirements should be addressed to OPNAV N09F.

d. This manual is organized into four sections.

(1) Section A: SOH Program Administration. This section outlines the overall administration, organization, and training aspects of the SOH program, including a statement of policy and a listing of responsibilities.

(2) Section B: Major Hazard Specific Chapters. This section is divided into chapters which address specific hazards such as asbestos management, heat stress, hazardous material (HAZMAT) control and management, radiation protection, electrical safety, gas free engineering, tag-out and personal protective equipment (PPE). This section is addressed to personnel who have SOH management responsibilities and assist the commanding officer in implementing SOH requirements (e.g., safety officer, electrical safety officer, gas free engineer, HAZMAT coordinator, and the medical department representative (MDR)).

(3) Section C: Surface Ship Safety Standards. This section contains basic safety requirements that are applicable to surface ship activities and equipment. These precautions comprise the SOH safety standards for surface ships required by reference (a). It may be necessary, when conducting operations and maintenance on specific systems or equipment, to consult other Navy publications such as the naval ships' technical manuals (NSTM), naval warfare publications, technical manuals and operating manuals, and equipment maintenance requirement cards (MRC) from the planned maintenance system (PMS) for additional safety precautions. This section is written for the individual deck-plate Sailor and his or her supervisor.

(4) Section D: Submarine Safety Standards. This section contains basic safety requirements that are applicable to submarine activities and equipment. These precautions provide similar guidance to submarines as section C does for surface ships. These standards do not duplicate or supersede the safety precautions found in either the standard submarine organization and regulations manual, the ship systems manuals, or the standard operating procedures (SOP) applicable to submarines. These other standards augment section D precautions.

3. Major Changes. Major changes are summarized in the following subparagraphs 3a through 3c.

a. Section A: Safety and Occupational Health Program. Clarified policy on ship safety self-assessments, medical surveillance reporting and moved training requirements into chapters to which they apply.

b. Section B: Major Hazard Specific Elements

(1) Clarified control of asbestos on ships in unique areas such as arc chutes.

(2) Updated automated heat stress system (AHSS) information.

(3) Updated HAZMAT policy to align with the Globally Harmonized System (GHS), environmental requirements in OPNAV Manual 5090.1 of 10 January 2014 and improved data systems.

(4) Revised hearing conservation standards to 85 decibel (dB) and 3 dB doubling to comply with DoD requirements.

(5) Improved sight conservation policy to comply with newer American National Standards Institute requirements.

(6) Updated respiratory protection policy to recognize improved technology and moved policy on some respirators into NSTM 077.

(7) Clarified that primary reference for electrical safety is NSTM 300.

(8) Updated laser safety training requirements.

(9) Clarified when ships need radiation hazard (RADHAZ) surveys

(10) Clarified safety officer responsibility for lead compliance plans and added supervisor responsibilities to monitor and enforce the use of PPE.

(11) Added a new chapter on fall protection to include working aloft, working over the side, and working on elevators, dumbwaiters, conveyors and aerial lifts.

c. Section C: Surface Ship Safety Standards and Section D: Submarine Safety Standards. Updated all chapters to clarify work area specific safety to recognize updated references, Board of Inspection and Survey (INSURV) feedback, and fleet input.

4. Applicability

a. Military Sealift Command (MSC) is required to adhere to United States Coast Guard (USCG) certification requirements for its civil service mariners and USCG inspection requirements for the ships. Additionally, MSC is directed to comply with the International Maritime Organization's Safety of Life at Sea (SOLAS) treaties including the International Safety Management Code and with the American Bureau of Shipping inspection requirements. MSC's civil service mariners are likewise covered by bargaining units for which conditions of work are identified in MSC's civilian mariner's personnel instruction. Because of these factors and the manning complexities for MSC ships, Commander MSC may authorize alternate procedures, as promulgated in MSC's Safety Management System (SMS), that at a minimum provide protection equal to or better than that provided by this manual.

b. Aviation squadrons and other embarked units that are required to comply with reference (b) ashore must coordinate safety program requirements with the ship. Safety officers must adhere to safety requirements in this manual. The provisions also apply to Marine Corps personnel embarked in the aforementioned vessels. Information contained within section A that specifically applies to submarines or that which exempts submarines is annotated as such.

c. Requirements of this instruction are applicable to ship's force on pre-commissioned and commissioned ships not operated by MSC, on combatant and shore support craft as defined by reference (d). Appendix A3-B provides specific applicability guidance from this manual and reference (b) in relation to combatant and shore support craft. Government civilians and contractors on board follow Navy, Occupational Safety and Health Administration (OSHA), or other requirements. Examples include energy control, gas free engineering, HAZMAT, and fire watches. Afloat commands must coordinate with appropriate personnel during pre-planning meetings for availabilities and pier side operations involving shore side personnel to ensure applicable Navy SOH instructions are identified and implemented.

Note: U.S. shores include any State, Guam, Puerto Rico and the U.S. Virgin Island.

d. Under the statutory authority of the Atomic Energy Act of 1954, as amended, and Executive Order 12344, codified in Public Law 98-525, the Director, Naval Nuclear Propulsion Program (Chief of Naval Operations (CNO) (N00N)), is responsible for the safety of reactors and associated naval nuclear propulsion plants, and the control of radiation and radioactivity associated with naval nuclear propulsion plant activities, including prescribing and enforcing standards and regulations for these areas as they affect the environment and the safety and health of workers, operators, and the general public. Nothing in this manual will affect the standards and requirements established by CNO (N00N), for areas under his cognizance. However, for areas other than those described above, such as asbestos control, heat-stress, electrical safety, and gas free engineering, the requirements of this instruction manual apply to activities involved with naval nuclear propulsion.

e. This manual addresses the identification and maintenance of safe and healthful conditions in afloat work places or occupational environments. Recreational and off-duty safety and traffic safety program requirements are provided in references (e) and (f). Some, but not all, of aviation safety and explosives safety are addressed in section B of this instruction manual. Additional guidance in these areas is provided in references (g) and (h).

5. References and Definition of Terms. For matters of convenience and organization, references for a specific chapter appear at the beginning of each chapter. Special terms and their definitions appear in the glossary as an appendix at the end of the manual.

6. SOH Manual Changes

a. Users who identify a requirement for a modification to this manual should initiate a change recommendation as per the following subparagraphs 6a(1) and 6a(2).

(1) A proposed alteration to this manual or a safety requirement must be submitted by the identifying command to OPNAV N09F, via the chain of command.

(2) A proposed alteration to a health standard or criterion may be submitted by an individual or command to the Navy and Marine Corps Public Health Center (NMCPHC) via the chain of command. NMCPHC must submit the proposed modification to the Department of the Navy, Bureau of Medicine and Surgery (BUMED), with a recommendation regarding incorporation of the modification into the manual.

b. Modifications to the manual will be made by reviewing user comments as described in the previous subparagraph 6a, by routinely reviewed all references that have been updated, and by coordination with Navy subject matter experts.

7. Terminology. The words “will,” “must,” “should,” and “may” are used throughout this manual. “Will” and “must” are directive in nature and require mandatory compliance. “Should” is a strong recommendation, but compliance is not required. “May,” when used, is optional in nature and compliance is not required.

8. Precedence. In cases of conflicting safety standards among various directives and technical manuals, precedence will be given to the directive issued by the highest authority and of the most recent issue date (e.g., DoD, SECNAV, OPNAV, echelon 2, TYCOM, etc.). For clarification, if there is a conflict between an allowance equipment list (AEL) and an NSTM, the AEL takes precedence. If a standard is not provided within any of those documents, then nationally recognized consensus standards, such as the American National Standards Institute (ANSI) or American Conference of Governmental Industrial Hygienists or other governmental bodies such as the National Institute for Safety and Health (NIOSH) or the National Fire Protection Association (NFPA) may be cited. Any questions on precedence of safety standards afloat may be addressed to OPNAV N09F.

9. Forms

a. The forms listed below in subparagraphs 8a(1) through 8a(9) are available at Naval Forms On-line, https://forms.documentservices.dla.mil/order/.

(1) SECNAV 5100/1 Supervisor's Medical Surveillance and Certification Exam Referral, in chapter A2, subparagraph 3e(6).

(2) OPNAV 3120/5 Safety Hazard Report, in chapter A4, subparagraph 4a(2).

(3) OPNAV 5100/17 Heat Stress Monitoring Sheet, in chapter B2, subparagraph 3c(3)(a).

(4) OPNAV 5100/18 Used Hazardous Material, in chapter B3, subparagraph 4d(2).

(5) OPNAV 5100/23 Working Aloft Check Sheet, in chapter C8, subparagraph 2a.

(6) OPNAV 5100/24 Working Over the Side Check Sheet, in chapter C8, subparagraph 2a.

(7) OPNAV 5100/25 Working in Vertical Trunk Check Sheet, in chapter C8, paragraph 7.

(8) OPNAV 5100/40 Asbestos Repair Workplace Release Checklist in chapter B1, subparagraph 6b.

(9) NAVMED 6260/2 Hazardous Noise Warning Decal, S/N 0105-LF-004-7200, in chapter B4, subparagraph 5c.

(10) NAVMED 6260/2A Hazardous Noise Decal (Wear Double), S/N 0105-LF-004-7800, in chapter B4, subparagraph 5c.

(11) DD 2521 Hazardous Chemical Warning Label (8-1/2" x 11"), S/N 0108-LF-981-2600, in chapter B3, subparagraph 4d.

(12) DD 2522 Hazardous Chemical Warning Label (4" x 6"), S/N 0108-LF-981-3800, in chapter B3, subparagraph 4d.

(13) NAVSEA 1995/93 Prevent Laundry Dryer Fires, S/N 0118-LF-981-6600 in chapter C20, subparagraph 2c(7).

b. The forms listed in subparagraphs 8b(1) through 8b(3) are available at the DoD Forms Management Program Web site, http://www.esd.whs.mil/Directives/forms/.

(1) DD 771 Eyewear Prescription, in chapter B5, subparagraph 4b.

(2) DD 2215 Reference Audiogram, in chapter B4, subparagraph 7a.

(3) DD 2216 Hearing Conservation Data, in chapter B4, subparagraph 7b.

c. SF 600 Chronological Record of Medical Care, in chapter B4, subparagraph 7d, is available for download from the General Service Administration (GSA) form Web site, https://www.gsa.gov/reference/forms#SF.

d. NMCPHC 5100/16 Industrial Hygiene Bulk and Wipe Sample Survey Form in chapter B1, appendix B1-A, paragraph 8, is available in the NMCPHC-TM 6290.91-2 Rev B, Industrial Hygiene Field Operations Manual, http://www.med.navy.mil/sites/nmcphc/industrial-hygiene/industrial-hygiene-field-operations-manual/Pages/default.aspx.

SECTION A

CHAPTER 2

SOH PROGRAM ORGANIZATION AND RESPONSIBILITIES

Ref: (a) SECNAVINST 5100.10K, DON Safety Program
(b) DoD Instruction 6055.01, DoD Safety and Occupational Health (SOH) Program, 14 October 2014
(c) DoD Instruction 6055.05, Occupational and Environmental Health, 11 November 2008
(d) OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual
(e) NMCPHC TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix (Edition 12), August 2015
(f) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual
(g) OPNAVINST 3120.32D, Standard Organization and Regulations of the U.S. Navy
(h) Navy Environmental Health Center (NEHC) TM 6290.91-2, Industrial Hygiene Field Operations Manual, November 2018

1. Policy

a. Navy policy is to maintain safe and healthy working conditions for personnel and enhance operational readiness and mission accomplishments by establishing an aggressive SOH program that will reduce operational and occupational injuries, illnesses or deaths, and material loss or damage. The safety aspects of the program address the elimination or control of hazards that can result in immediate injury or death. The occupational health aspects are primarily concerned with the identification, elimination, or control of hazardous chemical, physical, and biological agents with potentially adverse health effects. Also included is the diagnosis and treatment of work-related illnesses and injuries.

b. A successful SOH program that reduces work-related injuries and illnesses results when the program is emphasized at every level of the organization. The Navy's SOH program is built on this principle, and the overall responsibility for the SOH program is vested in the Secretary of the Navy and implemented through the chain of command. The maintenance of safe and healthful working conditions is a responsibility of the chain of command.

2. Overall Navy Program

a. The Assistant Secretary of the Navy (Energy Installations and Environment) is the designated SOH official for the Department of the Navy, per reference (a).

b. Chief of Naval Operations (CNO) is responsible for implementation and management of the SOH program and, in coordination with the Commandant of the Marine Corps, for matters of mutual concern. The CNO:

(1) issues appropriate SOH policy and standards; OPNAV N09F is responsible for developing program policy and guidance and issuing standards under references (b) and (c);

(2) establishes appropriate planning, programming, staffing requirements, and budgeting for the SOH program and training;

(3) ensures that fleet commanders maintain a staff of qualified SOH professionals who will be responsible for maintaining a comprehensive SOH program;

(4) conducts research and development to preclude occupational hazards or exposures from causing physical injury or degrading health status or work performance;

(5) develops SOH program evaluations and inspection criteria;

(6) provides for occupationally-related medical support;

(7) develops procedures for prompt investigation of reports of unsafe or unhealthful working conditions and ensures corrective action is taken within appropriate time periods;

(8) ensures personnel receive thorough and continuous training on SOH matters and risk management; and

(9) adopts, develop, and review proposed alternate standards and promulgate SOH standards.

c. Specified systems commands (SYSCOM) responsibilities are contained in reference (d).

d. Chief, BUMED responsibilities are contained in reference (d). BUMED provides all afloat activities with a baseline (initial), periodic, and any supplemental industrial hygiene (IH) surveys and establishes and completes the exposure monitoring plan per reference (e) and updates the exposure assessment during the periodic survey to reflect current findings. For ships with permanently assigned industrial hygiene officers (IHO), see subparagraph 3c(18).

e. Commander, Naval Safety Center (COMNAVSAFECEN). COMNAVSAFECEN, in addition to serving as OPNAV N09F, collects and analyzes mishap data and disseminates lessons learned and other safety information. COMNAVSAFECEN conducts afloat operational safety assessments (AOSA) per chapter A3, paragraph 4, and provides direct support and assistance to fleet units in safety matters upon request. COMNAVSAFECEN sponsors and coordinates the CNO safety awards, and assists as requested with safety investigations. Should

COMNAVSAFECEN identify any critical safety-related (policy, material, training, PMS, etc.) deficiencies in the course of conducting assessments and collecting and analyzing mishap data (casualty report, operational report, etc.), COMNAVSAFECEN will notify the applicable chain of command, SYSCOMs, and stakeholders, as appropriate. This notification serves to bring critical issues to the forefront for resolution and will include recommendations to correct deficiencies and proposed direct or indirect COMNAVSAFECEN support when appropriate.

f. President, Board of Inspection and Survey (INSURV) conducts assessments of the effectiveness of afloat programs in SOH, operational risk management (ORM), mishap and near-mishap investigation and reporting, traffic safety, and recreational off-duty safety and inspects installed safety equipment per technical warrant holder and ship design criteria as part of the regular INSURV inspection process.

g. Commander, U.S. Fleet Forces Command; Commander, U.S. Pacific Fleet; and Commander, Naval Special Warfare Command responsibilities are contained in reference (d). This includes providing policy, direction, guidance, and oversight for SOH matters throughout the fleet; and conducting program evaluations on their respective echelon 3 air, surface, and undersea commands once every 3 years.

h. Air, surface, and undersea TYCOMs. Oversight of subordinate commands' SOH programs and coordination of matters of mutual concern are the primary responsibilities of TYCOMs. Accordingly, these TYCOMs responsibilities are contained in the below subparagraphs 2h(1) through 2h(10).

(1) Ensure that subordinate commands implement the SOH afloat program. Program oversight must be conducted on subordinate commands at least once every 3 years as outlined in the respective TYCOM policy.

(2) Coordinate with Commander, Navy Installations Command, SYSCOMs, COMNAVSAFECEN, and regional and shore host activity commanders regarding support services for traffic, recreation and off-duty safety (RODS), HAZMAT and waste, and other aspects of SOH provided to local afloat units.

(3) Schedule AOSAs for their ships approximately every 6 years and provide feedback as required by subparagraph 2e.

(4) Assign TYCOM SOH responsibilities to qualified personnel as either a primary duty or collateral duty safety officer billet per fleet and TYCOM policy. Ensure assigned TYCOM safety officer(s) have completed the required training in paragraph 4.

(5) Provide SOH assist visits, upon request.

(6) Coordinate and promote those aspects of the SOH program of mutual concern to forces afloat.

(7) Coordinate IH support.

(8) Ensure timely and thorough safety investigations are conducted and reports submitted per reference (f).

(9) Set SOH performance targets and measures, with concurrence of the fleet commanders, for comparison by ship class and operational cycle and provide them to the INSURV. These targets and the measures will be reviewed on an annual basis.

(10) Consolidate safety self-assessment and ship medical surveillance exam completion reports and forward to the appropriate fleet commander per annual guidance provided by Naval Safety Center (NAVSAFECEN) message.

i. Immediate superiors in command (ISIC) are responsible for the tasks in the following subparagraphs 2i(1) through 2i(8).

(1) Assign SOH responsibilities to qualified personnel as either a primary duty or collateral duty safety officer billet per fleet and TYCOM policy. Ensure that the ISIC safety officer completes the required training in paragraph 4.

(2) Mentor and assist afloat commands to ensure that workplace SOH discrepancies beyond shipboard capability to accomplish are identified and prioritized in the workload availability package.

(3) Ensure timely and thorough safety investigations are conducted and reports submitted per reference (f).

(4) Ensure afloat commands complete required baseline and periodic IH surveys.

(5) Ensure that subordinate units complete their annual SOH self-assessments. Consolidate safety self-assessment reports and forward to the appropriate TYCOM.

(6) Ensure that the SOH program, for subordinate commands, is evaluated through AOSAs conducted by the NAVSAFECEN approximately every 6 years or sooner if the ISIC determines that a ship is at risk of a mishap.

(7) Ensure that the unit commanding officer provides a copy of the post-AOSA report with written status of all discrepancies identified during the survey following the guidance in subparagraph 4b(6). The status must be provided to the ISIC within 30 calendar days of the completion of the safety survey.

(a) ISICs must forward a copy of the ship's discrepancy status report to the TYCOM and the NAVSAFECEN within 10 calendar days after receipt of the ship's report.

(b) A follow-up report on the status of uncorrected discrepancies must be provided by the ISIC to the TYCOM and the NAVSAFECEN every 4 months until all discrepancies are completed.

(8) To arrange an AOSA, contact the NAVSAFECEN, Afloat Directorate, via e-mail at SAFE-AFLOAT@navy.mil, or by naval message.

3. Command Program

a. Ships or other afloat units can only achieve a safe and healthy working environment through the full participation and cooperation of all personnel assigned. Establishing and implementing a comprehensive SOH program is achieved through the ship's chain of command.

b. Responsibilities of commanding officers of ships and other afloat units are included in the below suparagraphs 3b(1) through 3b(13).

(1) Implement and maintain an aggressive, comprehensive, and continuing SOH program per fleet and TYCOM policy, this instruction and reference (g).

(2) Designate either a primary duty or collateral duty safety officer billet per fleet and TYCOM policy. Ensure that the safety officer attends the required training in paragraph 4.

(3) Establish objectives that promote maximum cooperation in safety matters at all levels, ensure wide distribution of safety information, monitor the submission of required safety reports to ensure accuracy and timeliness, and maintain appropriate safety records and statistics.

(4) Designate in writing a warfare-qualified command safety manager assistant (SMA) with a pay grade of E-6 or above. An SMA is not required for the USS *Constitution*, submarines, hybrid-crewed ships (i.e., both civil service mariners and active duty military), mine countermeasure (MCM), patrol coastal craft (PC), fast frigates (FF), and littoral combat ships (LCS). If enlisted, they must be rated as a "Must Promote" or better on their last evaluation. Requirements for an SMA are in subparagraph 3d.

(5) Ensure the command has received a baseline IH survey and has a copy of the survey report on-board. Any additional IH information received after the baseline survey, such as the periodic IH survey, or follow-on reports must be appended to the baseline survey.

(6) Ensure the safety and medical departments receive and maintain copies of the baseline, periodic, and any supplemental IH surveys.

(7) Incorporate required SOH training into the command's training program.

(8) Ensure at least 1 command Web-enabled Safety System (WESS) safety authority is appointed and that safety investigations are conducted and reported per reference (f).

(9) Serve as the chair of the safety council.

(10) At a minimum, conduct one safety stand-down per calendar year.

(11) Coordinate with shore installation safety to ensure unit personnel receive orientation on the applicable safety policy specific to the homeport.

(12) Ensure NAVSAFECEN AOSA is conducted per chapter A3, subparagraph 4a, and the post-assessment report is completed as required by chapter A3, subparagraph 4b(6), and provided to the ISIC within 30 calendar days of the completion of the AOSA.

(13) Commanding officers may request an out of cycle AOSA at any time via their chain of command to have the NAVSAFECEN assess their safety culture and provide feedback, best practices and lessons learned.

c. The safety officer is responsible for managing the SOH program per this instruction and reference (g), which includes the following in subparagraphs 3c(1) through 3c(18).

(1) Report directly to, and advise the commanding officer or master, as applicable, on functional SOH matters.

(2) Report directly to the executive officer or chief officer, as applicable, for administrative SOH matters.

(3) Oversee ship-wide planning to implement all elements of the SOH program.

(4) Prepare and submit, through the chain of command, requests for external SOH support such as IH surveys, AOSAs, safety assist visits or technical guidance.

(5) Establish a command WESS safety account and ensure timely and accurate investigation, reporting and record keeping of required mishaps per reference (f).

(6) Ensure that an annual SOH self-assessment is completed by the end of each calendar year. Chapter A3 contains information on conducting self-assessment evaluations. Consolidate the top five safety concerns (program deficiencies and weaknesses, road blocks to successful mishap prevention efforts and workplace hazards) beyond ship’s ability to correct and forward to the ISIC. Additional guidance will be provided by the respective TYCOM.

(7) Maintain and analyze SOH records as per the following subparagraphs 3c(7)(a) through 3c(7)(d).

(a) INSURV, NAVSAFECEN, TYCOM, and afloat training group inspections and assessment reports must be kept until after the next type of inspection and assessment is conducted.

(b) IH surveys keep and all periodic surveys must be kept for the life of the ship.

(c) Mishap reports must be maintained for 2 years or as required by reference (f).

(d) All other records such as safety council and committee meetings, HAZMAT storage (including storage locker) reviews, accident and injury reports, etc., for 2 years.

(8) Schedule and coordinate required SOH training with the training officer or planning board for training. Conduct training as appropriate and ensure records of that training are maintained for 2 years.

(9) Ensure safety petty officers (SPO) complete the required training in paragraph 4.

(10) Ensure all newly reported personnel complete safety indoctrination training (submarines integrate as part of phase one of submarine qualification) as required by chapter B2, subparagraph 4d.

(11) Serve as advisor-recorder of the safety council. Prepare minutes for issuance by the chairperson.

(12) Serve as chairperson of the enlisted safety committee and ensure dissemination of SOH information.

(13) Ensure that SOH discrepancies identified from workplace inspections and other outside assessments (e.g., NAVSAFECEN, INSURV, etc.) that are beyond ship's force capability are properly identified, prioritized, and documented for corrective action.

(14) Complete the required training in paragraph 4.

(15) Analyze accident and injury reports on personnel treated by the medical department and, if reportable, submit as required by reference (f).

(16) Ensure timely processing and follow-up on safety hazard reports submitted by crew members.

(17) Coordinate with the command's traffic safety coordinator and RODS program coordinator to include these programs in the overall SOH program.

(18) On ships where the assigned safety officer or assistant safety officer is an IHO:

(a) maintain and ensure calibration of all IH equipment;

(b) participate in and demonstrate proficiency in asbestos laboratory quality assurance programs as required by the TYCOM;

(c) conduct periodic IH surveys in per references (d) and (h) and ensure the documentation will be recorded as directed by the TYCOM; if assistance is needed, due to the complexity of changes, the IHO will contact the TYCOM IHO;

(d) conduct emergent IH assessments as necessary; and

(e) conduct periodic underway workplace monitoring identified in the IH survey exposure monitoring plan. Forward the original hard copy of periodic sampling documentation to the cognizant BUMED IH activity for technical peer review and defense occupational and environmental health readiness system – industrial hygiene (DOEHRS-IH) data entry and retention.

d. In addition to the requirements in subparagraph 3b(4), the safety manager assistant (SMA) will:

(1) assist the safety officer in managing the SOH program;

(2) complete the required training in paragraph 4;

(3) be able to hold the position for a minimum of 18 months;

(4) complete the Naval Safety Supervisor Course (Naval Education and Training (NAVEDTRA) 14167F) prior to or within 3 months of assignment;

(5) obtain Navy enlisted classification (NEC) 9571, safety technician, within 6 months of assignment;

(6) act as lead assistant to the safety officer and provide leadership, training, and mentorship to SPOs from all departments and divisions;

(7) ensure oversight of all command safety programs;

(8) review department mishap reports prior to safety officer release; and

(9) co-chair the enlisted safety committee.

e. In support of the SOH Program, the ship's medical officer (MO) or MDR must:

(1) participate in the SOH program (e.g., assist division officers and work-center supervisors by providing occupational health consultation);

(2) coordinate external occupational medicine and IH support as necessary;

(3) initiate accident and injury reports on personnel treated by the medical department to the commanding officer via the chain of command with a copy to the safety officer for investigation (and a copy to the officer of the deck (OOD) for entry into the deck log);

(4) coordinate with division officers and work-center supervisors to identify personnel who require medical surveillance;

(5) maintain medical surveillance records and complete or coordinate screening and certification exams as advised in the IH survey or if required for a specific job, and track and document applicable exam completion, including due dates and dispositions for each member enrolled in medical surveillance to ensure medical surveillance exams are completed in the proper time frame;

(6) ensure that the supervisor's SECNAV 5100/1 Supervisor's Medical Surveillance and Certification Exam Referral is completed for all medical surveillance or certification exams within the scope and practice of the MO or MDR - prior to referring personnel to a medical treatment facility (MTF) for a medical surveillance or certification exam, communicate the form to the supporting occupational health clinic, and, when practicable, communication of the form must be through secure, electronic means such as encrypted e-mail or similar method (see chapter A3, paragraph 6, for additional information);

(7) ensure that personnel supervisors are informed of the results of medical surveillance exam disposition (medically qualified, not medically qualified, medically qualified with limitations, etc.); and

(8) ensure that the annual medical surveillance exam completion report spreadsheet is filled out and forwarded to the TYCOM. Refer to chapter A3, subparagraph 6d, for details regarding the spreadsheet.

f. The department heads, division officers, and work-center supervisors must:

(1) ensure that all assigned workspaces are maintained free of hazards and are in compliance with applicable SOH standards;

(2) ensure that all assigned personnel are properly trained, advised of any associated hazards, are equipped and provided with appropriate protective clothing and equipment as stated in MRCs or the ship's IH survey, and complete any required medical surveillance screenings as stated in the ship's IH survey.;

(3) assist the MO and MDR in identifying personnel who require medical surveillance;

(4) take prompt action to abate and correct any identified deficiency under their control;

(5) integrate safety in all activities consistent with mission requirements;

(6) ensure that mishaps, hazards, and near-mishaps are reported to the safety officer;

(7) ensure safety training is documented using Navy career development program databases (e.g., remote administrator (R-Admin)) or other standard electronic or hardcopy means; and

(8) department and division officers must appoint a senior petty officer (E-4 or above) as the division SPO per fleet and TYCOM policy. Departmental and divisional SPOs must have a minimum of 12 months remaining before their projected rotation date. Ensure that SPOs are qualified as required in paragraph 4.

Note: Ships with small departments or divisions may combine to have one SPO.

g. Fleet and TYCOM policies will address which particular ships and submarines will be required to have SPOs. The division SPO or aviation SPO (when embarked onboard ship) will:

(1) advise the department head and division officer on the status of the SOH program and training needs within the department or division including any safety-related items revealed through maintenance, such as non-compliance with or deficiency in the PMS;

(2) conduct department and division SOH training twice a month and ensure documentation of that training is maintained - for small ships, this can be conducted at command quarters;

(3) assist in mishap or hazard investigations and provide recommendations to division officers for correction.

(4) serve on the enlisted safety committee;

(5) perform or supervise the performance of required SPO maintenance index page (MIP) planned maintenance.

(6) Complete required training in paragraph 4.

h. The safety council consists of the commanding officer (chairperson), executive officer, safety officer (advisor-recorder), SMA, training officer, all department heads, MO or MDR, a safety representative from each embarked unit (e.g., air wing safety officer, Marine expeditionary unit safety officer, explosive ordnance disposal detachment), RODS program coordinator, the ship's command master or senior chief petty officer, department and division SPOs, and an SPO from each embarked unit (e.g., aviation SPO or Marine safety specialist). Fleet and TYCOM policies will address which particular ships and submarines will be required to have a safety council. The safety council must meet at least quarterly, maintain minutes, and develop action items based on the afloat unit's scope of operations and hazard or mishap experiences. Safety council meetings may be held in conjunction with other meetings of similar attendance. Minutes of each meeting must be recorded (electronic or hard copy) and retained by the safety officer, with proof that the commanding officer has reviewed and approved the minutes (initials, signature, or electronic signature record). Specifically, the safety council must:

(1) review mishap and hazard statistics compiled by the safety officer; and

(2) review the results of the annual self-assessment (chapter A3, paragraph 3) including the top 5 safety concerns submitted to the ISIC. Monitor the status of any corrective actions to ensure completion.

i. All hands must:

(1) comply with all safety precautions and standards and use required PPE;

(2) promptly report suspected unsafe or unhealthy work procedures or conditions to their immediate supervisor, the division SPO, or the safety officer; and

(3) report injuries, occupational illnesses, or property damage resulting from a mishap immediately to their supervisor.

4. Training

a. TYCOM, group, ISIC, safety officers (primary and collateral duty), craft custodians, and SMAs must complete the afloat safety officer course (A-4J-0020) or the submarine safety officer course (F-4J-0020), as appropriate, prior to or within 6 months of assignment. Safety officers who are graduates of Surface Warfare Officer School (SWOS) department head course meet this

requirement. If operations do not permit the prospective safety officer of SMA to attend formal training prior to assuming the position, he or she must attend formal training at the first opportunity and, in the interim, complete the naval safety supervisor course (NAVEDTRA 14167F) located in the My Navy Portal non-resident training courses.

Notes:

1. On ships where an IHO is the assistant safety officer, the IHO must complete the afloat safety officer course (A-4J-0020) prior to or within 6 months of assignment.

2. On ships where the safety officer has attended and successfully completed the department head course at Surface Warfare Officer School Command, completion of the afloat safety officer course is not required as the department head course contains the A-4J-0020 curriculum and is considered its equivalent.

b. The SMA, in addition to completing the training in subparagraph 4a above, if enlisted must also obtain the NEC 9571 safety technician within 6 months of assignment.

c. SPOs must (not applicable to submarines, MCMs, PCs, and LCSs):

(1) complete watch station 301 of the safety programs afloat (SPA) personnel qualification standard (PQS) (NAVEDTRA 43460-4D) within 6 months of being assigned; and

(2) at least 50 percent of all departmental and divisional SPO's must attend the SPA (course identifying number (CIN) A-493-2099) either classroom or on line course. Squadron divisional SPOs must attend the Aviation Safety Specialist Course (CIN A-493-0065) or SPA course. Both courses are taught by the Naval Safety and Environmental Training Center (NAVSAFENVTRACEN). SPOs must complete this training within 6 months of assignment.

Note: Completion of the SPA or Aviation Safety Specialist course satisfies part of the requirement for the Navy safety technician secondary Navy enlisted classification (SNEC) code 9571. In addition, completion of any of these courses, counts for completion of the fundamental section of the SPA PQS watch station 301.

d. All newly reporting personnel must complete indoctrination training (submarine personnel phase one of submarine qualification) which must include:

(1) introduction of the SOH program and identification of key personnel in the chain of command;

(2) hazard identification and risk assessment of known hazards (heat, noise, asbestos, HAZMAT, and electrical shock, for example as applicable);

(3) safety precautions and standards (section C or D);

(4) safety, warning and caution signs, and deck markings;

(5) procedures for reporting mishaps and hazards;

(6) HAZMATs spill response training including the process of reporting a HAZMAT spill on the ship; and

(7) oil spill emergency response training including the process of reporting an oil spill on the ship.

SECTION A

CHAPTER 3

INSPECTIONS, ASSESSMENTS, ASSISTS, AND MEDICAL SURVEILLANCE

Ref: (a) OPNAVINST 3120.32D, Standard Organization and Regulations of the U.S. Navy
(b) OPNAVINST 5100.12J, Navy Traffic Safety Program
(c) OPNAVINST 5100.25C, Navy Recreation and Off-Duty Safety Program
(d) INSURVINST 4730.1H, Trials and Inspections of Surface Ships
(e) INSURVINST 4730.2H, Trials and Inspections of Submarines
(f) OPNAVINST 4780.6F, Policy for Administering Service Craft and Boats in the U.S. Navy
(g) OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual
(h) NSTM 074, Volume III, Gas Free Engineering, revision 6, 1 Aug 2011
(i) NMCPHC TM 6290.91-2, Industrial Hygiene Field Operations Manual, November 2018
(j) NAVSEA S9510-AB-ATM-010 (U), Nuclear Powered Submarine Atmosphere Control Manual, revision 6, 30 Sep 2013
(k) NMCPHC TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix, (12th edition), November 2018
(l) NAVMED, P-117 Manual of the Medical Department (MANMED)
(m) NAVSAFECEN Navy Safety and Supervisor's Guide to Medical Surveillance

1. Discussion. This chapter addresses identifying hazardous conditions and detecting adverse health effects. The principle way to identify hazards is through workplace inspections, assist visits and inspections (e.g., TYCOM, ISIC, INSURV, and NAVSAFECEN). IH surveys are another valuable tool for hazard identification and developing controls to reduce hazards.

2. Safety Inspections. Hazards may be a result of many things, including unsafe work practices, violations of standards contained in sections C or D, neglecting posting of warning or equipment placards, or not following PMS procedures. Identification of hazard trends may warrant a ship-wide safety inspection as part of a safety stand-down to raise the command's safety awareness.

a. Workplace Inspections. Safety inspections must be conducted annually of all work spaces to identify hazardous conditions unsafe work practices and violations of standards. It is not necessary to conduct workplace inspections of all work spaces and equipment at one time. This may be accomplished as part of the regularly scheduled zone or "Division in the Spotlight" inspections required by reference (a). Zone inspectors must be trained by the safety officer to know how to look for hazardous conditions and violations of safety standards including assigning risk assessment codes (RAC). The safety officer must track all safety items to ensure completion as specified in chapter A4, paragraph 5.

b. INSURV Inspections. SOH and environmental protection inspections are conducted by the INSURV during final contract trials (FCT) and regularly scheduled material inspections. In addition to the SOH elements of this instruction, additional items inspected during these material inspections or final contract trials are identified in the traffic safety program, reference (b), RODS program, reference (c), and in the INSURV inspection instructions, references (d) or (e). Oversite inspections of shore support craft are conducted per reference (f). Appendix A3-B provides specific applicability guidance from this manual and reference (g). Copies of all SOH-related discrepancy results from these inspections must be routed to the safety officer to ensure that identified safety hazards are documented, and tracked to correction.

3. Self Assessments

a. Self-assessments of all major hazard-specific items in sections A and B; that are applicable to the afloat unit, must be conducted annually. Self-assessments may be conducted as a single project or staggered throughout the year. Copies of the self-assessment results, hard copy or electronic, will be retained by the safety officer for at least 2 years. The safety officer must ensure that self-assessments are completed and advise the safety council of the results of these self-assessments and status of any corrective actions. At a minimum, INSURV or NAVSAFECEN checklists must be used to conduct self-assessments of the SOH program with the exception of gas free engineering, which must be assessed utilizing the NSTM 074 check sheet in reference (h). Additional guidance is contained in chapter A2, subparagraph 3c.

b. Self-assessment items that cannot be immediately corrected must be identified with a RAC and entered into the hazard abatement tracking system. Commands must take all necessary steps to correct hazards and deficiencies. Commands must complete and submit self-assessment results as required by chapter A2, subparagraph 3c.

4. AOSA

a. The AOSA is conducted by the NAVSAFECEN in 1 or 2 days depending on the size of the ship, and either underway (preferred) or pier side. Assessments should be conducted approximately every 6 years for surface ships and submarines or sooner as requested by TYCOMs, ISICs, or the commanding officer if they determine that a ship is at risk of a mishap. For new construction ships the first AOSA should be scheduled within 9 to 12 months after commissioning. The ship's ISIC or TYCOM will schedule ships for safety assessments to correspond to when the safety center assessment team is planned to be in the geographical area, except when TYCOMs, ISICs, or the commanding officer determine that a ship is at risk of a mishap. AOSAs will consist of an in brief, program and material review, monitoring operational risk management (ORM) and time critical risk management (TCRM) practices, an assessment of the unit's safety climate, and an out brief. Program checklists for the surface warfare community is provided on the NAVSAFECEN Web site at http://www.public.navy.mil/navsafecen/Pages/Afloat/surface/surfacewarfare.aspx and program

checklists for the submarines community is provided on the NAVSAFECEN Web site at http://www.public.navy.mil/navsafecen/Pages/Afloat/submarine/submarine.aspx.

(1) For 2-crew submarines (e.g., ballistic missile nuclear power submarine (SSBN) and guided missile nuclear power submarine (SSGN)), the assessment should be conducted during crew turnover when possible so both crew safety programs can be assessed.

(2) For submarines in a major maintenance period (longer than 6 months) conduct an assessment shortly after the submarine has completed sea trials.

(3) For submarine tenders, safety assessments will be scheduled in conjunction with the MSC safety review to support American Bureau of Shipping requirements for MSC ships.

b. The AOSA's purpose is to increase operational readiness by improving crew awareness in safety and mishap prevention. Emphasis is placed on training personnel to recognize, correct or mitigate safety deficiencies and hazardous conditions. The safety assessment provides the commanding officer with an evaluation of the safety status of the command and an assessment of the ship's safety climate. To increase its value, commanding officers are encouraged to provide the senior assessor, during the in-brief or beforehand, with information that can be used to provide focus on their areas of interest. This can include relevant information from the latest unit safety self-assessment, crew safety survey, afloat culture workshop, etc.

(1) The program and material portion of the AOSA normally consists of nine areas. For ships: electrical, main propulsion, damage control, combat systems, deck, SOH, auxiliary, weapons, and command safety programs. For submarines: safety officer, general departmental, damage control, electrical, mechanical, combat systems, deck, HAZMAT and medical.

(2) Assessment team members conduct a hazard identification walk-through of the ship covering the areas specified above with department and division representatives. The team members identify representative safety hazards and observe how the ship's routine reflects hazard awareness, identification and correction or mitigation using a checklist of safety-related questions. Each assessment attribute question lists the appropriate reference. Team members mark the attributes either "C" (compliant), "R" (requires further action), "NA" (not applicable), or UA (unable to be assessed). Items assessed as an "immediate danger to life and health" (IDLH) with be immediately brought to the command's attention and annotated in the report as "IDLH." For those actions requiring further action, team members will evaluate the degree of non-compliance to the requirement. Line items where there is significant non-compliance will be highlighted for command leadership. Additionally, each discrepancy may be noted as "(R)" (repeat) safety discrepancy, "(A)" (administrative) discrepancy, or "(P)" (PMS) for maintenance related discrepancy on the detailed discrepancy report, or a combination of R, A, and P for each discrepancy.

(3) If the senior assessor, with the consensus of his or her safety assessment team, determines that the number and severity of significant discrepancies found are excessive and deemed to be critical to the safety of the ship and crew, the senior assessor will immediately report the team's findings to COMNAVSAFECEN. Should COMNAVSAFECEN concur with the senior assessor's findings, the unit's chain of command will be notified per chapter A2, subparagraph 2e. The NAVSAFECEN carefully weighs competing principles of preserving safety assessments as an assist for commanding officers verses the need to provide perspective of significant deficiencies to the chain of command.

(4) The ORM and TCRM assessment consists of the assessment team monitoring regularly scheduled evolutions and providing feedback to the ship's application of ORM and TCRM.

(5) The ISIC safety officer is encouraged to attend the out-brief.

(6) The AOSA report consists of an executive summary, and a detailed discrepancy list. A complete preliminary report is provided to the commanding officer at the end of the assessment. TYCOMs and ISICs will receive a copy of the executive summary within 30 days of the assessment, after they are reviewed by COMNAVSAFECEN.

(7) Within 30 days of the completion of the assessment, commanding officers must provide their ISIC with a copy of the post-assessment report with written status of all discrepancies noted in the executive summary and repeat discrepancies identified during the survey. The status must indicate the discrepancies that have been corrected, those on the current ship's maintenance project (CSMP) (including job sequence number); for aircraft carriers (nuclear propulsion) (CVN), those on the total ship information management system (TSIMS), national stock number (NSN), quantities ordered and estimated delivery dates; and those discrepancies that are beyond capability of the command to correct without outside assistance.

5. IH Surveys

a. Navy IH personnel identify, evaluate, and make recommendations to control unacceptable workplace exposures. Exposure assessment of Navy workplaces requires a sound, logical strategy and must be based on reference (i) and this instruction. The purpose of such a strategy is to accomplish at least four goals:

(1) To assess potential health risks to Navy personnel by differentiating between acceptable and unacceptable exposures with the goal to prevent or control unacceptable exposures.

(2) To establish and document a historical record of exposure levels for Navy personnel and to communicate exposure monitoring results.

(3) To ensure and demonstrate compliance with safety and health exposure criteria.

(4) To provide a basis for exposure medical surveillance examinations.

b. The occupational exposure assessment strategy is the plan for identifying, evaluating, and documenting all potential exposures, and for developing controls for occupational exposures that are determined to be unacceptable. The following subparagraphs 5b(1) through 5b(5) outline the basic requirements for an occupational exposure assessment.

(1) Basic Characterization of the Workplace (Walk-through Survey). The first step in the Navy's exposure assessment strategy is to characterize the workplace, workforce and environmental agents. The cognizant IH must conduct a survey of each workplace to obtain, as a minimum, the following information:

(a) Descriptions of operations, tasks and work practices that take place in the workplace (e.g., welding, spray painting). The description must include a layout sketch incorporating relevant aspects of the factors listed below, along with the number of persons assigned to the operation or task and the specific work area(s) occupied. The IH must note the frequency and duration of events occurring within the workplace.

(b) A list of HAZMATs used in the workplace that present significant risk. The list must include a description of use at each workplace. Reproductive hazards and carcinogens must be specifically identified.

Note: IHs must have access to a copy of the authorized use list for the workplaces being surveyed.

(c) A list of physical hazards found in the workplace (e.g., noise, ergonomic stressors, non-ionizing radiation) that present risk. The list must include a brief description of their source(s).

(d) A description of existing controls (e.g., industrial ventilation and PPE).

(2) Exposure Assessment. The IH will assess exposures using all the information available. The outcomes include: groups of workers having similar exposures, definition of an exposure profile for each similarly exposed group and a professional evaluation regarding each exposure profile. The IH will make appropriate control strategy recommendations regarding the workplace, workforce, and environmental agents based on the results of the exposure assessments by using accepted IH practices, which comply with appropriate regulatory requirements.

(3) Further Information Gathering. For exposure profiles that are not well understood, or for which acceptable evaluations cannot be assigned with high confidence, profiles must be further characterized by collecting additional information.

(a) Quantitative Exposure Monitoring. Monitoring the workplace for toxic substances and harmful physical agents is the primary means of assessing:

1. personnel exposures,

2. the need to control exposures, and

3. the effectiveness of measures directed at reducing or eliminating health hazards.

Note: An IH accomplishes these assessments using data gathered from representative sampling programs in the workplace. Analysis and interpretation of the data from this sampling assists in the timely assessment of hazards, in making recommendations for changes to existing conditions, and is used in determining requirements for the medical surveillance of exposed personnel

(b) Qualitative Exposure Decisions. Examples may include exposure modeling, biological monitoring or determining an appropriate occupational exposure level. The IH will determine the appropriate information needed, gather it, and evaluate it to reach an acceptable or unacceptable exposure assessment, determine the appropriate controls and make recommendations for implementation.

(4) Communications and Documentation. Exposure assessment reports and records are critical elements of the exposure assessment process. Reports and records are needed to ensure effective communication of workplace findings and successful continuity of the IH survey.

(5) Reassessment. Consists of workplace monitoring and periodic IH surveys.

c. A baseline IH survey is the first IH survey conducted on a newly commissioned ship or submarine. Afloat activities without baseline IH surveys must contact the supporting Navy environmental and preventive medicine units (NAVENPVNTMEDU) or shore MTFs to arrange a survey. For new construction, initiate the baseline IH survey for new construction ships as soon as possible after acceptance trials and before the commencement of post shakedown availability (PSA). Ships must be in receipt of the completed survey report no later than 6 months after PSA.

d. A periodic IH survey is an update of the baseline IH survey. Periodic IH surveys will be completed every 3 years to address changes that have occurred in work processes, ship

configuration, or equipment. The periodic IH survey will also update exposure assessments related to changes in occupational health policy or exposure standards or both.

(1) The ship must coordinate with the BUMED activity to schedule the periodic IH survey at least 6 months before the IH survey is due. The TYCOM IHO may extend the IH survey periodicity due to circumstances that prevent an update within the 3-year cycle (e.g., a deployment, yard period, or to comply with the readiness cycle).

(2) Commanding officers may consider requesting IH assistance from their supporting NAVENPVNMEDU or MTF, especially following a major availability or major ship alteration. For submarines, detailed atmosphere sampling, per reference (j), is required at the completion of a major shipyard availability or prior to PSA to identify any airborne contaminants resulting from construction activities.

e. After receiving the IH survey report, the safety officer must make it readily available to all departments, divisions, and work-centers. The individual shop sections contain required safety information that is used for hazard awareness and hazard control training within the workplace to include PPE and medical surveillance requirements.

6. Medical Surveillance

a. Purpose. The medical surveillance program is designed to monitor the health of individuals exposed to hazards in the fleet and serves the purposes in the following subparagraphs 6a(1) through 6a(3).

(1) Job certification and recertification to determine an individual's fitness to begin or continue to perform a job safely and effectively.

(2) Secondary prevention to detect early indicators of exposure caused by the work environment before actual illness, disease, or injury occurs and to allow for the timely implementation of corrective actions to prevent long-term adverse effects.

(3) To comply with the requirements of certain SOH standards as noted in section B of this instruction manual.

b. Selection of Personnel. Selection of personnel for hazard based medical surveillance examinations is based primarily on the results of IH surveys and reference (k) for certification exams (e.g., forklift operators, sanitation worker). Selection for some medical surveillance programs may be based on a history of past exposure to certain HAZMATs such as asbestos or cadmium. Job certification and recertification is based on job titles or specific functions performed by the individual. The workplace supervisor, using the recommended medical surveillance requirements from the IH survey and assisted by the safety officer, division officer,

division SPO and MDR, will identify personnel who require medical surveillance following the guidance of enclosure (1) to reference (k), and references (l) and (m).

c. Medical Examinations. Medical examinations include baseline (pre-placement), periodic, termination, certification, and special and follow-up examinations as required by section B. Periodic occupational medical examinations should be scheduled on a birth-month basis or as needed to meet the periodicity requirements. Guidance to medical personnel providing these examinations is outlined in the specific stressor programs contained in reference (j). The Medical Surveillance Toolbox and Supervisor's Guide to Medical Surveillance, both located on the NAVSAFECEN's Web site, http://www.public.navy.mil/navsafecen/Pages/OSH/MedSurv.aspx and http://www.public.navy.mil/navsafecen/Documents/OSH/MedicalSurv/Safety_and_Supervisor%27s_Guide_to_Med_Surveillance.pdf, contain several tools to help both supervisors and MDRs.

(1) SECNAV 5100/1 must be used to document and track medical surveillance and certification program requirements and exam completion for applicable personnel who receive medical surveillance and certification exams by clinics off the ship.

(2) SECNAV 5100/1 should be communicated via encrypted e-mail or other electronic means when feasible. Coordination between MDRs and supporting clinics may be required to determine the most effective means of electronic communication. Hard copy of other non-electronic communications may be used when electronic communications are not feasible.

d. Evaluation of Results

(1) The safety officer, assisted by the MDR, must monitor all medical surveillance results to identify trends related to hazard exposure. The MDR must notify the individual's work-center supervisor, division officer, and safety officer when results of a medical surveillance exam require an individual to be removed or disqualified from performing the duties related to a medical surveillance program. The MDR must also periodically monitor medical surveillance exam compliance by calculating completion rates of required exams using the following formula:

$$\text{Occupational Medical Exam Completion Rate} = \frac{\text{\# of required medical exams completed}}{\text{\# of required medical exams by occupational exposure}}$$

(2) The completion report spreadsheet, available at www.public.navy.mil/navsafecen/pages/osh/medsurv.aspx, automatically calculates compliance using the equation above and must be used to document those medical surveillance exams applicable to the ship. The command medical surveillance exam completion rates must be reported to the TYCOM each year as part of the annual self-assessment report as required in chapter A2, paragraph 3.

e. Maintenance, Retention, and Disposition of Personnel Medical Records. Maintenance, retention, and disposition of personnel medical records must be per reference (l). The IH forwards individual exposure monitoring information to the MDR for review and placement into the individual's medical record. The MDR ensures that the results of all hazard exposure medical examinations and personal exposure records are entered into each individual's medical record. The MDR also informs each individual, verbally or in writing, of the significance of all findings, and provides access to such records upon request. Submarines exceeding the general area continuous exposure limit (CEL) as defined by reference (j) must be recorded in affected crew members' medical records. Recorded information must include time, date, contaminants, concentration, duration of time exceeding the CEL, and any other pertinent information about the exposure.

7. Federal and State Occupational Safety and Health (OSH) Inspections of Navy, Civilian, or Contractor Workplace Aboard Navy Ships. This paragraph provides guidance and procedures regarding requests by Federal or State OSH officials to inspect or investigate Navy civilian or contractor workplaces on board Navy ships in port or located at associated facilities (e.g., industrial activities).

a. Subject to the conditions and exceptions stated below, Navy afloat activities are advised that permission is granted for Federal OSHA compliance officials to be taken aboard U.S. Navy ships in port to conduct safety and health inspections and investigations of Navy civilian and contractor workplaces. State OSH officials must not be granted access aboard naval ships and service craft or in areas of exclusive federal jurisdiction. A summary of inspector access is provided in appendix A3-A.

(1) Except for the limitations imposed in the below subparagraphs 7a(2) and 7a(3), provide OSHA compliance officials, upon request, immediate access to Navy civilian or contractor workplaces where the Navy repair activity or contractor has equipment or other work-related material or paraphernalia in the workplace under Government work or a Government contract. Access to Navy civilian workplaces must be coordinated through the project management team of the lead Navy repair activity. Where Navy civilian or contractor employees have worked or will work but where the work force is no longer deployed or has yet to deploy any work-related material or paraphernalia, forward requests for access to inspect these workplaces by message and by telephone to the CNO (OPNAV N09F), copy to Commander, Naval Sea Systems Command (COMNAVSEASYSCOM), and copy to the Navy repair activity for Navy civilian workers, with information to the chain of command. All message requests must identify the workplace involved and furnish all immediately available details. A reply to such requests will be forthcoming without delay.

(2) If the requested inspection or investigation involves handling or storage of ammunition or explosives, deny the request for access. Report any such request to the CNO (OPNAV N09F), information to the chain of command (and for Navy civilians, to the Navy repair activity), by message.

(3) With respect to nuclear propulsion plant spaces on nuclear-powered ships, to related nuclear shipyard facilities, ashore or afloat, shipboard nuclear support facilities, or to nuclear weapons areas, forward the request for access by message and by telephone to CNO (OPNAV N09F) with copies to COMNAVSEASYSCOM Naval Reactors (NAVSEA 08) and the chain of command. All message requests must identify the workplace involved and furnish all other immediately available details. Withhold access pending receipt of the reply and, where granted, will be subject to the requirements of this chapter and any conditions imposed in the CNO reply. CNO will furnish such a reply expeditiously, and, if possible, within 3 working hours from receipt of the request by the CNO.

(4) In cases of non-nuclear ships or nuclear ships, with the exceptions in subparagraphs 7a(2) and 7a(3), and under the procedures of subparagraph 7(a)(1), access to Navy civilian and contractor workplaces, as defined above, will be granted upon request to Federal OSHA compliance officials. Access will be to conduct inspections and investigations of such workplaces within reasonable limits and in a reasonable manner during regular working hours except when other times are mutually agreed upon by the concerned officials. Access to Navy civilian workplaces must be coordinated through the project management team of the lead Navy repair activity.

(5) OSHA officials must not take photographs. Any photographs requested by OSHA officials must be taken by Navy personnel, must be tentatively classified "confidential," and must not be delivered to OSHA compliance officials until all film, negatives, and photographs have been sent to COMNAVSEASYSCOM Maintenance and Industrial Operations (SEA 04R) and fully screened and censored, as appropriate, in the interest of national security. Also, forward any design or system performance data (e.g., recordings of noise sound level profiles and light level readings) to COMNAVSEASYSCOM Safety Management Division (SEA 04RS) for screening as described above prior to release. This process will normally be completed within a period of 15 working days from receipt of material by Naval Sea Systems Command (NAVSEASYSCOM).

(6) OSHA officials must not be given copies of any federal records or reports. If access to Navy records or reports is requested by OSHA officials, forward the request to the appropriate releasing official(s).

(7) In addition to presenting appropriate identification credentials, all OSHA compliance officials must possess appropriate security clearance for entry into areas where the workplace is located.

(8) Representatives of the ship's commanding officer and the commanding officer of the Navy repair activity or his on-site representative (for Navy civilian employees) must accompany the OSHA compliance official at all times during physical inspection of Navy civilian workplaces. Representatives of the activity contracting officer, and the shore activity commanding officer or officer in charge at which the ship is located, as appropriate, must

accompany the OSHA compliance official at all times during physical inspection of contractor workplaces. A representative of the contractor and a representative of the employees may accompany the OSHA compliance official during the inspection or investigation provided proper security clearances are verified. If there is no authorized employee representative, the compliance official is authorized to consult with a reasonable number of employees only (contractor or Navy civilian), concerning matters of health and safety in the pertinent workplace.

(9) OSHA compliance officials are authorized to question privately the contractor, contractor employee, Navy civilian employee, or their authorized representatives.

b. Unless specifically requested by the responsible OSHA official, commanders and ship commanding officers will not provide contractors with advance notice of OSHA inspections except in cases of apparent imminent danger to Navy or contractor employees. Notification of other Navy activities working aboard the ship is authorized. Any person who violates the foregoing is subject to a fine of not more than $1,000 or to imprisonment of not more than 6 months, or both.

c. Report in writing to the CNO full information regarding any OSHA inspection or investigation aboard ship with a copy to COMNAVSEASYSCOM (Attention: SEA 04RS) and the chain of command.

APPENDIX A3-A
INSPECTION OF DEPARTMENT OF THE NAVY WORKPLACES BY FEDERAL AND STATE OSH REPRESENTATIVES

	AFLOAT		
	Contractor Workplaces	Civilian Workplaces	Exclusively Military Workplaces
FEDERAL OSH REPRESENTATIVES	YES [1,2,3]	YES [1,2,3]	NO
STATE OSH REPRESENTATIVES	NO	NO	NO

Notes: 1. Ships or service craft must be in port; Navy Department will not transport Federal OSHA representatives to ships or service craft that are underway.

2. Federal and State OSH representatives have no jurisdiction over military unique operations or equipment. In addition, these officials are not authorized to inspect workplaces or operations for compliance with any standard implementing section 172 of Title 10, U.S. Code (explosive safety), or sections 2012, 2021, or 2022 of Title 42 U.S. Code (nuclear safety).

3. Inspections may be announced or unannounced.

APPENDIX A3-B
APPLICABILITY OF THIS INSTRUCTION MANUAL IN RELATION TO COMBATANT AND SHORE SUPPORT CRAFT

All combatant craft and support craft, as defined by SECNAVINST 5030.8C, must comply with the requirements of OPNAVINST 5100.23G; however, the following chapters and paragraphs of this instruction manual apply: chapter A1 - subparagraph 1c, paragraph 4, and paragraph 8; chapter A2 - subparagraph 4a; chapter A3 - subparagraph 2c and appendix A3-B; chapter B2; chapter B3, for self-propelled service craft only; chapter B7 - subparagraphs 2c(3) through 2c(5), subparagraphs 2e(1) through 2e(4), subparagraphs 2f(2) through 2f(4), and subparagraph 5a; paragraphs C1, C2, C4, C5, C6, C8, C9, C10, C11, C13, C15, C16, C18, C19, C20, C21, and C22. Chapter A2, subparagraph 4a collateral duty or full time safety officer's requirement applies.

- Chapter B2 (Heat Stress)
- Chapter B3 (HAZMAT) - only applies to self-propelled service craft.
- Chapter B5 (Sight Conservation) - only paragraph 3 applies to service craft.
- Chapter B7 (Electrical Safety) - the following subparagraphs of this chapter apply: subparagraphs 2c(3) through 2c(5); subparagraphs 2e(1) through 2e(4); subparagraphs 2f(3) through 2f(5); and subparagraph 5a.
- Chapter C2 (Dry Cargo Operations and Stores Handling)
- Chapter C4 (Small Boats)
- Chapter C5 (Wire and Fiber Rope)
- Chapter C6 (Ground Tackle and Towing)
- Chapter C8 (Working Over the Side or Aloft; Vertical Trunks; Drydock Safety)
- Chapter C9 (Electrical and Electronic Safety and Tag-Out Precautions)
- Chapter C10 (Shipboard Fuels)
- Chapter C11 (Welding, Cutting, Brazing and Hot Work)
- Chapter C13 (Machinery)
- Chapter C15 (Marine Sanitation Devices (Sewage Systems))
- Chapter C16 (Heavy Weather)
- Chapter C18 (Painting and Preservation)
- Chapter C19 (Food Service and Trash and Garbage Disposal Equipment)
- Chapter C20 (Laundries and Photography Labs and Darkrooms)
- Chapter C21 (Medical and Dental Facilities)
- Chapter C22 (CO_2 Fixed Flooding Systems Safety Precautions and Procedures)

SECTION A

CHAPTER 4

HAZARD CONTROL, REPORTING, AND ABATEMENT

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) OPNAVINST 4790.4F, Ship's Maintenance and Material Management System Policy
(c) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual

1. Discussion. There are three methods of controlling hazards. The first, and preferred, is to prevent the hazard at the design and acquisition stages. The second is to identify and eliminate existing hazards. The third is to reduce the likelihood and severity of mishaps from hazards that cannot be eliminated.

2. Hazard Prevention. Hazards may be prevented or mitigated during the design and acquisition or alteration process. Many effective actions that should be taken to improve safety at those planning and design stages include designing safety improvements, conducting system safety activities (per Military Standard (MIL-STD)-882 – Standard Practice for System Safety), holding design reviews, and developing operating, purchasing, maintenance, and logistical procedures. Such activities are primarily the responsibility of the appropriate SYSCOM, with design input from TYCOMs and others (e.g., life cycle engineering manager, ship program manager, and fleet requirements process). Since upfront activities like these are beyond ship's force, this chapter addresses only those actions which can be taken at the shipboard level to prevent or eliminate hazards.

a. Planned Maintenance. Some hazards arise as the result of an inadequate maintenance program. An effective shipboard planned maintenance program can keep equipment and material from degrading to the point where it becomes an operational hazard.

b. Operating Procedures. SOPs, instructions, or similar directives that are issued to identify the manner in which work is to be performed can prevent hazards from occurring. Obvious examples include tank cleaning, and foul weather operations. Personnel must be familiar with the appropriate SOPs and current updates applicable to their duties.

c. ORM. ORM is the process of identifying, assessing and controlling risks. The systematic ORM process, discussed in reference (a), is applicable to all missions and environments and must be used in the shipboard environment to identify hazards and mitigate risk.

d. Purchasing Procedures. Afloat units procuring material and equipment at the local or unit level can prevent hazards by purchasing approved material or equipment in the proper quantity (i.e., that which can reasonably be expected to be used to accomplish the operation or task for which it was procured). Procurement of unauthorized, or excess, material or equipment can introduce hazards to the workplace, as well as create stowage and disposal problems. HAZMAT is of special concern. All local purchases of potentially HAZMAT will be accomplished as specified in chapter B3.

3. Principles of Hazard Control. Short of complete elimination of the hazard, methods of hazard control, in order of preferred application, are substitution, engineering controls, administrative controls, and use of PPE.

a. Substitution. The risk of injury or illness may be reduced by replacement of an existing process, material, or equipment with a similar item having a lower hazard potential. Care must be exercised in any substitution to ensure that the substitute materials are technically acceptable and that a new hazard is not being introduced. Contact COMNAVSEASYSCOM or Commander, Naval Air Systems Command (COMNAVAIRSYSCOM) for substitution approval. To propose a substitution for a material, tool, or procedure called for on an MRC, submit a PMS feedback report, per reference (b).

b. Engineering Controls. This means of hazard control is accomplished primarily through design and advanced planning. Whenever these methods are used, the cognizant safety officer or industrial hygienist should approve these methods before implementation. Examples of engineering control methods include isolation and ventilation.

(1) Isolation. Isolation is the physical separation of a hazard from personnel to eliminate or minimize contact or exposure. This involves the use of a barrier or limiter and may be in the form of a physical barrier, use of semi-automatic equipment that does not require constant attendance (time-separation), or distance. Examples include machine guards, electrical insulation, sound barriers, and remote controlled equipment.

(2) Ventilation. Potentially hazardous airborne substances may be controlled by ventilation, using one of two methods:

(a) Local Exhaust Ventilation. Local exhaust ventilation captures and removes the contaminant at its point of generation. It is generally the preferred and more economical method of hazard control.

(b) General or Dilution Ventilation. Properly used, general or dilution ventilation can be effective for the removal of large volumes of heated air or for the removal of low toxicity contaminants.

Note: When ventilation is required throughout this instruction, and portable exhaust ventilation will be used to remove the contaminant, exhaust overboard to prevent reentry and recirculation of the contaminant back into spaces of the ship. When ducting is used from the portable ventilation to exhaust overboard, ensure that the ducting is free of any holes or tears to prevent contaminants from being released into spaces where the ducting is being routed through. The preferred location of the portable exhaust fan would be on a weather deck at the tail end of the ducting, vice at the head of the ducting inside the space being ventilated. Locating the fan at the tail end of the ducting ensures that the ducting is under negative pressure and minimizes potential contamination in adjoining spaces from holes or leaks in the ducting.

c. Administrative Control. Hazards can be administratively mitigated in a number of ways, as per the following subparagraphs 3c(1) through 3c(4).

(1) Work practice controls. Establishing effective SOPs that reduce the potential exposure of individuals to chemical or physical hazards.

(2) Limiting employee access to high hazard areas or operations.

(3) Preventive maintenance programs to reduce the potential for leakage of hazardous substances.

(4) Adjusted work schedules that involve either limiting the amount of time that someone can work in a hazardous area or rotating personnel, where permissible (e.g., rotation out of a hot environment into a cool space for rest and recovery is a common practice). Adjusted work schedules are appropriate only when the hazard is recognized as having a limit below which all personnel may be repeatedly exposed without adverse effect. The amount of time by which a limit may be exceeded for short periods without injury depends on several factors such as the nature of the hazard, whether or not the effects are cumulative, the frequency with which the hazard occurs, and the duration of the hazard. All factors must be taken into consideration in determining whether a hazardous condition exists and whether or not exposures above the limit are permitted. Do not allow exposures above established limits without the commanding officer's approval.

d. PPE. Activities must recognize that PPE does nothing to reduce or eliminate the hazard itself. PPE merely establishes a last line of defense, and any breakdown, failure, or misuse of PPE immediately exposes the worker to the hazard. Nevertheless, there are instances where adequate risk mitigation cannot be achieved through other methods and personal protective devices must be used, either alone or in conjunction with other control measures. Training, maintenance of PPE, and user acceptance are key to the successful use of PPE to protect personnel. Chapter B12 discusses PPE in general. Other chapters describe PPE requirements for specific programs and hazards.

4. Hazard Reporting. Detection of unsafe or unhealthful working conditions at the earliest possible time and prompt control of hazards identified as a result is essential to a successful SOH program. Hazard reporting should always be encouraged and may be accomplished by any of the procedures in the following subparagraphs 4a and 4b.

a. Reporting by Individual Crewmembers

(1) All hands are encouraged to orally report unsafe or unhealthful conditions to their immediate supervisor. That supervisor will promptly evaluate the situation and take appropriate corrective actions. Supervisors will contact the division SPO, the division officer, or the safety officer for assistance, if necessary. Inform the reporting crewmember of all actions taken.

(2) Individuals may also report unsafe or unhealthful conditions using OPNAV 3120/5 Safety Hazard Reports. Safety hazard reports must be available to all personnel either hard copy or electronically. The report may be handwritten and should simply state the nature of the condition and its location. Safety hazard reports will be forwarded to the safety officer for action. The reporting member will receive feedback concerning the correction of the safety hazard. If the originator desires that his or her name not be revealed, this should be included in the report.

(a) Upon receipt of a report, the safety officer will advise the cognizant division officer that an unsafe or unhealthful working condition has been reported.

(b) The safety officer will evaluate all submitted reports and assign a RAC to the hazard. A RAC of 1 must be evaluated immediately. RAC 2 or 3 will be evaluated within 3 days (see subparagraph 5f for RAC descriptions). If necessary, the safety officer may request assistance from support activities for the evaluation.

(c) The safety officer will provide any interim and a final response in writing to the originator of the reported condition within 10 working days of report receipt. Interim responses will include the expected date for a final response. If the evaluation identifies a hazard and its causative deficiency, the final response will include a summary of the action taken for abatement of the deficiency. If no significant hazard is found to exist, the reply will include the basis for that determination.

(d) Once the originator receives the final response he or she may contact the safety officer if he or she desire additional information or is dissatisfied with the response. If the originator remains dissatisfied after discussing the matter, the safety officer will advise him or her of the right to appeal to the commanding officer. The appeal (or report) must be in writing and contain, at least, the following information in subparagraphs 4a(2)(d)1 through 4a(2)(d)3.

1. A description of the condition including its location, nature of the alleged hazard, and standards violated (if known). A copy of the original hazard report will suffice.

2. How, when, and to whom the original report was submitted.

3. What actions (if known) were taken as a result of the original report.

(e) The commanding officer, or his or her representative, will respond to the originator of the appeal within 10 working days. An interim response will suffice if the evaluation is incomplete at that time.

b. Command Reporting. Ships may establish their own reporting procedures for safety hazards reported by the crew, SPOs, zone inspections, and those from outside inspections and surveys.

5. Hazard Abatement Procedures

a. Some safety hazards may be corrected by ship's force, while others may require documentation to ensure they are noted for correction during availabilities or maintenance periods. All reported safety hazards not able to be corrected immediately will be recorded and tracked until verified as completed or eliminated.

b. Shipboard hazards that cannot be immediately corrected will be assigned a job sequence number per reference (b), if applicable. The ship's maintenance and material management coordinator will forward the on-board maintenance management system safety report to the safety officer for review.

c. The safety officer will provide all reported safety discrepancies to the division officer in charge of the operation or space evaluated. Upon receipt of this report, the division officer will take prompt action to ensure correction of each identified deficiency.

Note: The senior person on the scene must be notified and must stop all work immediately, when cases of imminent danger are identified, except in an operational emergency. Notify the commanding officer of the situation, and take action as soon as possible. Imminent danger is defined as a shipboard condition that immediately threatens the loss of life, bodily injury, or illness to personnel.

d. The safety officer will maintain documentation of identified safety hazards. The CSMP or other means (e.g. hazard abatement log) may be used as documentation of safety hazards awaiting correction or resolution. Each safety hazard documented will be assigned a RAC. Documentation for hazards will consist of the following per subparagraphs 5d(1) through 5d(3), at a minimum.

(1) Date, location, and description of hazard.

(2) RAC (see subparagraph 5f).

(3) Date and corrective action taken to control or eliminate the hazard.

e. In some instances, where it would be helpful or prudent to notify others outside of the command of the hazard, the safety officer will complete a hazard report. Hazard reports must be submitted in the WESS. Specifics about what should be reported by a hazard report are contained in reference (c).

f. A risk assessment will be conducted on each identified safety hazard that cannot be corrected immediately. The assessment provides a measure of the degree of risk associated with a deficiency by combining both the severity of the hazard and the probability. At the conclusion of the assessment a RAC is assigned, which provides a priority for the correction of deficiencies. The RAC is derived as per the below subparagraphs 5f(1) through 5f(3).

(1) Severity. The severity is an assessment of the worst reasonably expected consequence, defined by degree of injury, illness, or physical damage which is likely to occur as a result of the hazard. Severity categories are assigned Roman numerals according to the criteria in the following table A4-1.

Description	Category	Results
CATASTROPHIC	I	The hazard may cause death, major facility damage, or loss of mission-critical system or equipment.
CRITICAL	II	The hazard may cause severe injury, illness, major property or equipment damage, or significantly degrade mission capability.
MARGINAL	III	The hazard may cause minor injury, illness, minor property or equipment damage, or degrade mission capability.
NEGLIGIBLE	IV	The hazard presents a minimal threat to personnel safety, health, minimal property or equipment damage or little or no adverse impact on mission capability.

Table A4-1

(2) Probability. The probability is the likelihood that a potential consequence may occur as a result of a hazard based on an assessment of such factors as location, exposure in terms of

cycles or hours of operation, and affected population. Probability is assigned a letter according to the following criteria:

Subcategory	Description
A	Likely to occur immediately or in the very near future.
B	Probably will occur in time.
C	May occur in time.
D	Unlikely to occur, but not impossible.

(3) RAC. To derive the RAC from the elements of hazard severity and mishap probability, use the matrix shown below. The RAC is expressed as a single Arabic number (1, 2, 3, 4, or 5) that can be used to help determine hazard abatement priorities.

		Probability			
		A	B	C	D
Severity	I	1	1	2	3
	II	1	2	3	4
	III	2	3	4	5
	IV	3	4	5	5

Code Description

1) Critical Safety or Health Deficiency — Correct as Soon as Possible. This is a deficiency which presents a critical safety hazard to personnel or machinery or health hazard to personnel which must be corrected immediately. This code is to be used for items such as electric shock hazards, inoperative interlock on safety devices, missing or damaged lifelines, inoperable escape scuttles, a leaking refrigerant system into a confined space, leaking component containing polychlorinated biphenyls (PCB), and the like. All efforts must be exerted to correct these items prior to any other maintenance deficiencies. Suspension of use of equipment system or space is mandatory.

2) Serious Safety or Health Deficiency – Suspension of Equipment or System or Space Use is Required. These items deal with serious safety hazards to personnel or machinery or health hazards which must be corrected prior to resuming use of equipment or system or space.

3) Moderate Safety or Health Deficiency -Waiver of Equipment or System or Space Use is Granted Pending Correction of the Item. This category is to be used in cases where the equipment or system or space can be operated or utilized in a satisfactory manner without greatly risking personal injury, serious damage to the Equipment or system or space, or greatly risking personal health.

4) Minor Safety or Health Deficiency. This is a category of safety or health deficiency that should be corrected when resources become available, but use of equipment or system or space is unrestricted.

5) Negligible Safety or Health Deficiency. This category is used to identify those deficiencies that are noted for record purposes and may be corrected when other work is accomplished on the equipment or system or space.

6. Interim Controls

a. As soon as it is recognized that correction of workplace deficiencies is not possible, establish and document appropriate interim controls. Interim controls may consist of physical barriers, written instructions, word passed over the one multi-channel, warning signs, or other measures as deemed appropriate. Interim controls must meet or exceed minimum necessary requirements to prevent future damage to equipment or injury or death to personnel. The safety officer must approve interim safety hazard controls if in effect more than 60 days.

b. Notify the commanding officer if an unabated deficiency is classified as critical or serious (RAC 1 or 2), and determine who will personally approve interim protective measures. The appropriate department head must approve interim controls for other unabated deficiencies.

SECTION B. MAJOR HAZARD SPECIFIC ELEMENTS

CHAPTER 1

ASBESTOS MANAGEMENT

Ref: (a) 29 CFR 1915.1001, Occupational Safety and Health Standards for Shipyard Employment, Asbestos
(b) 29 CFR 1910.1001, Occupational Safety and Health Standards, Asbestos
(c) NMCPHC Technical Manual TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix, Edition 11
(d) NMCPHC Technical Manual TM 6290.91-2, Industrial Hygiene Field Operations Manual, November 2018

1. Discussion

a. Asbestos is a fibrous mineral that can be produced into a material that is fireproof, possesses high tensile strength, good heat and electrical insulating capabilities, and moderate to good chemical resistance. Because of these characteristics, asbestos has traditionally been used as thermal and acoustical insulation, pipe lagging, gaskets, brake and clutch linings, winch and capstan brakes, and roofing and flooring materials.

b. Inhalation of asbestos causes lung disease and cancer. Asbestosis is characterized by fibrosis (scarring) of the lungs and is a progressively worsening disease that can be disabling or even fatal. Asbestos is also a causal factor in the development of lung cancers and of mesothelioma (a cancer of the linings of the chest and abdomen, but primarily the lungs), and asbestos is suspected of causing cancer in other organs. When coupled with smoking, the risk of developing lung cancer is multiplied. Asbestos-related diseases may not appear until 10 to 40 years after exposure.

c. Asbestos insulation and other asbestos-containing materials (ACM) are normally not a health hazard when in good condition, secured in place, and unlikely to be disturbed. Bound asbestos materials, such as most gaskets, floor coverings, and cements are not generally health hazards except when worked by punching, grinding, machining, or sanding; or when the material is deteriorated. Of primary concern is asbestos that has the potential to become airborne through friability (able to be crushed under hand pressure). Gasket material that has been exposed to high heat over time, and damaged asbestos packing materials may also be friable.

d. There are no known acute (immediate) effects associated with exposure to asbestos. However, avoid breathing asbestos dust because of the long term affects it can produce if inhaled. There is only one way to completely prevent the possibility of asbestos-related illness, and that is to eliminate asbestos from the work environment. Since total removal is not possible,

the Navy has instituted a plan to control the use of asbestos and to replace any removed asbestos with a non-asbestos substitute where technically acceptable substitutes have been identified.

e. Asbestos has been used aboard ship in insulation and lagging for high temperature machinery, boilers and piping, gasket material, electrical wiring, certain deck tiles and decorative paneling, and some packing material. For purposes of this afloat instruction, ACM is characterized as one of two types.

(1) Friable. Friable ACM is defined as material that can be crumbled, pulverized, or reduced to powder under hand pressure, thereby releasing airborne fibers. Friable ACM represents the most significant health hazard, because airborne fibers can be released during normal work operations. Typical examples are in the following subparagraphs 1e(1)(a) through 1e(1)(c).

(a) Pipe lagging.

(b) Acoustical insulation.

(c) Sheet gasket material used in high temperature applications.

(2) Non-friable. This form of ACM, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure. The asbestos fibers in these materials cannot be readily released into the air under normal work conditions. Some examples are in the following subparagraphs 1e(2)(a) through 1e(2)(d).

(a) Brake and clutch linings.

(b) Gaskets and adhesives.

(c) Floor tile and adhesives.

(d) Arc chutes and insulating materials in some overload relays.

2. Chapter Organization

a. The chapter has been reorganized to clarify ships' requirements and responsibilities for management of asbestos exposure.

b. There are two categories of asbestos work that can be performed aboard ship (paragraphs 7 and 8). These categories are referred to in this chapter as asbestos work protocols. Individual asbestos work protocols, which detail plan work scope, plan responsibilities, and equipment and training requirements are included for each type of asbestos work.

c. This chapter contains two types of information. Paragraphs 1 through 6 contain information that is general in nature, and is mandatory for all ships. Paragraphs 7 and 8 detail information that is applicable to ships relative to the asbestos work protocol under which the ship must operate.

3. Applicability

a. Navy policy is that asbestos-contaminated insulating materials will not be used on U.S. ships. COMNAVSEASYSCOM cannot definitively establish that a ship is free of ACM. Because of this, and the fact that all U.S. Navy ships contain some form of ACM, all ships must implement the requirements of this chapter prior to performing work on any ACM.

Note: Ships will refer requests for information from the Department of Veterans Affairs to the Navy Asbestos Litigation Support Officer, Naval Sea Systems Command, Environmental Management Division (SEA 04RE), 1333 Isaac Hull Ave SE, Stop 1210, Washington Navy Yard, DC 20376-1210.

b. This chapter, including work protocols, combined with supplemental recommendations and information, such as locations of ACM and suspected ACM, provided as part of the IH survey constitutes the ship's asbestos management plan. Commanding officers must ensure that all required resources and personnel are assigned to accomplish this plan.

c. All ships must implement, at a minimum, the protocol for ship's force (paragraph 7) if they are required to maintain the AEL 2-330024045. A ship may be required to implement and maintain an additional protocol, for emergency asbestos response team (EART) (paragraph 8).

d. Any ship whose keel was laid prior to 1980 will be considered to contain friable asbestos thermal systems insulation (TSI), and must therefore maintain an EART. Ships in this category must implement and maintain both the ship's force (paragraph 7) and EART (paragraph 8) protocols.

e. Any ship whose keel was laid during or after 1980 was prohibited by Federal regulation (reference (a)) from being constructed with TSI, and by definition, does not require an EART. TSI repair work performed by facilities and contractors controlled by U.S. maritime regulations prevented asbestos TSI from being introduced onto the ship. Those same regulations were not always enforceable for work conducted by non-U.S. regulated repair facilities or contractors.

Note: Any ship that has had TSI repair work performed in any non-U.S. Navy regulated facility or a contractor, should be handled as if the ship contains asbestos TSI, unless supporting documentation, such as ship's drawings, work control documents, material history drawings, and prior sample results may be used to determine whether the material to be worked is free of asbestos. If documentation is unavailable, unreliable, or

questionable, a sample of the insulation material will be obtained following the procedures of appendix B1-A and submitted for analysis. If the material is found to contain asbestos, then the port engineer must initiate a contract to have the asbestos material removed. A non-U.S. regulated facility or contractor is defined as "any facility or contractor outside the direct controls of the contracting official for all materials and work practices used during the repair."

4. Identification of Asbestos Hazards

a. The industrial hygienist must identify any hazards associated with asbestos and provide recommended actions to the ship to eliminate or minimize the asbestos hazard. This information must be included in the IH survey.

b. It is necessary to determine if thermal insulation, due to be handled by ship's force for repair or removal, contains asbestos, prior to the time each repair or removal is to be performed. For non-nuclear propulsion spaces, unless supporting documentation, supported by laboratory analysis (see subparagraph 3e note above), can document that ACM was not introduced onto the ship, then a sample of the insulation material will be obtained. If inside 3 nautical miles (nm) of a U.S. shore, then the test, evaluation, and sample collection of potentially ACM can only be conducted by either an Environmental Protection Agency (EPA)-accredited asbestos inspector or a certified industrial hygienist® per reference (b). The 3-day Asbestos Inspector course (CIN A-493-0014, and the 1-day Asbestos Inspector Refresher course (CIN A-493-0015) are offered by the NAVSAFENVTRACEN, and are EPA-accredited. If inside 3 nm, then samples can only be taken by an accredited asbestos inspector or certified industrial hygienist®.

c. For nuclear propulsion spaces, a thorough determination for the presence of asbestos prior to initiating thermal insulation removal will be conducted. If reliable documentation, substantiated by laboratory analysis (see subparagraph 3e note), is not able to document that ACM was not introduced onto the ship, then the insulation material must be sampled following the procedures of appendix B1-A, and submitted for analysis.

d. It is impossible to identify asbestos based solely on a visual inspection. Therefore, thermal insulation, especially on ships that were built before 1980, should be handled as if it contains asbestos, unless the insulation material is shown to be asbestos-free by laboratory analysis or for nuclear propulsion plant spaces by reliable documentation addressed in the subparagraph 3e note. Ships having asbestos identification capability can provide this laboratory service, to positively identify suspected ACMs. Naval shipyards, NAVENPVNTMEDUs, and MTFs may have the capability to test materials for the presence of asbestos or can facilitate sending samples to the accredited IH lab for analysis. Identification by polarizing light microscopy or transmission electron microscopy is acceptable.

Note: Analysis of potentially ACM samples must be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program, or the National Institute for Standards and Technology, or the Round Robin for bulk samples administered by the American Industrial Hygiene Association, or an equivalent nationally-recognized round robin testing program per reference (b).

e. There are many means of marking asbestos-free thermal insulation. Do not rely on any such systems as positive identification of non-asbestos material.

5. Types of Asbestos Work Performed Aboard Navy Ship. For the purposes of this chapter, all work processes involving ACM removal or repair have been divided into two work protocols.

a. Ship's Force Protocol. This protocol details the requirements and procedures for the repair and removal of materials that contain non-friable ACM (paragraph 7). Appendix B1-B details the SOPs for ship's force asbestos work. All ships must comply with the requirements of this protocol.

b. EART Protocol. This protocol details the requirements and procedures for the minor repair and removal of friable ACM (i.e., asbestos work that can be accomplished using proper glove bag procedures (paragraph 8)). Appendix B1-C is the SOP for EART work processes.

c. Management of Asbestos in the Workplace. Navy policy is to eliminate asbestos exposure hazards by substitution of ACM with asbestos-free material, approved under the technical management of NAVSEASYSCOM. Ship’s force will not remove installed ACM which is in good condition, for the sole purpose of eliminating asbestos. Where substitution is not possible, the ship will use engineering controls or PPE. The ship will prohibit the use of administrative controls, (e.g., personnel rotation) as a means of keeping the exposure below the permissible exposure limit (PEL).

d. Warning Signs and Labels

(1) The ship must provide and display warning signs listed below, which comply with reference (a), at each location where asbestos work is performed. Post signs at a sufficient distance from the work area that personnel may read the signs and take necessary steps before entering the area. A listing of required protective equipment may be attached to, or be a part of the sign. The warning sign must state:

DANGER
ASBESTOS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
AUTHORIZED PERSONNEL ONLY WEAR RESPIRATORS AND PROTECTIVE CLOTHING
REQUIRED IN THIS AREA

(2) Affix warning signs to containers of raw materials, mixtures, scrap, waste, debris, samples and other products containing asbestos materials. Print the warning labels in letters of sufficient size and contrast as to be readily visible and legible. Include the following information:

DANGER
CONTAINS ASBESTOS FIBERS
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
DO NOT BREATHE DUST
AVOID CREATING DUST

Note: Analysis of potentially ACM samples must be performed by persons or laboratories with proficiency demonstrated by current successful participation in a nationally recognized testing program such as the National Voluntary Laboratory Accreditation Program, or the National Institute for Standards and Technology, or the Round Robin for bulk samples administered by the American Industrial Hygiene Association, or an equivalent nationally-recognized round robin testing program.

e. Proper Stowage and Offloading of Materials Containing Asbestos

(1) Stowage of Unused Asbestos-Containing Gasket Materials and Packing. Stow asbestos-containing gasket material and packing (e.g., Garlock® asbestos sheets) in double, heavy-duty plastic bags or other suitable impermeable containers. The storage material must be leak tight. Tightly roll plastic bags with contents from closed end to open end, rather than squeeze them, to remove excess air before sealing. This method minimizes the creation of ACM. All bags or containers must be provided with standard asbestos labels per subparagraph 5d(2). Exercise care to prevent bags and other containers from rupturing during transportation and stowage.

Note: ACM storage locations onboard ships are tracked in the relational supply (R supply) database under special material content code (SMCC) “N.”

(2) Handling, Packaging and Offloading of Removed ACM. Adequately wet ACM during removal and maintain wet through disposal. Dispose of the wet waste material in double, heavy-duty (6 millimeters thickness) plastic bags or other suitable impermeable containers. The waste container must be leak tight. Do not overfill the bags. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Provide all bags or containers with standard warning labels per subparagraph 5d(2). Exercise care to prevent bags and other containers from rupturing when being transported to a shore activity for disposal. Accomplish disposal per appendix L of reference (c).

f. Environmental Protection

(1) Repair and removal operations of friable asbestos in appendix B1-C may only be conducted at a distance greater than 3 nm from a U.S. shore. These operations are not subject to EPA emissions and reporting standards for asbestos. However, EPA standards for disposal of ACM apply upon return to port. All ACM will be held on station and disposed of ashore per the appropriate EPA requirements. Routine repair and removal operations of friable asbestos by ship's force personnel will use in appendix B1-C and may only be conducted at a distance greater than 3 nm from a U.S. shore. Emergency repair or removal operations of friable asbestos while at sea will also use appendix B1-C; however, ships must consult legal advice for operations conducted at distances of 3 nm or less from a U.S. shore. Operations conducted at a distance greater than 3 nm from a U.S. shore are not subject to either EPA emissions and reporting standards for asbestos, or OSHA regulations for sample collection (reference (b)). However, EPA standards for disposal of ACM apply upon return to port. All ACM will be held on station and disposed of ashore per the appropriate EPA requirements.

Note: U.S. shores include the United States of America, Guam, the Commonwealth of Puerto Rico, American Samoa, the Commonwealth of the Northern Mariana Islands, the United States Virgin Islands, and any other territory or possession over which the United States exercises sovereignty. This sovereignty would include Naval Station Guantanamo Bay, Cuba. The following is a list of the minor outlying islands that are part of the U.S. insular areas: Bajo Nuevo Bank, Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Islands, Navassa Island, Palmyra Atoll, Serranilla Bank, and Wake Island.

(2) Ships are not authorized to perform non-emergency repairs or removal of either friable or non-friable asbestos within 3 nm of a U.S. shore unless that operation is under the supervision of an EPA-accredited asbestos supervisor per reference (b). Both the 5-day Asbestos Supervisor Initial course (CIN A-493-0069) and the 1-day Asbestos Supervisor Refresher course (CIN A-493-0070) are offered by the NAVSAFENVTRACEN, and are EPA-accredited. Due to inconsistent state-to-state, and increasingly stringent, federal air emissions reporting requirements, each ship is required to contact their TYCOM IHO or regional environmental coordinator (REC) to determine specific local emissions reporting guidance.

6. Workplace Release Criteria

a. Strict adherence to good housekeeping procedures, and dust control measures to minimize release of asbestos fibers during removal or repair of ACMs are the most important and effective means of reducing downtime to reoccupy a workspace after asbestos repair or abatement operations.

b. Before a space, where asbestos work was performed, may be released for unrestricted access, the area must be thoroughly cleaned and inspected. Use OPNAV 5100/40 Asbestos Repair Workplace Release Checklist for this protocol.

7. Protocol for Ship's Force Performing Non-Friable Asbestos Maintenance

a. All Navy ships have non-friable asbestos; therefore, all afloat commands required to maintain AEL 2-330024045 must comply with the specific requirements of this protocol. The SOPs for the work processes authorized for ship's force personnel to perform are found in appendix B1-B. Additionally, all afloat commands are required to comply with the general requirements detailed in paragraphs 1 through 6. Ship's force may perform:

(1) replacement of asbestos-containing gasket and asbestos-containing packing material,

(2) limited asbestos floor tile removal (9 square feet (feet^2) maximum),

(3) preventive maintenance of brake and clutch assemblies, and.

(4) replacement of arc chutes containing asbestos in shipboard circuit breakers.

b. Ship's force protocol responsibilities are below per subparagraphs 7b(1) through 7b(6).

(1) Safety Officer

(a) Ensure that ship's force personnel performing work under this protocol are trained to accomplish the work described in appendix B1-B.

(b) If applicable, ensure that documentation, substantiated by laboratory analysis, is obtained for any repair work performed in non-U.S. Navy-operated facility to ensure that no ACM is introduced onto the ship (see subparagraph 3e note).

(c) Ensure that the ship has the required equipment to accomplish work per this protocol as defined in AEL 2-330024045.

(2) Engineering, Repair, and Aviation Intermediate Maintenance Department Heads (as appropriate)

(a) Provide personnel who work with asbestos, per this protocol, the necessary equipment and protective clothing specified in AEL 2-330024045.

(b) Identify all personnel involved in asbestos repair or removal operations to the MDR. If personnel are entered into the asbestos medical surveillance program (AMSP), ensure personnel report for medical examinations as required.

(c) Ensure that all asbestos-containing waste materials are collected, stowed, and disposed of as required by subparagraph 5d(2).

(d) Ensure that ship's force personnel performing work under this protocol are trained as required in paragraph 9.

(3) MDR. Implement, if applicable, an AMSP, per reference (d). Personnel performing these SOPs are not required to be enrolled into the AMSP.

(4) Division Officers

(a) Notify the safety officer and engineer officer or repair officer prior to performing or authorizing any work that may include the repair or removal of ACM.

(b) Ensure that the workplace is properly cleaned and cleared prior to release for uncontrolled access per paragraph 6. The department head or division officer may designate a leading petty officer to accomplish the workplace release inspection.

(c) Ensure that all mandatory training for work covered in this protocol is conducted. Training requirements are detailed in paragraph 9.

(5) Work-center Supervisors. Train all hands who work in areas where ACM is present to recognize and report damaged ACM.

(6) All Hands

(a) Avoid areas posted with asbestos warning signs. Unless authorized, do not enter an asbestos-posted area.

(b) Inform appropriate supervisor of damage to materials covered under this protocol.

(c) Disposal of Asbestos Waste. Dispose of asbestos waste per subparagraph 5d(2).

8. Protocol for EART

a. All afloat commands meeting the criteria in paragraph 2 must have an EART to perform emergency repair or replacement of ACM. Ships requiring the EART must comply with the general requirements detailed in paragraphs 1 through 6. Each EART team must consist of a supervisor, a cutter, and a cleaner. The EART may perform asbestos emergency repair or removal, limited to small-scale, short-duration repair or maintenance actions conducted at a distance greater than 3 nm from U.S. shore (see subparagraph 5f). Small-scale, short-duration actions are such tasks as minor repairs of asbestos-containing insulation on pipes. The definition of a minor repair includes removal and reinstallation of less than 3 linear feet of pipe insulation or less than 1 square foot ($feet^2$) of insulation on surfaces other than pipe (an amount that can be done within a glove bag). The SOP for this action is found in appendix B1-C.

b. EART responsibilities are following per subparagraphs 8b(1) through 8b(4).

(1) Safety Officer

(a) Inspect each repair operation involving friable asbestos.

(b) Ensure that the ship has the required equipment to accomplish work per this protocol as defined in AEL 2-330024045.

(c) When asbestos removal or repair operations are completed, approve access to work area using the release criteria per paragraph 6.

(2) Engineering or Repair Department Head (as appropriate)

(a) Ensure that a qualified shore intermediate maintenance activity (IMA) is scheduled to do the work, if asbestos work exceeds the scope of this protocol

(b) Provide personnel who work with asbestos, per this protocol, with the necessary equipment and protective clothing specified in AEL 2-330024045.

(c) Identify and provide a list of all personnel involved in asbestos operations to the MDR for consideration for entry into the AMSP.

(d) Ensure that all asbestos-containing waste materials are collected, stowed and disposed of as required by subparagraph 5d(2).

(e) Ensure personnel are trained as required in paragraph 9.

(f) If a repair or removal of ACM, involving an IMA is scheduled, interface with the IMA personnel and attend the pre-work brief (see appendix B1-D).

(3) Division Officer of the Workspace Where Asbestos Work is Being Conducted

(a) Attend the asbestos pre-work brief if required asbestos work exceeds the scope of this protocol (subparagraph 8a and appendix B1-D).

(b) Ensure that all mandatory training for work covered in this protocol is conducted. Training requirements are detailed in paragraph 9.

(4) MDR. Implement an AMSP, per reference (d). All EART personnel are required to be in the AMSP.

c. Personnel engaged in work per this protocol, must wear the protective clothing and equipment listed in AEL 2-330024045.

Note: Critical watchstanders, who must remain in the immediate area where asbestos repair or removal is being conducted are required to wear the same PPE as personnel performing the asbestos work (at least a NIOSH–approved half-mask, air-purifying respirator with P100 filters) and to meet all the requirements for wearing a respirator in chapter B6.

d. Dispose of asbestos waste as required by subparagraph 5d(2).

9. Training

a. Personnel performing any of the SOPs in appendix B1-B must be trained on the specifics of the SOP to be used prior to performing any asbestos work. This training must be accomplished by the safety officer, engineer officer, or a member of the EART.

b. Personnel assigned to the EART must complete the Emergency Asbestos Response Team course (A-760-2166), prior to performing any friable asbestos removal or training of personnel performing any of the SOPs in appendix B1-B.

c. General training is required for all personnel currently exposed, or with the potential for being exposed to asbestos. The MDR or safety officer should conduct training to include:

(1) the health effects and hazards of asbestos, including the association between the exposure to asbestos and the use of tobacco products that may increase the risk of developing lung cancer;

(2) uses of asbestos that could result in an exposure;

(3) engineering controls and work practices associated with an individual's work assignment;

(4) purpose, proper use and limitations of protective equipment;

(5) purpose and description of medical surveillance program;

(6) review of types of SOPs contained in this chapter; and

(7) posting signs and affixing labels.

APPENDIX B1-A
ASBESTOS INSULATION BULK SAMPLE COLLECTION AND SUBMISSION PROCEDURE FOR SHIPS FORCE

This procedure only applies to ships greater than 3 nm from a U.S. shore (see chapter B1, subparagraph 5f, for details). To determine if the thermal insulation to be handled for repair or rip-out is asbestos, a sample of the material must be submitted to the IH department of any NAVENPVNTMEDU, naval hospital, or naval medical clinic, or to the IHO or safety officer aboard a tender for immediate analysis. Following are procedures for collecting a sample suspect asbestos material:

1. Restrict access within 10 feet of the area in which sampling is to be done to only personnel wearing a NIOSH-approved half-mask air-purifying respirator equipped with P100 filters. Respiratory protection must be worn by personnel collecting bulk samples of insulation. Personnel who wear respirators must be qualified as required in chapter B6.

2. Secure supply and exhaust ventilation systems in the area.

3. Lightly moisten the cut area with water using a plastic water spray bottle to control asbestos dust while cutting out bulk insulation samples. Adjust the spray to produce a mist, not a straight stream.

4. While cutting into the lagging, hold a disposable plastic bag under the area for collection of any debris.

5. Only a small sample is required for analysis. Carefully cut an approximate 1/2-inch (or quarter size) diameter core through the outer lagging cloth or paste and through the underlying insulation down to the covered metal surface. For soft insulation material, a knife may be appropriate. For hard preformed insulation, a chisel or sharpened screwdriver may be used. A knife is not safe for use with hard preformed insulation since the increased force necessary to penetrate the insulation makes accidental hand contact with the exposed blade a real probability. The ideal coring device is a sharpened steel punch that can be driven into the preformed insulation. Some Navy shipyards have locally fabricated stainless steel borers, modeled after cork borers but substantially strengthened, for this purpose. Whatever device is used for sampling must be cleaned after each sample to prevent cross-contamination of samples. For boring tools, cleaning with a wire bore-brush followed by a water wash is recommended. A sample should be submitted for every 10 feet of lagging provided that the material appears to be the same. If there are breaks, seams, or changes in the direction of the lagging, a sample for each section is required. A sample for each type of tile and type of gasket or packing should also be submitted.

6. Using forceps, a spatula, some other instrument, or a gloved hand, place the insulation in a 4 by 4-inch polyethylene interlocking seal bag. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Label the exterior of the bag as

required in chapter B1, subparagraph 5d(2). The bag must be marked as to location of the sample, command, sampler's name, date of sample and any sample number, if applicable. Fold and place the labeled bag inside another 4 by 4-inch polyethylene interlocking seal bag.

7. After collecting the sample, cover the exposed insulation with duct tape, place respirator in a plastic bag. Respirators should be cleaned per chapter B6. P100 filters and all rags or material used to wipe down the respirator and tools should be immediately disposed of as asbestos waste per chapter B1, subparagraph 5d(2). Wash hands, tools and sprayer.

8. The collected sample(s) should be submitted by mail or hand-delivered to the cognizant asbestos analysis support facility using the NMCPHC 5100/16 Industrial Hygiene Bulk and Wipe Sample Survey Form.

9. Upon receipt, the sample will be analyzed using polarizing light and dispersion staining microscopy, results recorded on the asbestos identification analytical report and returned to the requesting command. A return phone call of results may also be arranged.

APPENDIX B1-B
STANDARD OPERATING PROCEDURES FOR SHIP'S FORCE PROTOCOL

A. Replacement of Asbestos-Containing Gasket and Packing Material

1. Scope. This SOP covers the repair and replacement of asbestos-containing gaskets or packing in pumps or valves and the replacement of asbestos-containing gaskets in pipes.

2. Stowage. Store all quantities of ACM in sealed impermeable containers or plastic bags and labeled as ACM until needed for repair and replacement per chapter B1, subparagraph 5d(1). Manufacturer's warning labels noting asbestos content are sufficient only if the materials are not removed from that packaging. Repackaged, unlabeled materials must have new labels applied. Similarly stow waste ACMs for shore offload. Post storage areas with asbestos warning signs to advise personnel of asbestos presence per chapter B1, subparagraph 5d(2).

3. PPE. No PPE is required for this SOP.

4. Procedures

a. Personnel must not eat, drink or use tobacco during asbestos-containing gasket and packing maintenance operations.

b. Use an impermeable drop cloth below the work area.

c. Thoroughly wet the gasket or packing material with water prior to removing. For gaskets, wetting should be accomplished after the joint is loosened.

d. Avoid cutting, abrading, or breaking the gasket or packing material. Remove the gasket or packing material intact, if possible.

e. Place wet gasket or packing material into a disposal container and keep it wet until transferred to a closed receptacle.

Note: A sealable, suitably sized plastic bag may be used for temporary stowage until transferred to an appropriately labeled container per chapter B1, subparagraph 5d(2). Do not roll or squeeze the bag to remove excess air before sealing the bag, as this could release ACM.

f. Remove any residue by scraping using wet methods.

Note: Do not use power tools to remove gasket or packing residue.

g. Dispose of gasket or packing material and drop cloth as ACM.

h. Replace all ACMs with approved asbestos-free material, if available. If replacement material contains asbestos, prior to cutting new gasket or packing, thoroughly wet gasket or packing material; then cut. Once the cut gasket or packing is in place, dispose of residual debris, continuing to use wet methods. Wipe up debris with damp rags. Gasket or packing material that is still useable must be placed in asbestos-labeled container or bag and properly secured.

Note: Wire-wound (e.g., flexitallic) gaskets with asbestos between rings need not be wetted prior to installation.

i. At the conclusion of work, either use a cleaner with a high-efficiency particulate air (HEPA) filter (AEL 2-330024045) to vacuum all dusty surfaces, or wet and wipe down with a damp rag. Dispose of damp rag(s) as ACM.

j. Clean and decontaminate all tools with damp rags. Dispose of rags as ACM.

k. Personnel must wash their hands upon completion of gasket or packing repairs or replacements and before eating, drinking, or using tobacco.

5. Offload. Offload the replaced gasket or packing material and any scrap materials as ACM. Handle all rags as asbestos waste. Handle drop cloths as ACM. Once asbestos waste is collected, place in an impermeable ACM-labeled bag and thoroughly wet all waste. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Tape-off the bag and place in second approved asbestos labeled bag (double bag). Seal all bags with a "J" or goose-neck seal and tape securely. Place asbestos waste bags in an ACM-marked barrel or container for offload. Properly label the waste container per chapter B1, subparagraph 5d(2).

B. Limited Asbestos Floor Tile Removal

1. Scope. This SOP covers removal of a limited amount of asbestos-containing floor tile. Limited amount is defined as 9 square feet of tile (approximately nine tiles). The intent of this SOP is operational; not to improve the aesthetics of a space.

2. Stowage. Store all quantities of ACM in sealed impermeable containers or plastic bags and labeled as ACM until needed for repair or replacement (see chapter B1, subparagraph 5d(1)). Manufacturer's warning labels noting asbestos content are sufficient only if the materials are not removed from that packaging. Repackaged, unlabeled materials must have new labels applied. Post storage areas with asbestos warning signs to advise personnel of the presence of asbestos, per chapter B1, subparagraph 5d(2).

3. PPE

a. Respiratory Protection. No respiratory protective equipment is required for this SOP.

b. Gloves. Wear disposable gloves for this action. Surgical gloves are prohibited.

4. Procedures

a. Cordon off an area around the floor tile to be removed using rope or tape and appropriate signs.

Note: Do not eat, drink, or use tobacco in the work area during maintenance operations.

b. Remove the floor tiles from the deck using a putty knife, spatula, or other manual, hand-operated tool. Do not use power tools to remove floor tiles or mastic. Heat guns may be used to remove tiles. Avoid breaking the tiles, if possible.

c. Place removed floor tiles into an ACM labeled container.

d. If mastic will be removed from the deck, remove by scraping using wet methods. Mastic remover may be required to remove all mastic. Ensure mastic remover is authorized by checking the ship's hazardous material list (SHML) or through written commanding officer authorization.

e. Offload tile and mastic as ACM.

f. Use non-asbestos-containing replacement tiles. If replacement tiles contain asbestos, dispose of tile residue and debris as ACM. Wipe up debris with damp rags. Tile material that is still useable must be placed in asbestos-labeled container or bag and properly secured (see chapter B1, subparagraph 5d(1)).

g. At the conclusion of work, either HEPA vacuum all dusty surfaces or wet and wipe them down with a damp rag. Dispose of damp rag(s) as ACM.

h. Remove gloves and dispose of as ACM.

i. Clean all tools and decontaminate with damp rags. Dispose of rags as ACM.

j. Personnel must wash their hands upon completion of tile and mastic removal action and before eating and drinking, chewing gum or tobacco, or applying cosmetics.

5. Offload. Dispose of removed tile and mastic material and any scrap materials as ACM. Handle all rags, disposable clothing, and respirator filters as ACM. Once all asbestos waste is collected, place in an impermeable ACM-labeled bag and thoroughly wet waste. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Tape-off the bag and place in a second approved and appropriately-labeled bag (double bag). Seal all bags with a "J" or goose-neck seal and tape securely. Place bags in an ACM-marked barrel or container for offload. Properly label the waste container per chapter B1, subparagraph 5d(2).

C. Preventive Maintenance on Brake Assemblies

1. Scope. This SOP covers brake PMS on anchor windlass, capstan, and weight handling equipment (hoist, cranes, conveyors, elevators, winches, chainfalls, and come-a-longs) in which brakes are made of ACMs.

2. Stowage. Store all quantities of ACM in impermeable, sealed containers or plastic bags and labeled as ACM per chapter B1, subparagraph 5d(2), until needed for repair or replacement. Manufacturer's warning labels noting asbestos content are sufficient only if the materials are not removed from that packaging. Repackaged, unlabeled materials must have new labels applied. Post storage areas with asbestos warning signs to advise personnel of the presence of asbestos.

3. PPE

a. Wear a NIOSH-approved half-mask air-purifying respirator equipped with P100 filters for this operation. The respiratory protection program manager (RPPM) must ensure that personnel who wear respirators for asbestos are fully qualified and fit tested.

b. Wear disposable impermeable coveralls (Tyvek® type II or equivalent) for this action. Seal the coveralls with tape at the wrists, ankles, and neck. Wear disposable gloves to handle asbestos brake assemblies and tape gloves at the wrists.

4. Procedures

a. Cordon off the area and hang appropriate signs identifying the asbestos hazard.

Note: Do not eat, drink, or use tobacco in the work area during maintenance operations.

b. During brake maintenance activities, control access to the space in which maintenance is being performed. This may require posting a Sailor at each entrance and exit to the space.

c. Use an impermeable drop cloth in the work area to assist in clean-up.

d. Do not use any equipment or perform any operation that liberates fibers or creates dust (e.g., dry sweeping or using an air hose in the work area).

e. Don the approved respirator per subparagraph C3a of this appendix.

f. Before commencing work, either wet the area in which the brake assembly is located or vacuum the area or both, whichever will be required to eliminate asbestos fibers or dust in the area. Use a HEPA filter vacuum to ensure the area is thoroughly clean and good housekeeping is maintained.

CAUTION:

Do not use low pressure air to blow dust out of the brake assembly area.

g. Commence preventive maintenance in brake assembly area including repair or replacement of asbestos-containing components. During maintenance, take care not to use power tools that may generate dust. If a power tool must be used, consult the shipboard safety officer.

h. At the conclusion of work, either use a cleaner with a HEPA filter (AEL 2-330024045) to vacuum all dusty surfaces, or wet and wipe down with a damp rag. Dispose of damp rag(s) as ACM.

i. Place all clothing removed in the reverse order it was applied. Dispose of coveralls as ACM.

j. Remove respirator last. Treat P100 filters as ACM. The respirator face-piece must be decontaminated and returned to proper storage.

k. Ensure all tools are cleaned and decontaminated with damp rags. Dispose of rags as ACM.

l. Personnel will wash their hands upon completion of maintenance action and before eating, drinking, or using tobacco.

m. Upon completion of all work, the safety officer must inspect and clear the area using appendix B1-D prior to allowing general access to the space.

5. Offload. Offload the old brake pads and any scrap materials as ACM. Handle all rags, disposable clothing, respirator filters, and drop cloths as asbestos waste. Once all asbestos waste is collected, place in impermeable, appropriately-labeled bag and wet thoroughly. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Tape off the bag and place in a second impermeable and appropriately-labeled bag (double bag). Seal all bags with a "J" or goose-neck seal and tape securely. Place bags in an ACM-marked barrel or container for offload. Properly label the waste container per chapter B1, subparagraph 5d(2).

D. Preventive Maintenance on Asbestos Arc Chutes

1. Scope. This SOP covers preventive maintenance on the following Air Circuit Breakers (ACB) circuit breakers with arc chutes that contain asbestos.

a. General Electric: all ACB types.

b. Westinghouse: all DBN ACB types.

c. Surge Protection Devices (SPD), Imperial/Gould: ACB-640R, 900RC, 901R, 1600R, 1600HR, 1600HRC, 2000HR, 2000RC (450 volt applications only, does not apply to 5KV 2000RC), 2601R, 2801R, 3200HR, 4000HR.

2. Stowage. Store all quantities of ACM in sealed impermeable containers or plastic bags and labeled as ACM until needed for repair or replacement per chapter B1, subparagraph 5d(1). Manufacturer's warning labels noting asbestos content are sufficient only if the materials are not removed from that packaging. Repackaged, unlabeled materials must have new labels applied. Post storage areas with asbestos warning signs to advise personnel of the presence of asbestos per chapter B1, subparagraph 5d(2).

3. PPE

a. Respiratory Protection. No respiratory protective equipment is required for this SOP.

b. Gloves. Wear disposable gloves to handle asbestos arc chutes. Surgical gloves are prohibited.

c. Goggles. Wear goggles while handling asbestos arc chutes.

4. Procedures

a. Cordon off the area and hang appropriate signs to identify the asbestos hazard.

Note: Do not eat, drink or use tobacco during asbestos-containing arc chute maintenance operations.

b. Arc chute removal and inspection.

(1) Use an impermeable drop cloth below the work area.

(2) Don protective gloves and goggles per subparagraphs D3a and D3b of this appendix.

(3) Once the circuit breaker is racked out and the 3 arc chutes are accessible, prior to removal, visually inspect the arc chutes; if arc chutes appear damaged or degraded in any way, stop and proceed to the step in subparagraph D4c of this appendix. If the arc chutes appears intact, proceed to the next step in subparagraph D4b(4) of this appendix.

(4) Carefully remove the arc chutes from the circuit breaker following the applicable technical manual.

(5) Inspect the arc chutes for degradation or damage using the guidance provided in the MRC and technical manual. If arc chutes are acceptable and will remain in service, set the arc chutes aside in a safe location to ensure they are not damaged and continue performing the remainder of the circuit breaker maintenance per MRC or technical manual. If an arc chute is damaged or degraded, proceed to the step in subparagraph D4c(3) of this appendix.

c. Damaged arc chute procedure.

(1) Use an impermeable drop cloth below the work area.

(2) Don protective gloves and goggles per subparagraphs D3a and D3b of this appendix.

(3) Carefully remove the damaged arc chute following the maintenance procedure and place material into a disposal container. Ensure all loose arc chute material is placed in the container as well.

Note: A sealable, suitably sized plastic bag may be used for temporary stowage until transferred to an appropriately labeled container. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM.

Note: Do not use power tools to remove arc chute material residue.

(4) Remove any residue by wiping with a damp rag(s).

(5) Dispose of arc chute, residue material, gloves and drop cloth as ACM.

(6) Replace arc chute ACM with approved asbestos-free material, if available. Install replacement arc chute following the applicable technical manual.

(7) At the conclusion of work, either use a cleaner with a HEPA filter (AEL 2-330024045) to vacuum all dusty surfaces, or wet and wipe them down with a damp rag. Dispose of damp rag(s) as ACM.

(8) Clean and decontaminate all tools with damp rags. Dispose of rags as ACM.

(9) Personnel must wash their hands upon completion of damaged arc chute replacement and before eating, drinking, or using tobacco.

5. Offload. Offload the replaced arc chute material and any scrap materials as ACM. Handle all rags used to wipe up arc chute material residue as asbestos waste. Handle drop cloths as ACM. Once asbestos waste is collected, place in an asbestos labeled bag and thoroughly wet all wastes. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Tape-off the bag and place in second approved and appropriately labeled bag (double bag). Seal all bags with a "J" or goose-neck seal and tape securely. Place in an ACM-marked barrel or container for offload. Properly label the waste container per chapter B1, subparagraph 5d(2).

APPENDIX B1-C
STANDARD OPERATING PROCEDURES FOR EMERGENCY ASBESTOS RESPONSE TEAM PROTOCOL

1. General. This SOP covers the emergency repair of asbestos-containing lagging. The intent of this SOP is for emergency asbestos lagging repair work, and is not for general maintenance or normal repair of asbestos lagging which must be conducted by an IMA or contractor personnel.

Note: Critical watchstanders, personnel who must remain in the immediate area, due to watch standing requirements, where asbestos repair or removal is being conducted, are required to wear the same PPE as those persons performing the asbestos work.

2. PPE

a. Respiratory Protection. A NIOSH-approved half-mask, continuous flow supplied air respirator must be used. The RPPM must ensure that personnel who wear respirators for asbestos are fully qualified and fit tested.

b. Gloves. Wear disposable gloves for this action. Surgical gloves are prohibited as an outer glove. Surgical or patient exam gloves may be worn as an inner glove during removal operations.

c. Disposable Sacksuits. Wear impermeable coveralls (e.g., Tyvek® or equivalent disposable sacksuits) with integral booties and hood.

d. Boots. Wear rubber slip-resistant booties over the approved booties.

e. Tape. Duct tape must be applied to wrists, ankles, and around the respirator and hood opening. While other tapes may work, duct tape is recommended due to its superior adhesive properties.

3. Procedures

a. Obtain the commanding officer's permission to remove asbestos for emergency repair.

b. Brief the EART.

c. Secure installed ventilation.

d. Cordon off the area around the asbestos lagging to be removed using rope or tape and appropriate signs.

e. Suit up team in required PPE ensuring that all openings are taped shut.

Note: Do not eat, drink, or use tobacco during asbestos emergency repairs.

f. Use an impermeable drop cloth (polyethylene) below the work area.

g. Glove bag procedure

(1) Place any tools, encapsulant, etc., into glove bag before beginning securing operations.

(2) Attach glove bag to area being worked. Be sure to securely close all seams on and around the glove bag with duct tape.

(3) The glove bag should be tested for leaks using smoke tubes. Smoke tubes used in respiratory fit test procedures are ideal for this function. If leaks are found, secure with additional duct tape.

(4) Ensure the HEPA vacuum (AEL 2-330024045) and amended water sprayer are attached to appropriate points on the glove bag and taped to prevent leaks. When using HEPA vacuum to obtain negative pressure in a glove bag, it will be extremely difficult to maintain a negative pressure and accomplish work simultaneously. It is recommended that negative pressure be used only upon the completion of the job, and when the glove bag is being removed from the repair site.

h. Thoroughly wet lagging with the amended water prior to and during the removal operation.

i. Remove the lagging as intact as possible.

j. Clean bare pipe and seal off exposed insulation using approved encapsulation methods.

k. Wash and wipe down inside of glove bag from top to bottom to remove potential fiber contamination.

l. Remove any recoverable tools by holding onto them and pulling them out. The glove should now be inside out. Twist the glove and seal with duct tape. Cut glove from glove bag with scissors or sharp knife, and hold for later decontamination.

m. Turn on HEPA vacuum and twist glove bag in the middle below the vacuum hose. Seal with duct tape and cut in two, cutting in the middle of the tape. Place this into an approved and appropriately labeled disposal bag.

n. Disconnect rest of glove bag and place into asbestos disposal bag.

o. Replace all asbestos-containing lagging with non-asbestos containing lagging.

p. Either HEPA vacuum or wet and wipe any dusty or potentially contaminated surfaces with a damp rag or both vacuum and wet and wipe with a damp rag. Dispose of rags as ACM.

q. Clean and decontaminate all tools with damp rags. Dispose of rags as ACM.

r. Pick up drop cloth and dispose of as ACM.

s. Remove rubber booties and decontaminate with wet rags. Dispose of rags as ACM.

t. Remove the coveralls and dispose of as ACM. It is recommended that the arms be turned inside out, then roll the suit down the body, and pull the legs inside out. This keeps contamination on the suit and away from the body.

u. Remove gloves by turning them inside out, and dispose of as ACM.

v. Remove respirator and decontaminate using warm soapy water.

w. Personnel must shower upon completion of asbestos removal action and before eating and drinking, chewing gum or applying cosmetics.

4. Disposal. Dispose of glove bag, PPE, any scrap materials, all rags, and drop cloths as ACM. Once ACM is collected, place in an impermeable bag and thoroughly wet all wastes. Do not roll or squeeze the bag to remove excess air before sealing the bag as this could release ACM. Tape off the bag and place in a second approved and appropriately labeled bag (double bag). Seal all bags with a "J" or goose neck seal and tape securely. Place in an ACM barrel or container for offload. Properly label the waste container per chapter B1, subparagraph 5d(2).

5. Conflicts. Application of asbestos-control requirements must not be allowed to compromise the requirements for control of radioactive contamination in naval nuclear-powered ships as contained in NAVSEA 0389-LP-028-8000, Radiological Controls for Shipyards. Should conflicts be discovered, submit a proposed resolution to COMNAVSEASYSCOM (SEA 08).

APPENDIX B1-D
ASBESTOS REPAIR OR REMOVAL PRE-WORK BRIEF

To be conducted jointly between the shore repair facility and the vessel receiving asbestos repair or removal support. Prior to conducting asbestos repair or removal operations on a ship, the shore repair facility will conduct a pre-work briefing with the ship's engineering officer, safety officer, and division officer or work-center supervisor to include at least the following:

1. A listing of all spaces that will be affected by the asbestos work. These will include the spaces used for shower facilities if they are required.

2. A discussion of the asbestos controls that will be used to accomplish the work. This will include:

a. the exact location of the asbestos regulated area boundaries;

b. the requirement to secure ship's ventilation in the area of the removal operation and its effect on the ship and personnel;

c. disposal of any waste generated and who will be responsible for its disposal (normally this will be the receiving ship); and

d. air monitoring that will be accomplished and how the results of the general area monitoring will be conveyed to the receiving ship.

3. A discussion of any vital watchstanders the receiving ship may require to remain in the asbestos regulated area. The shore repair facility and the receiving ship will mutually agree to the need for these watchstanders.

4. The planned times that the asbestos area will be isolated and entry restricted.

5. Any additional aspects of the planned work that either party feels should be discussed.

SECTION B

CHAPTER 2

HEAT STRESS

Ref: (a) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual
(b) NAVMED P-5010-3, Manual of Naval Preventive Medicine, Chapter 3: Prevention of Heat and Cold Stress Injuries (Ashore, Afloat, and Ground Forces)
(c) NSTM 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables
(d) NMCPHC Technical Manual TM OEM 6260.6A, Prevention and Treatment of Heat and Cold Stress Injuries

1. Discussion

a. This chapter establishes Navy policy and procedures for the control of personnel exposure to heat stress and applies to all ships, including submarines. Ships must not expose personnel to excessive heat stress and must provide a shipboard work environment that minimizes the probability of such exposure.

b. This chapter applies to heat stress control and personnel protection for most shipboard operating conditions. It does not apply for the determination of heat exposure limits specifically for personnel wearing layered or impermeable clothing such as chemical and biological warfare clothing, firefighting protective clothing or ensemble, or chemical protective clothing (worn for use during clean-up of HAZMAT spills) or any type of body cooling garment or device.

c. Heat stress is any combination of air temperature, thermal radiation, humidity, airflow, workload, and health conditions that may stress the body as it attempts to regulate body temperature. Ships can determine maximum exposure limits for various environmental conditions and individual work rates. Adherence to these maximal heat exposure guidelines can prevent or reduce the adverse physiological effects of heat stress. Sufficient recovery time in a cool environment will help reverse the harmful effects of heat stress. Recognizing personnel heat stress symptoms and obtaining prompt medical attention for affected persons is an all hands responsibility.

d. To obtain accurate and reliable data on heat stress conditions, ships must conduct heat stress surveys to record dry-bulb (DB), wet-bulb (WB), and globe temperature (GT) readings. The Navy uses either a wet-bulb globe temperature (WBGT) meter or an automated heat stress system (AHSS) to measure each of the above temperatures. The WBGT index is calculated

using DB, WB, and GT. The WBGT index and physical exertion level are used to determine how long an individual may be exposed safely to heat stress conditions. Appendix B2-A presents this information in a columnar format by means of the physiological heat exposure limits (PHEL) tables.

e. While heat stress conditions can occur anywhere on board a ship, machinery spaces, laundries, sculleries, galleys, flight decks, and steam catapult rooms are the most likely to have conditions that may cause heat stress. Conditions of elevated heat stress include operations in hot and humid climates, arduous physical tasks, steam and water leaks, boiler air casing leaks, missing or deteriorated thermal insulation, and ventilation system deficiencies. Factors that reduce physical stamina and enhance susceptibility to heat stress injury or illness are dehydration, lack of sleep, illness, certain medications, drugs, alcohol, and the presence of atmospheric contaminants such as combustion gases or fuel vapors.

f. PHEL curve stay-time guidance is not limited to watchstanders, but applies to all personnel present in the workspace. Exposure time for personnel completing their watch rotation but returning to the workspace to perform other duties (e.g., repairs, PMS) may be limited by the existing heat stress conditions. Additionally, the recovery time guidance provided in subparagraph 3d may require a specific rest and recovery time out of the workspace between intervals of working in the space and standing the watch in the workspace.

g. In most individuals, continued (i.e., daily) exposure to heat stress causes a series of physiologic adaptations called acclimatization, whereby the body becomes more efficient in coping with the heat stress. Heat acclimatization occurs gradually, usually requiring 3 weeks or more (although most of the process occurs in the first week).

2. Responsibilities

a. Commanding Officer

(1) Establish and enforce an effective heat stress policy that ensures personnel heat exposures are limited per this chapter except in an operational emergency.

(2) Review and initial daily, heat stress surveys that result in reduced stay times.

(3) Conduct an inquiry into the circumstances surrounding all heat injuries that result in unconsciousness.

(4) Report to the ISIC those material deficiencies, beyond ship's force capability to correct, which contribute to heat stress conditions aboard the ship.

(5) Ensure at least two portable, calibrated, and operable WBGT meters are available onboard.

b. Safety Officer

(1) Ensure heat stress injuries are reported per reference (a).

(2) Ensure the program is evaluated at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

c. MDR

(1) Review all heat stress surveys to determine obvious inaccuracies, reduced PHEL stay times, and any personnel protective actions being taken. Submit heat stress surveys that result in reduced stay times to the commanding officer daily for review. Maintain originals of all heat stress surveys for 1 year.

(2) Provide training as required in paragraph 5.

(3) Report all cases of heat stress related injuries to the safety officer.

(4) Conduct heat-stress surveys of all spaces not under engineering as needed.

(5) For submarines, the MDR conducts heat stress surveys in engineering spaces.

d. Engineer Officer or Reactor Officer

(1) Ensure DB thermometers are installed and maintained per subparagraph 3b(1) and temperatures are monitored and recorded per subparagraphs 3b(3) and 3b(4)

(2) Assign engineering department personnel to perform heat stress surveys in engineering spaces and ensure they are qualified as required in paragraph 5.

(3) Assign and qualify supervisors to review DB temperatures or access AHSS readings and take the required actions per paragraph 3.

(4) Review heat stress surveys and ensure stay times for engineering or reactor personnel are being properly determined as specified per paragraph 4. Limit personnel heat exposures accordingly, except as approved by the commanding officer in an operational emergency.

(5) If maintenance or repair is required, record all heat stress related deficiencies on the CSMP and TSIMS (CVNs only). Appendix B2-B provides heat stress trouble-shooting and recommended repair actions.

e. Supply Officer, Air Boss, and Other Department Heads

(1) Ensure DB thermometers are installed per subparagraph 3b(1) and temperatures are monitored and recorded per subparagraphs 3b(3) and 3b(4). Space temperature logs must be reviewed weekly by the division officer.

(2) May assign departmental personnel to conduct heat stress surveys. These personnel must be qualified as required in paragraph 5.

(3) Ensure the heat stress surveyor conducts heat stress surveys per subparagraphs 3c(4) and 3c(5).

(4) Assign and qualify supervisors to review DB temperatures or access AHSS readings and take the required actions per paragraph 3.

(5) Review heat stress surveys and ensure stay times for personnel are being properly determined as specified in paragraph 4. Limit personnel heat exposures accordingly, except as approved by the commanding officer in an operational emergency.

(6) If maintenance or repair is required, record all heat stress related deficiencies on the CSMP. Appendix B2-B provides heat stress trouble-shooting and recommended repair actions.

f. Division Officers

(1) Limit personnel heat exposures per established stay times, except as approved by the commanding officer in an operational emergency.

(2) If maintenance or repair is required, record all heat stress related deficiencies on the CSMP and TSIMS (CVNs only). Appendix B2-B provides heat stress trouble-shooting and recommended repair actions.

g. Heat-stress Surveyors

(1) Be trained and qualified as required in paragraph 5.

(2) Perform heat stress surveys as required by paragraph 3.

h. All Hands

(1) Obtain prompt medical attention for personnel who exhibit heat stress symptoms.

(2) Follow recommended work practices and procedures for controlling heat stress hazards.

(3) Complete heat stress training upon reporting aboard.

3. Heat Stress Monitoring and Surveying

a. Definitions

(1) Monitoring. Observing and recording temperatures of DB thermometers at specified watch or workstations.

(2) Surveys. Use a WBGT meter or AHSS to measure DB, WB, and GT, and compute the WBGT index to determine the amount of time it is safe to work in a given space. Personnel conducting a survey must validate the WBGT index using the following formula.

$$WBGT = (0.1 \times DB) + (0.7 \times WB) + (0.2 \times GT)$$

(3) Heat Stress Surveyor. A person assigned to conduct WBGT surveys and trained per paragraph 5.

b. Heat Stress Monitoring

(1) DB Thermometer Positioning. A hanging DB thermometer (alcohol in glass - NSN 9G-6685-00-243-9964 temperature range 0 to 150 degrees Fahrenheit) must be permanently mounted at watch and workstations throughout the ship where heat stress conditions may exist. Evaluation and designation of potential heat stress areas is part of the IH survey. These thermometers must be mounted in a position so they indicate the most accurate representative temperature for the area where workers and watchstanders spend the majority of their time. Placement of the DB thermometers may be in or out of the ventilation air stream but must be hung at least 2 feet from any supply ventilation terminal or opening. Thermometers must be hung with a non-heat conducting material such as plastic tie-wrap or string (never hang with metal wire) and positioned to minimize the influence of any adjacent or local heat or cold sources (avoid direct contact between thermometer and hot or cold structural surfaces). If the difference between the hanging DB thermometer and the DB temperature measured with the WBGT meter, during a survey, is 5 degrees Fahrenheit or greater at any watch or workstation, then the DB thermometer is not representative of the temperature at the workstation. DB thermometers do not require calibration, so, if found inaccurate, the hanging DB must be replaced or validated by aligning the etch mark with the freezing point (32 degrees Fahrenheit). The ship must install DB thermometers, at a minimum, in main machinery spaces, auxiliary machinery spaces, emergency diesel spaces and other engineering spaces containing heat sources, as well as in laundries (not required for self-help laundries), sculleries, galleys, bake shops, and steam catapult spaces.

(a) DB thermometer must be temporarily mounted to monitor conditions where repairs or maintenance are being performed in a heat stress area.

(b) A DB thermometer must also be mounted in non-air conditioned spaces, not normally manned, in which personnel may have to periodically work or conduct maintenance, such as storerooms.

Note: "No Calibration Required" stickers are not required to be placed on DB thermometers.

(2) AHSS. The AHSS units must be mounted in a position so they indicate the most accurate representative temperature for the area where workers and watchstanders spend the majority of their time. The AHSS units must be positioned so as to avoid interference with activity in that space. If ventilation is present at the workstation where an AHSS unit will be installed the distance of the AHSS unit from ventilation ducts, as required for DB thermometers in subparagraph 3b, is not applicable. The critical factor is that the AHSS unit should be located in relation to the ventilation duct such that airflow across the sensors does not exceed 600 feet per minute (fpm). The AHSS unit is to be positioned vertically with the sensors at the top of the unit and with a minimum clearance of 4 inches above the sensors and a minimum clearance of 6 inches on the right side of the AHSS unit. Calibration is not required for the AHSS but the sensors must be validated quarterly by ships force as required by the equipment MRC.

Note: DB thermometers must still be mounted on ships with AHSS. The ability to conduct manual DB reading procedures must be available in the event that access to the data on the AHSS workstation is unavailable due to power failure, securing of the workspace, etc.

(3) DB Temperature Readings. The ship must record DB temperature readings when the ship is underway or when potential heat stress conditions exist while in port. The ship must monitor the following compartments when manned: main machinery spaces, (fire rooms and engine rooms), auxiliary machinery spaces, emergency diesel spaces, laundry spaces, sculleries, galleys, bake shops, and steam catapult spaces. Assigned personnel must monitor compartments as per the following subparagraphs 3b(3)(a) through 3b(3)(c).

(a) Every 4 hours for manned spaces if DB temperatures do not exceed 85 degrees Fahrenheit.

(b) Every hour for manned spaces if DB temperatures exceed 85 degrees Fahrenheit.

(c) Every hour at temporary installations where the DB temperature exceeds 85 degrees Fahrenheit during repair or maintenance operations.

(4) DB Temperature Recording

(a) Hanging DB temperatures must be recorded on a prepared paper log form or green log book and reviewed by the space supervisor (e.g., machinist mate of the watch (MMOW), galley captain). Logs must be kept for 1 year. If a DB temperature reaches or exceeds 100 degrees Fahrenheit (watch or work length 4 hours or less), or 90 degrees Fahrenheit (watch or work length greater than four hours), or 85 degrees Fahrenheit (in the scullery) per subparagraph 3c(3)(a), the space supervisor must circle (in red) the DB reading and immediately notify the watch supervisor (e.g., engineering officer of the watch (EOOW), division officer). The watch supervisor must direct heat stress surveys to be conducted and enforce the resulting stay times.

(b) The space supervisor (e.g., MMOW, galley captain) must record and review the DB temperatures for the AHSS either as part of the centralized data acquisition system, or as printed copies. The space supervisor must initial in the appropriate box and check the appropriate notation in the computer log. If a DB temperature exceeds the temperature per subparagraph 3c(4)(a), the space supervisor must immediately notify the watch supervisor (e.g., EOOW, division officer). The watch supervisor must direct heat stress surveys to be conducted and enforce the resulting stay times.

c. Heat Stress Surveys - WBGT Meter

(1) Heat Stress Conditions. The heat stress surveyor determines environmental heat stress conditions using the WBGT meter (Model RSS-220, NSN 6685-01-055-5298 or Model Questemp 48N, NSN 6685-01-584-0785), or the AHSS which provides a computer display, hard drive storage and printout of the heat stress information. Each method uses the DB, WB, and GT and integrates them into a single heat stress value, the WBGT index. Appendix B2-C provides detailed information and procedures regarding the proper use and care of the WBGT meter. The surveyor uses the WBGT index, along with the individual's physical exertion level, to determine the permissible heat exposure limits referred to as the PHEL or PHEL stay times.

Note: The effective operating range for the RSS-220 and Questemp 48N WBGT meters and the AHSS is 65 to 150 degrees Fahrenheit. The relative humidity (RH) range for the AHSS is 10 percent to 95 percent. Use of these meters outside of this range will not provide accurate temperature measurements.

(2) Measurement Techniques

(a) When surveying a work or watch station using the WBGT meter, the surveyor must position the meter where the worker or watchstander would normally stand or where the intended work is to be performed, with ventilation arranged to provide normal ventilation at that location. Operating instructions for the RSS-220, the Questemp 48N and the AHSS are in appendix B2-C, paragraphs 3, 4, and 5, respectively, and in the appropriate technical manual.

(b) The heat stress surveyor must conduct the first WBGT measurement in the workspace after the meter has been in the space 10 minutes to enable it to equilibrate to the surrounding area. As the meter is moved from one site to another, the meter should be at each site for 5 minutes to allow for stabilization of the first reading DB in the series to be taken. To determine when each sensor has stabilized, the surveyor should watch the 0.1 degree Fahrenheit digit of the display. When the 0.1 degree Fahrenheit digit stops changing or when it oscillates between a larger or smaller value, the sensor has stabilized and the value can be recorded (if oscillating, always record the higher of the two values).

(c) Where AHSS units are used, watchstanders should take care not to shield the automated WBGT sensor from airflow or heat sources so that readings reflect an accurate watchstander stay time.

(3) Recording and Reporting Survey Results

(a) The heat stress surveyor must record survey readings (for the RSS 220 round to the nearest 0.1 degree Fahrenheit) to the OPNAV 5100/17 Heat Stress Monitoring Sheet. Ships using the Questemp 48N or the AHSS may use a computer printout for the heat stress survey sheet. The surveyor must use the WBGT index reading to determine the PHEL stay time per paragraph 4 (the AHSS provides stay time). The surveyor must record the PHEL curve used and the corresponding exposure time on the survey sheet. Upon completion of the survey and determination of PHEL stay times, the heat stress surveyor must note any stay times for manned watch or workstations that, under routine conditions, are less than the watch or work period. The surveyor must circle these readings on the sheet in red. The surveyor must notify space supervisors and responsible department heads immediately of the reduced exposure times. If a survey results in a PHEL stay time which is less than the work or watch period, the department head responsible for the space must promptly notify the commanding officer of the condition, indicating action being taken to protect personnel or to reduce the excessive heat-stress situation or both. The surveyor must record the following heat stress information, per subparagraphs 3c(3)(a)1 through 3c(3)(a)4, on the heat stress survey sheet manual or computer printout.

1. Date and time of survey.

2. In the follow-on survey block, identify a time and temperature.

3. Stations surveyed, including the following information in subparagraphs 3c(3)(a)3a through 3c(3)(a)3d for each station.

a. Time WBGT measurement was taken at the location

b. Hanging DB temperature. Not required for the automated system.

c. WBGT meter readings for DB, WB, GT, and WBGT.

d. PHEL curve for the station and the corresponding exposure time.

Note: Only the column that pertains to the current watch or work situation needs to be completed (e.g., all four columns do not need to be filled in).

4. The heat stress surveyor must check to ensure that the WB < DB; GT $\geqslant$ DB; and WB < WBGT < GT. Additional information on WBGT validation is contained in appendix B2-C.

(b) The heat stress surveyor must note any material deficiencies that may be contributing to adverse heat stress conditions and record them on the survey sheet. Additionally, personnel must comment on the availability of drinking water on the survey sheet.

(c) The surveyor must record the hanging DB temperatures on the heat stress survey sheet. If the difference between the hanging DB thermometer and the DB temperature measured with the WBGT meter, during a survey, is 5 degrees Fahrenheit or greater at any watch or workstation, the DB thermometer is not representative of the temperature at the workstation. Replace or validate the hanging DB by aligning the etch mark with the freezing point (32 degrees Fahrenheit). Comparing the hanging DB temperature values with the AHSS DB values is not required.

(d) Following the department head's review, all OPNAV 5100/17s, including engineering, must be delivered to the MDR. The MDR must review all engineering and non-engineering heat stress surveys to determine obvious inaccuracies, reduced PHEL stay times, and any personnel protective actions being taken and submit heat stress survey sheets daily to the commanding officer. The commanding officer must initial the survey sheets, and return the sheets to the MDR. The MDR must retain heat stress surveys sheets for 1 year.

(4) Space Surveys. Ships must conduct the survey of spaces for heat stress using the WBGT meter or the AHSS.

(a) At all manned watch and workstations within the space whenever the temperature from a permanently mounted hanging DB thermometer reaches or exceeds the following temperature requirements:

PHEL I through III	
Watch/Work length 4 hours or less	DB => 100 degrees Fahrenheit
Watch/Work length greater than 4 hours	DB => 90 degrees Fahrenheit
PHEL IV through VI	DB = 85 degrees Fahrenheit

Notes: (1 through 4)

1. Daily WBGT space surveys at the hottest time of the day are no longer required.

2. Shipboard conditions cannot be adequately addressed by a single DB value. For watches longer than 4 hours or activity levels greater than PHEL III, a 100 degrees Fahrenheit temperature would miss potentially serious heat stress conditions. The values listed above take into consideration likely levels of RH, watch duration's, and levels of activity. Under normal operations, routine watches in engineering spaces are expected to be 4 hours at a PHEL III or lower. PHEL IV through VI applies to above average work rates.

3. WBGT readings are not required for spaces that are not manned with a routine watch but where a rover must periodically enter for a short period of time (e.g., less than 15 minutes) to perform some task (i.e., take equipment readings or fuel, oil, and water samples).

4. If the space temperature is less than 65 degrees Fahrenheit, heat stress surveys are not required. This is because the meter is not accurate below 65 degrees Fahrenheit.

(b) In any space when a heat injury (heat exhaustion or heat stroke) occurs.

(c) Prior to conducting engineering casualty control (ECC) drills:

1. if the drill-set exceeds 3 hours (not required in spaces not affected by the drill or in areas that are unmanned); and

2. if already in a reduced stay time, the surveyor must use the most current heat stress survey and calculate stay times for ECC watchstanders using the ECC PHEL values in appendix B2-A. The length of the exercises cannot exceed the watch PHEL stay times.

(d) In any unmanned space when personnel must perform work and DB temperatures exceed 90 degrees.

(e) In any space when the commanding officer determines that a heat stress situation may occur.

(f) As required for follow-on surveys (see subparagraph 3c(5)).

(5) Follow-on Surveys. Once a heat stress survey has been conducted, follow-on surveys for the remainder of that day and for subsequent days must be accomplished as identified below. Once the follow-on survey allows a return to normal watch periods, then a new WBGT survey would be required according to subparagraph 3c(4). Follow-on surveys must be accomplished using the WBGT meter as per the following subparagraphs 3c(5)(a) through 3c(5)(c).

(a) For engineering spaces on nuclear, gas turbine and diesel powered ships.

1. If the survey resulted in a PHEL stay time greater than the duration of the normal watch or work period and did not require a change from the normal watch and work time, then no further follow-on surveys are required unless the hanging DB temperature increases by more than 5 degrees Fahrenheit from the hanging DB temperature in the previous survey.

2. If the survey resulted in a PHEL stay time less than the duration of the manned watch or workstation then the watch and work times must be adjusted to reflect the new PHEL stay times indicated by the WBGT. A follow-on survey is only required if the hanging DB temperature increases by more than 5 degrees Fahrenheit or more from the hanging DB temperature in the previous survey. If the hanging DB temperature drops below the value in subparagraph 3c(4) and return to a normal watch and work time is desired, a survey must be conducted to ensure conditions allowing a return to normal watch and work periods have been reestablished.

(b) Two options are provided for follow-on surveys for engineering spaces on non-nuclear, steam-powered ships and for laundries, sculleries, galleys, steam catapult spaces and arresting gear spaces.

1. Follow-on surveys where WB and DB temperatures are not monitored and recorded each hour. Follow-on surveys must be conducted prior to the end of the current manned watch or work period as indicated in the previous survey. Follow-on surveys must continue to be conducted each watch and work period until the conditions specified in subparagraph 3c(4) no longer exist.

2. Follow-on surveys where WB and DB temperatures are monitored and recorded each hour at manned workstations.

a. If the WBGT survey resulted in a PHEL stay time greater than the duration of the normal watch or work period, a change from the normal watch and work time is not required. Follow-on surveys are not required unless the DB temperature increases by 5 degrees Fahrenheit or more or WB temperature increases by 3 degrees Fahrenheit or more from the DB and WB temperatures recorded from the previous survey. The DB and WB temperature must be measured each time using the same instrument or device. The WBGT meter, motorized

psychrometer, or commercially available hygrometer may be used to measure DB and WB temperature. If the DB temperature drops below the value in subparagraph 3c(4) and return to a normal watch and work time is desired, then a survey must be conducted to ensure conditions allowing a return to normal watch and work periods have been reestablished.

b. If the WBGT survey resulted in a PHEL stay time less than the duration of the manned watch, or work period, the watch and work time must be adjusted to reflect the new stay times indicated by the WBGT. Follow-on surveys are not required unless the DB temperature increases by 5 degrees Fahrenheit or more or WB temperature increases by 3 degrees Fahrenheit or more from the DB and WB temperatures recorded from the previous survey. The DB and WB temperature must be measured each time using the same instrument or device. The WBGT meter or commercially available hygrometer may be used to measure DB and WB temperature. If the DB temperature drops below the value in subparagraph 3c(4) and return to a normal watch and work time is desired, then a survey must be conducted to ensure conditions allowing a return to normal watch and work periods have been reestablished.

(c) A heat stress survey to restore the normal watch is not required at the end of the ECC drill set unless a DB temperature at any manned watch station exceeds the appropriate value identified in subparagraph 3c(4)(a).

(6) Time Weighted Mean (TWM) WBGT Values. The TWM WBGT is for use in especially hot environments where reduced stay times have been imposed on watch or work standers. The TWM WBGT is an optional, not mandatory provision, for use if an air-conditioned booth or cooler space is available for personnel to spend time in the cool climate and afford them some relief from the heat in the space. When implemented, the TWM changes the WBGT value for that individual and increases the length of time they can now spend at their watch or work station. Appendix B2-D provides ships that have this ability with a way of properly calculating the new WBGT value.

d. Recovery Time for Personnel Reaching Exposure Limits

(1) Supervisors must direct personnel standing watch or working in spaces in reduced stay times (except in operational emergencies as directed by the commanding officer) to leave the heat stress environment prior to the expiration of the PHEL stay time. These personnel must move to a cool, dry area conducive to rapid physiological recovery (an area with a DB temperature of 80 degrees Fahrenheit or less).

(2) Preferred recovery environments are those that are air conditioned per the guidance in reference (b). Provided there is no evidence of accumulated fatigue, the length of recovery time must be equal to twice the exposure time or 4 hours whichever is less. After completing the necessary recovery period in preferred environmental conditions, an individual who nonetheless remains tired, unable to carry out normal work requirements, or has an increased incidence of health disorders must be referred to the MDR for evaluation.

(3) Supervisors must direct personnel experiencing heat stress symptoms while standing watch or working in the workspace, to report immediately to the MDR for evaluation.

e. Recommendations for Working in Heat Stress Environments

(1) Drink more water than satisfies thirst, but not more than 1.5 liters (about one and half quarts) per hour. Do not wait until thirst transpires to start drinking (scuttlebutts must be readily available and in working order). It is important that personnel stay hydrated. Backpack-style devices (operated with a tube or straw) have proven very effective in helping personnel to stay hydrated. Water storage devices facilitating hydration, are available in the supply system (NSN 9Q-8465-01-396-9855) and may be helpful in preventing dehydration.

(2) Eat three well-balanced meals daily.

(3) Get adequate rest. At least 6 hours of continuous sleep per 24 hours is recommended.

(4) Do not take salt tablets unless under the direction and supervision of the MDR.

(5) Limit intake of caffeinated drinks.

(6) The fleet has used several cooling vests in the supply system in a limited capacity. Initial research on one of these vests shows that if properly used in a heat stress environment it can reduce thermal strain. However, when using cooling vests, personnel must adhere to PHEL stay times as described in this chapter until revised PHEL curves are established for the cooling vest.

Note: Using cooling vests that contain paraffin-based phase change material is not recommended. This material is flammable and may release toxic vapors when burning. The material safety data sheet (SDS) information should be reviewed prior to using any of these products. This material must be stored per the requirements for flammable material in reference (c).

4. PHEL Determination

a. PHEL stay time guidance is determined via two components: 1) The WBGT index provides a measure of environmental conditions (ambient DB temperature, moisture content or WB temperature of the air and radiant or black GT of the air), and 2) the amount of metabolic work of a particular job being performed must be known. The more strenuous the job, the shorter the allowable exposure time. The Navy has developed six PHEL curves, each applying to a different work rate, ranging from light work (PHEL curve I) to heavy work (PHEL curve VI). The PHEL curve stay time guidance was developed with the understanding that under extreme environmental conditions and heavy workloads, personnel may experience some level of heat strain. Additionally, under routine operations, core temperature may rise to 102.2 degrees

Fahrenheit (39 degrees Celsius) but will return to normal with the appropriate recovery time. The PHEL curve general applicability table (table B2-A-1) in appendix B2-A provides the applicable stay times allowed for a specific types of work. For types of work not presented in table B2-A-1, the MDR should consult reference (b), article 3-8, and reference (d), section C2.3.16. For comparison, examples of light work include sweeping down, painting, adjusting automatic combustion controls, changing and cleaning lube oil strainers, and bleeding hydraulic oil. Examples of heavy work include manually chipping and wire brushing in preparation for painting, handling cargo and supplies, replacing large valves, cleaning lube oil sumps, and disassembly or reassembly of large or heavy equipment. The PHEL curves were developed and are accurate for normal, healthy, heat-acclimatized personnel who have had adequate rest, (6-hours continuous sleep in the last 24 hours), adequate water intake, and adequate recovery time from previous heat stress exposure (2 hours recovery for every 1 hour exposure or 4 hours maximum). Personnel are assumed to be wearing clothing consisting of a least 35 percent cotton fiber, not containing starch, and readily permeable to water transfer. Figure B2-A-1 represents the PHEL curves plotted on a PHEL chart. Table B2-A-2 presents the PHEL chart in a tabular format. Table B2-A-3 presents the PHEL values applicable when fuel combustion gases are present.

b. Procedures

(1) Curve Selection

(a) Routine Operations. Applicable PHEL curves should be determined by selecting the appropriate curve listed in table B2-A-1.

(b) Non-routine Operations. Non-routine operations, such as performing operations in out-of-normal plant configurations, increases in normal watchstander work rate, and minor equipment casualties require the use of the next higher number curve above that specified in table B2-A-1 for routine operations. For example, if the stay time for a particular watchstander is determined to be PHEL curve I during normal operations, then the exposure limit for the watchstander should be determined using PHEL curve II during difficult or more active than normal watches.

(c) ECC Exercises. Watchstanders must have their stay times determined by selecting the appropriate curve listed in table B2-A-1.

(d) Heavy Work. Personnel conducting heavy repairs or other strenuous work must have their stay time determined by using PHEL curve VI.

(2) Effects of Personnel Health Status on Curve Selection. As indicated, the PHEL curves and the assignment in table B2-A-1 are based on normal, healthy personnel who have

adequate rest and recovery from previous heat stress exposures. Personnel having repetitive exposures to heat stress without sufficient recovery may experience cumulative fatigue. Additionally, personnel with a respiratory system cold or infection, or both, lacking sufficient sleep (less than 6 hours in the past 24 hours), experiencing dehydration, having clinically confirmed hypertension or taking medication which adversely effects body temperature are much more prone to heat injuries. Maximum exposure limits for these personnel cannot be reliably predicted using the PHEL chart in table B2-A-1. The senior MDR on a case-by-case basis must determine appropriate exposure limits for these personnel.

(3) Curve Selection if Personnel Heat Injuries Occur. If, after determining personnel stay times per this section, a heat exhaustion or heat stroke occurs, then the stay times for all other personnel in the space must immediately be reduced by recalculating stay times using the next numerically higher PHEL curve than specified by table B2-A-1. The work and health status of the individual suffering the injury must be reviewed. When the cause of the injury has been reasonably resolved, the stay times for personnel in the space must be determined using the latest WBGT index and the normally appropriate curves as indicated in table B2-A-1.

(4) WBGT and PHEL Determination. The heat stress surveyor must use the PHEL table (table B2-A-2). To use the PHEL table, the heat stress surveyor must first round the recorded WBGT index to the next higher whole number value. This can be done easily as the WBGT index is recorded in tenths of a degree Fahrenheit. For example: 85.1 degrees Fahrenheit would be rounded to 86 degrees Fahrenheit and 89.9 degrees Fahrenheit would be rounded to 90 degrees Fahrenheit; but 92.0 degrees Fahrenheit would remain 92 degrees Fahrenheit. Using the whole number value of the WBGT index, the heat stress surveyor would obtain the permissible stay time in hours and minutes under the column for the PHEL curve determined using table B2-A-2. Hence, for a recorded WBGT index of 85.1 degrees Fahrenheit or 85.8 degrees Fahrenheit the stay time for PHEL curve III is 5 hours and 55 minutes.

(5) Stay Time Guidance. The current WBGT and PHEL stay-time guidance for each watchstander can be read from any of the AHSS computer workstations.

(6) Impact of Personal Status Change on Exposure Limits. If a person's status changes during the period of a watch (e.g., the person assumes a watch in a different location or works at a different exertion level), stay times must be computed using the procedures for remaining safe stay times provided in reference (c), article 3-8.h.

(7) Impact of Fuel Combustion Gases (Stack Gas) and Fuel Vapors on Exposure Limits

(a) Fuel combustion gases (stack gas) and fuel vapors can have severe physiological impact on personnel. The effects of these environmental factors are intensified by heat stress. Heat stress causes the body to shunt blood to the skin and to cause skin blood vessel vasodilatation to remove heat. Also, exposure to fuel combustion gases and fuel vapors causes

blood vessels in the skin to vasodilate. Blood vessel vasodilatation is greater from combustible gases or fuel vapors and heat stress in combination than vasodilatation from either separately. Personnel experiencing heat stress while exposed to combustible gases or fuel vapors results in increased vasodilatation, which in turn causes increased skin absorption of the combustible gases or fuel vapors. Also, the synergistic combination of vasodilatation from heat stress and from combustible gases or fuel vapors impairs the individual's cardiac reserve (i.e., their physiologic capacity to respond to further stress by pumping more blood). Prolonged exposure to relatively low concentrations can impact the ability of personnel to work safely. If someone entering a workspace or area for the first time in approximately 4 hours or more can smell the odor of stack gas or fuel vapors, then a harmful concentration may be present. Personnel should be checked for the symptoms in the following subparagraphs 4b(7)(a)1 through 4b(7)(a)4.

1. Eyes watering or burning, or both.

2. Difficulty breathing

3. Tingling or numbness of the tip of the tongue, tip of the nose, finger tips and toes.

4. Generalized sensation of mild alcoholic intoxication without alcohol consumption within the past 24 hours.

(b) If two or more of the above symptoms or symptom per subparagraph 4b(7)(a)4 (even if alone) are exhibited, then exposure limits must be reduced as per the below subparagraphs 4b(7)(b)1 through 4b(7)(b)3.

1. Prompt removal of affected personnel to fresh air is essential.

2. Using the latest WBGT index values, determine the PHEL stay time by using table B2-A-3.

3. Calculate the PHEL stay time for existing heat stress conditions per subparagraph 4b(4), and divide that stay time by three to obtain the new stay time. For example, if the exposure limit due to heat stress is 4 hours, then the exposure limit with stack gas and or fuel vapors present would be reduced to 1 hour and 20 minutes.

5. Training

a. The MDR must provide heat stress training for all newly reporting personnel during indoctrination and annually thereafter. At a minimum this training must include:

(1) heat stress health hazards,

(2) symptoms of excessive heat stress exposure,

(3) heat stress first aid procedures,

(4) heat stress monitoring, and

(5) causes of heat stress conditions.

b. Heat-stress surveyors assigned to perform WBGT surveys must be trained and qualified using the heat stress monitor watch station 318 of the engineering collateral PQS, NAVEDTRA 43704 within 12 weeks of assignment.

c. Training information on the AHSS is available in the technical manual.

APPENDIX B2-A
PHEL CURVE GENERAL APPLICABILITY SELECTION

Table B2-A-1

PHEL Curve General Applicability Table

PERSONNEL	PHEL CURVE	
	Routine Watch	Casualty Control Drills *
I. Steam Propelled Ships		
A. Propulsion Spaces		
1. BTOW (Boiler Technician of the Watch)	II	III
2. Console Operator	I	I
3. Upper Levelman (checkman)	II	III
4. Lower Levelman	II	III
5. MFP (Main Feed Pump) Watch	II	III
6. Burnerman	II	III
7. EOOW (Engineering Officer of the Watch)	I	I
8. MMOW (Machinist's Mate of the Watch)	II	III
9. Throttleman	I	I
10. EMOW (Electrician Mate of the Watch)	I	I
11. Upper Levelman (SSTG) (Ship Service Turbine Generator)	II	III
12. Lower Levelman (Lube Oil/Condensate)	II	III
13. Evaporator Watch	I	II
14. Messenger (see note below)	III	IV

Note: Messenger stay times should be determined by taking the average of all WBGT index values for the space not including the console booth. In most cases, this will give a longer stay time than using PHEL curve values listed for the messenger above.

B. Auxiliary Spaces		
1. All Watches	II	
II. Diesel Propelled Ships		
A. All Engineering Watch Personnel (unless specified below)	I	II
B. Evaporator Watch	II	II
C. Messenger	III	IV
III. Gas Turbine Propelled Ships		
A. CG 47 Class Ships		
1. All Engineering Watch Personnel	I	II
B. DDG-51 Class Ships		
1. All Engineering Watch Personnel (unless specified below)	II	III
2. Sounding and Security Watch	III	

*Includes restricted maneuvering

IV. Steam Catapult Spaces		
A. All Watches	II	II
V. All Other Surface Ship Spaces		
A. ECC Monitors and Inspectors	I	II
B. Laundry Personnel	III	NA (not applicable)
C. Scullery Personnel	V	NA
D. Galley and Food Service Line Personnel	II	NA

VI. Submarines

A. Engine Room		
1. EOOW	I	
2. Engineering Watch Station	II	III
3. Throttleman	I	I
4. Reactor Operator	I	I
5. Electrical Operator	I	I
6. Upper Level	II	III
7. Lower Level	II	III
8. Evaporator Watch	I	II
9. Engineering Drill Monitors	NA	II
B. Auxiliary Spaces		
1. All Watches	II	II
C. Other Spaces		
1. Food Service Personnel	II	NA

FIGURE B2-A-1

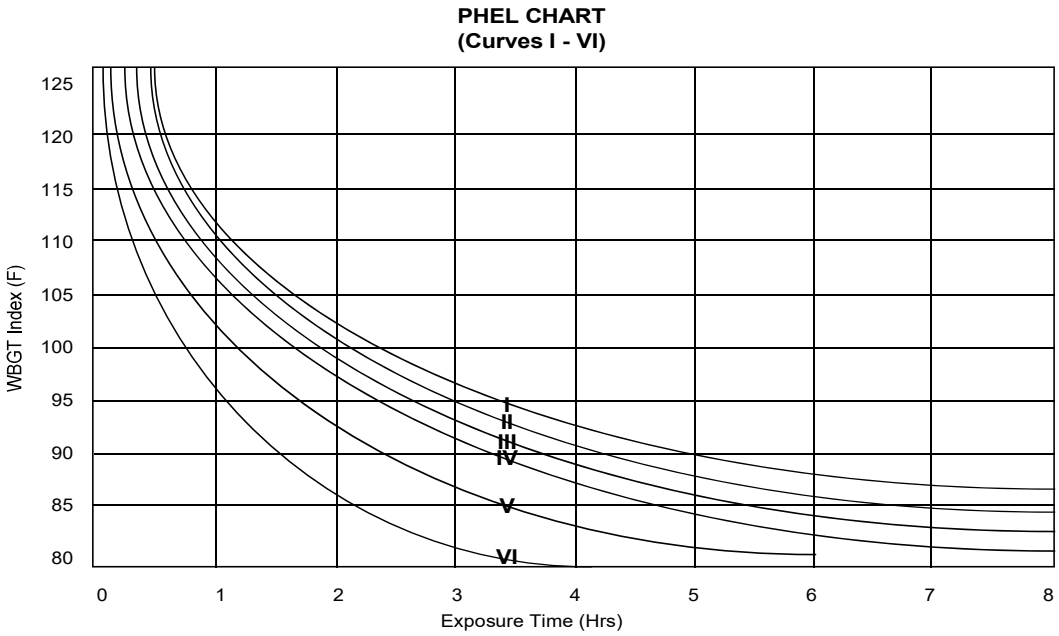

Table B2-A-2
PHYSIOLOGICAL HEAT EXPOSURE LIMITS (PHEL) TIME TABLE
(Without the presence of fuel combustion gases and fuel vapors)

	Six PHEL Curves (Total Exposure Time in Hours:Minutes)					
WBGT Index (F)	I	II	III	IV	V	VI
80.0	>8:00	>8:00	>8:00	8:00	6:35	4:30
81.0	>8:00	>8:00	>8:00	7:45	6:00	4:05
82.0	>8:00	>8:00	8:00	7:05	5:25	3:40
83.0	>8:00	8:00	7:45	6:25	4:55	3:20
84.0	>8:00	8:00	7:05	5:55	4:30	3:05
85.0	8:00	7:45	6:30	5:20	4:05	2:50
86.0	8:00	7:05	5:55	4:55	3:45	2:35
87.0	7:25	6:30	5:25	4:30	3:25	2:20
88.0	6:45	5:55	4:55	4:05	3:10	2:10
89.0	6:10	5:25	4:30	3:45	2:50	2:00
90.0	5:40	5:00	4:10	3:25	2:40	1:50
91.0	5:15	4:35	3:50	3:10	2:25	1:40
92.0	4:50	4:10	3:30	2:55	2:15	1:30
93.0	4:25	3:50	3:15	2:40	2:00	1:25
94.0	4:05	3:35	3:00	2:25	1:50	1:15
95.0	3:45	3:15	2:45	2:15	1:45	1:10
96.0	3:25	3:00	2:30	2:05	1:35	1:05
97.0	3:10	2:45	2:20	1:55	1:25	1:00
98.0	2:55	2:35	2:10	1:45	1:20	0:55
99.0	2:40	2:20	2:00	1:40	1:15	0:50
100.0	2:30	2:10	1:50	1:30	1:10	0:45
101.0	2:20	2:00	1:40	1:25	1:05	0:45
102.0	2:10	1:50	1:35	1:15	1:00	0:40
103.0	2:00	1:45	1:25	1:10	0:55	0:35
104.0	1:50	1:35	1:20	1:05	0:50	0:35
105.0	1:40	1:30	1:15	1:00	0:45	0:30
106.0	1:35	1:25	1:10	0:55	0:45	0:30
107.0	1:30	1:15	1:05	0:50	0:40	0:25
108.0	1:20	1:10	1:00	0:50	0:35	0:25
109.0	1:15	1:05	0:55	0:45	0:35	0:25
110.0	1:10	1:00	0:50	0:40	0:30	0:20
111.0	1:05	1:00	0:50	0:40	0:30	0:20
112.0	1:00	0:55	0:45	0:35	0:25	0:20
113.0	0:55	0:50	0:40	0:35	0:25	0:15
114.0	0:55	0:45	0:40	0:30	0:25	0:15
115.0	0:50	0:45	0:35	0:30	0:20	0:15
116.0	0:45	0:40	0:35	0:25	0:20	0:15
117.0	0:45	0:40	0:30	0:25	0:20	0:10
118.0	0:40	0:35	0:30	0:25	0:15	0:10
119.0	0:35	0:35	0:25	0:20	0:15	0:10
120.0	0:35	0:30	0:25	0:20	0:15	0:10
121.0	0:35	0:30	0:25	0:20	0:15	0:10
122.0	0:30	0:25	0:20	0:15	0:15	0:10
123.0	0:30	0:25	0:20	0:15	0:10	0:10
124.0	0:25	0:25	0:20	0:15	0:10	0:05

TABLE B2-A-3
(With the presence of fuel combustion gases and fuel vapors)

	Six PHEL Curves (Total Exposure Time in Hours:Minutes)					
WBGT Index (F)	I	II	III	IV	V	VI
80.0	4:50	4:15	3:30	2:55	2:15	1:30
81.0	4:25	3:50	3:10	2:40	2:00	1:20
82.0	4:00	3:30	2:55	2:25	1:50	1:15
83.0	3:40	3:10	2:40	2:10	1:40	1:10
84.0	3:20	2:55	2:25	2:00	1:30	1:00
85.0	3:00	2:40	2:10	1:50	1:25	0:55
86.0	2:45	2:25	2:00	1:40	1:15	0:50
87.0	2:30	2:10	1:50	1:30	1:10	0:45
88.0	2:20	2:00	1:40	1:25	1:05	0:40
89.0	2:05	1:50	1:30	1:15	1:00	0:40
90.0	1:55	1:40	1:25	1:10	0:55	0:35
91.0	1:45	1:30	1:15	1:05	0:50	0:30
92.0	1:35	1:25	1:10	1:00	0:45	0:30
93.0	1:30	1:20	1:05	0:55	0:40	0:25
94.0	1:20	1:10	1:00	0:50	0:35	0:25
95.0	1:15	1:05	0:55	0:45	0:35	0:20
96.0	1:10	1:00	0:50	0:40	0:30	0:20
97.0	1:10	0:55	0:45	0:40	0:30	0:20
98.0	1:05	0:50	0:40	0:35	0:25	0:15
99.0	0:55	0:45	0:40	0:30	0:25	0:15
100.0	0:50	0:45	0:35	0:30	0:20	0:15
101.0	0:45	0:40	0:35	0:25	0:20	0:15
102.0	0:40	0:35	0:30	0:25	0:20	0:10
103.0	0:40	0:35	0:30	0:25	0:15	0:10
104.0	0:35	0:30	0:25	0:20	0:15	0:10
105.0	0:35	0:30	0:25	0:20	0:15	0:10
106.0	0:30	0:25	0:20	0:20	0:15	0:10
107.0	0:30	0:25	0:20	0:15	0:10	0:10
108.0	0:25	0:25	0:20	0:15	0:10	0:05
109.0	0:25	0:20	0:15	0:15	0:10	0:05
110.0	0:25	0:20	0:15	0:15	0:10	0:05
111.0	0:20	0:20	0:15	0:10	0:10	0:05
112.0	0:20	0:15	0:15	0:10	0:10	0:05
113.0	0:20	0:15	0:15	0:10	0:05	0:05
114.0	0:15	0:15	0:10	0:10	0:05	0:05
115.0	0:15	0:15	0:10	0:10	0:05	0:05
116.0	0:15	0:10	0:10	0:10	0:05	0:05
117.0	0:15	0:10	0:10	0:05	0:05	0:05

APPENDIX B2-B
VENTILATION TROUBLE-SHOOTING AND REPAIR ACTIONS

VENTILATION: If a ventilation problem is suspected, the below information may assist in determining the cause of the problem. Recommend NTSMs also be consulted for ventilation troubleshooting.

STANDARDS	HOW TO MEASURE DISCREPANCIES	CAUSES	RECOMMENDED ACTION
1. VENTILATION NSTM 510, Heating, Ventilation and Air Conditioning (HVAC) systems for Surface Ships			
a. Supply (1) Flow			
Duct velocity 2500 to 3500 fpm	Anemometer	Inlet obstructed	Remove obstructions
		Dirty screens	Clean Screens
Velocity of airflow at watchstander (NAVMED P-5010-3) about 250 fpm minimum		Wrong screen mesh (1-1/2 inches required)	Replace with proper size mesh
		Toxic gas vent dampers closed	Open and repair dampers
		Vent duct pressure losses due to dirty ductwork, leaks, unauthorized openings or missing access covers	Clean, repair or replace
		Supply terminal obstructed	Clean the terminal
		Terminal inoperable or missing	Replace terminal

STANDARDS	HOW TO MEASURE DISCREPANCIES	CAUSES	RECOMMENDED ACTION
(2) Flow (continued)			
		Supply fan not working properly:	Repair
		-Motor speed low (single phase or miswired)	Repair
		-Controller defective	
		-Improper speed with exhaust fan	Repair/Replace
			Repair fan interlock
		-Failed motor bearings	
		Supply air short circuited by exhaust terminal	Repair
			Relocate supply or exhaust terminal
At least one supply terminal at each watch-stander station without damper, which can be pointed at the watch-stander	Visual	Incorrect terminal type (should be corrosion resistant steel)	Replace terminal
		Terminal damper is not removed	Remove damper
High efficiency filters (HEPA) are dirty. (Ships equipped with a collective protection system (CPS))	HEPA filter differential pressure gauge. (See PMS)	Continuous use in a dirty environment such as an industrial availability or sand storm)	Replace filters

b. Exhaust			
Refer to specific HVAC Design Criteria Manual (DCM) for ship class. If no specific DCM exists for the ship class in question, refer to NAVSEA 0938-018-0010 (HVAC DCM for Surface Ships). Exhaust ventilation is to be: -125% o - 125% of supply ventilation for 1200 pounds per square inch (psi) steam ships. -115% o - 115% of supply ventilation for other ships except CPS ships -equal to supply ventilation on CPS ships plus sweep air from type II airlocks	Anemometer	Exhaust fan not working properly: -Motor speed low (single phase or miss-wired) -Controller defective -Improper speed with exhaust fan -Failed motor bearings	 Repair Repair Repair fan interlock Repair
Space pressure negative at ¼ to ½ inch of water is mandatory with supply and exhaust fans at the same speed (airflow should be into space when access is opened)	U-Tube Manometer	Exhaust inlet or outlet obstructed. Dirty screens. Wrong screen mesh (1-1/2 inches required.	Remove obstructions. Clean Screens. Replace with proper size mesh.
	Feel/Visual	Vent duct pressure losses due to dirty ductwork, leaks, unauthorized openings or missing access covers.	Clean, repair or replace Open and repair dampers

		Toxic gas vent dampers closed	
Exhaust terminals in hot spots	Feel/Visual		Relocate terminal
2. INSULATION			
a. Piping and Machinery NSTM 635, Thermal, Fire and Acoustic Insulation Insulate all surfaces with temp. >125°F. Material/thickness per MIL-STD-769	Visual Check		
	Deteriorated cracked, worn, damaged	High traffic, walkway, standing, use of chain falls, etc.	Replace and install metal lagging/shielding
	Wet (water, oil, etc.)	Frequently occurring external leak Internal/external one-time leak	Replace and cover with metal lagging/shielding Replace
	Missing insulation	Removed for access	Replace
		Replaceable pad missing Valve bonnets, etc	Install replaceable pad
b. After insulation is installed, surface temperature should not exceed 125°F.	Infrared handgun/ pyrometer-Note 1 Surface temp too high.	Insulation deteriorated/ compacted.	Increase insulation thickness.
		Insulation too thin.	Paint surface with aluminum paint.

APPENDIX B2-C
USE OF THE WBGT METER

1. WBGT Meter. The basic instrument for assessing heat stress is the WBGT meter, a small, lightweight, portable instrument. The WBGT meter measures DB, WB, and GT and electronically integrates these values into the WBGT Index. There are currently two meters available in the fleet: the RSS-220 meter and the Questemp 48N. Each meter is assembled and operated per its technical manual and the guidance contained within this manual. Calibration of portable meters is every 3 years. Specific instructions for requisitioning and turn-in of units are available from TYCOMs. The AEL for the meters is AEL 2-870003051. Supply information for the meter and accessories is per the following subparagraphs 1a and 1b.

a. Model RSS-220 (Note: No longer manufactured). Standard nickel cadmium rechargeable size AA batteries. (NSN 9G-6140-00-449-6001)

b. Questemp 48N

(1) Heat stress monitor. (NSN 6685-01-584-0785)

(2) Standard size 9-volt batteries (see the technical manual for approved batteries).

2. WBGT Index. Environmental data displayed by the WBGT meter (heat stress monitor) are:

a. DB temperature;

b. WB temperature;

c. GT - this temperature is an integration of radiant and convective (the heating or cooling effects of air movement) heat transfer (heat gained or lost); and

d. WBGT Index - the meter calculates this value using the following mathematical equation:

$$WBGT = (0.1 \times DB) + (0.7 \times WB) + (0.2 \times GT)$$

3. Use of the WBGT Meter (RSS-220)

a. The procedure for turning on the WBGT meter readies it for operation. The turn-on procedure is per the below subparagraphs 3a(1) through 3a(5).

(1) Install the globe sensor by pushing the phone jack on the base of the sensor into the receptacle on top of the meter. Hold the globe sensor by its phone jack end, not by the black sphere. The globe can easily be damaged by squeezing, bumping, or dropping.

(2) Fill the WB water reservoir. The reservoir is accessible through the end of the tunnel marked WATER FILL. When filled, water should completely cover the sponge and be well below the level of the tunnel. Excess water can be poured out of the tunnel end. Be careful to keep the DB sensor dry. If it becomes wet, dry it with tissue or a soft cloth before operating the meter.

(3) Turn the power switch to "CHECK." Listen for the sound of the aspirating fan and see digits on the display.

(4) Turn the measurement function switch to DB, WB, GT, and WBGT. Wait 5 minutes for the initial DB reading. Wait 3 minutes for subsequent readings. Each position will give a display reading of 100.0 $\pm$ 0.2 degrees Fahrenheit, if the meter is operating properly. If the proper reading cannot be obtained, do not use the meter.

(5) Turn the power switch to "ON."

b. Take measurements in the order in which the meter will display data (DB, WB, GT, and WBGT Index) as the parameter selection switch is rotated clockwise from the DB position. This is the order in which the individual sensors will stabilize the quickest). Ensure temperature readings are properly recorded per subparagraph 3c(3). As the meter is moved from one site to another, the meter should be at each site for 5 minutes to allow for stabilization of the first DB reading in the series to be taken. To determine when each sensor has stabilized, the monitor should watch the 0.1 degree Fahrenheit digit of the display. When the 0.1 degree Fahrenheit digit stops changing or when it oscillates between a larger or smaller value, the sensor has stabilized and the value can be recorded. (If oscillating, always record the higher of the two values.)

c. While taking readings, hold the meter about chest high, 1 foot away from the body. If there is airflow at the reading location, the meter should be positioned to allow the airflow to enter the left side of the meter.

4. Use of the Heat Stress Monitor (Questemp 48N)

a. The procedure for turning on the WBGT meter readies it for operation. The turn-on procedure is per the below subparagraphs 4a(1) through 4a(5).

(1) Press the I/O Enter key to turn on. The first start-up screen details the name, type of instrument. The second start-up screen gives the revision and battery power (ensure the battery level does not fall below 6.4V).

(2) Next is the index start-up screen. After it appears press the I/O Enter key. The log rate start-up screen will be the last start-up screen, press the I/O Enter key.

(3) The main menu screen will appear next. The indicator arrow can be moved by pressing the up and down arrow keys.

(4) If the meter has not been previously setup then move the indicator arrow next to Setup and press the I/O Enter key. The following setup selection screens will appear. Use the I/O Enter key to select the appropriate values.

(a) Time and Date – Set to current time and date.

(b) Temperature – Set to Fahrenheit.

(c) Language – Set to English.

(d) Log Rate – optional, used if machine will log temperatures.

(e) Index setting – Set to PHEL.

(f) Exit Setup by pressing the Run/Stop key.

(5) At the main menu select the view screen and use the I/O Enter key to view each display. Displays will appear in the following order:

(a) The WB and DB display.

(b) The GT and RH percentage display.

(c) The WBGT value display.

(d) The time and date display.

(e) The battery and memory display.

(f) The Navy PHEL curve 5 and 6 display.

(g) The Navy PHEL curve 3 and 4 display.

(h) The Navy PHEL curve 1 and 2 display.

Note: The Navy PHEL curve gives the recommended working hours and minutes corresponding to the WBGT value.

b. While taking readings, hold the meter about chest high, 18 inches away from the body. Wait 10 minutes after turning the monitor on until taking the initial reading. As the meter is moved from one site to another, the meter should be at each site for 5 minutes to allow for stabilization. Ensure temperature readings are properly recorded per subparagraph 3c(3).

5. Use of the AHSS

a. Viewing and Printing AHSS Data

(1) The AHSS computer workstation displays, stores and prints the heat stress information. The information on the monitor is updated each minute and stored each hour. A DB log is available which displays the DB temperature values for each location. The AHSS software allows the workspace supervisor to review the DB log and enter the appropriate comments which will also record the time of the DB log review.

(2) A complete listing of all the WBGT and PHEL curve data are stored hourly and are available for review.

(3) The AHSS provides the ability to conduct a real-time and immediate heat stress survey. The heat stress survey printout includes the current WBGT and PHEL curve stay time information. Additionally, the AHSS software performs the comparison checks to verify that DB > WB, GT $\geqslant$ DB, and GT > WBGT > WB.

b. AHSS Operations

(1) The AHSS unit has four sensor channels, from left to right, the first is capped, the second has the DB sensor, the third has the RH sensor, the fourth has the GT (black globe) sensor. The WB value is calculated from the DB and RH values. The light-emitting diode (LED) lights for the AHSS unit should be red, green, green, green indicating that the AHSS unit and the three sensors are operating correctly.

(2) A DB and GT value of 32 displayed on the AHSS workstation denotes a sensor failure and the LED light will be red. Follow the procedures in the AHSS technical manual to determine if the DB or GT sensor can become operational. If not, connect a spare sensor in the appropriate DB or GT channel, re-power the AHSS unit, and arrange to have the faulty sensor repaired.

(3) A RH value of either 5 or 98 displayed on the AHSS workstation denotes a sensor has drifted low or high and the LED light will be red. Follow the procedures in the AHSS technical manual to re-align low and high set points using the 33 percent and 75 percent RH salt solutions. If not, connect a spare sensor in the RH channel, re-power the AHSS unit, follow the RH sensor calibration procedures, and arrange to have the faulty sensor repaired. Note that the RH salts are

a disposable item with a 1-year shelf life and must be replaced each year. Ordering information is provided in the AHSS technical manual. Refer to the AHSS technical manual for a comprehensive review of the AHSS procedures.

6. Periodic WBGT Meter Validation. During reviews of heat stress monitoring sheets by the MDR, the department head, and other supervisors, the temperature and WBGT Index values should be spot-checked to determine obvious errors. The validation rules in the following subparagraphs 6a through 6d should be applied.

a. WB temperatures must be less than DB temperatures (WB < DB).

Note: If the WB temperature equals the DB temperature for the RSS 220 then the wick over the WB sensor is probably dried out. Check that there is water in the WB reservoir.

b. GT for each set of readings should be greater than or equal to DB temperature for the same set of readings (GT $\geq$ DB).

c. WBGT Index must be greater than WB temperature and less than the GT (WB <WBGT < GT).

d. If any of the temperatures does not agree with the validation rules then the heat stress meter technical manual should be consulted for trouble shooting procedures.

Note: Manual calculation of the WBGT value is not required for the AHSS, Questemp 48N, or the RSS-220.

APPENDIX B2-D
TIME WEIGHTED MEAN (TWM) WBGT VALUES

Time Weighted Mean (TWM) WBGT Values. The TWM WBGT is intended for use in especially hot environments where reduced stay times have been imposed on watchstanders. The TWM WBGT is an optional provision, for use if an air-conditioned booth or cooler space is available for personnel to spend time in the cooler climate and afford some relief from the heat in the space. When the TWM is used it changes the WBGT value for that individual and increases the length of time spent at watch stations. Ships that have this ability may properly calculate the new WBGT value using the following equation:

$$\text{Time(booth)} = \frac{[\text{WBGT (watch station)} - \text{WBGT (desired)}] \times 60}{[\text{WBGT (watch station)} - \text{WBGT (booth/cool space)}]}$$

For example: Engineering spaces on a guided missile destroyer (DDG) in the Indian Ocean are on a 4-hour watch rotation. The temperature on a hanging DB thermometer in a main space measured 101 degrees Fahrenheit during the latest heat-stress survey:

Engine Room Operator WBGT = 92, PHEL = II, Stay time = 4:10
Central Control Station (CCS) (top watch) WBGT = 90; PHEL = II; Stay time = 5:40
Propulsion System Monitor WBGT = 92; PHEL = III; Stay time = 3:30

The propulsion system monitor has a stay time less than 4 hours while the other watch stations have stay times that are equal to or greater than 4 hours. The engineering officer decides to incorporate a TWM WBGT for the propulsion system monitor to maintain a 4-hour watch for all watch space personnel. He or she looks up the WBGT value (in the PHEL time table in appendix B2-A) to achieve a 4-hour stay time (90 WBGT = stay time of 4 hours) and does the calculation. The time that the propulsion system monitor must spend outside the engine room in a cooler space each hour to achieve a 4-hour watch would be calculated as follows:

For the Propulsion System Monitor:

$$\text{Time (booth)} = \frac{[\text{WBGT (watch station)} - \text{WBGT (desired)}] \times 60}{[\text{WBGT (watch station)} - \text{WBGT (booth/cool space)}]}$$

The 90 WBGT value is from the PHEL table in appendix B2-A.

$$\text{Time (booth)} = \frac{[92 - 90] \times 60}{[92\text{-}80]} = 10 \text{ minutes}$$

TWM WBGT information must be documented on the heat stress survey sheet.

SECTION B

CHAPTER 3

HAZARDOUS MATERIAL CONTROL AND MANAGEMENT (HMC&M)

Ref: (a) OPNAVINST 5090.1D, Environmental Readiness Program
(b) NAVSUP Publication P-485, Volume 1, Revision 5, Operational Forces Supply Procedures, Chapter 8, Part C, Paragraphs 8200-8264,
(c) NSTM 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables
(d) NAVSEA Manual S9510-AB-ATM-010(U), Nuclear Submarine Atmosphere Control Manual (NOTAL)
(e) NAVSUP P-573, Storage and Handling of Hazardous Materials
(f) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual
(g) NAVSEA S9593-FF-MMA-010, U.S. Navy Shipboard Oil and Hazardous Substances Spill Contingency Plan Guide
(h) NAVSEA S9593-FA-MMA-010, U.S. Navy Submarine Oil and Hazardous Substance Spill Contingency Plan Guide
(i) NSTM 555, Volume I, Surface Ship Firefighting
(j) BUMEDINST 6260.30B, Mercury Control Program for Dental Treatment Spaces
(k) NAVSEAINST 5100.3E, Control of Mercury, Mercury Compounds, and Components Containing Mercury or Mercury Compounds

1. Discussion

a. To attain and maintain operational effectiveness, Navy ships require specified types and quantities of hazardous material (HAZMAT). Great care must be taken in handling, using, and storing HAZMAT to prevent injury to personnel, damage to equipment, or harm to the environment. Risks associated with HAZMAT are greater aboard ship than ashore because of the limited number, confined nature, and "at sea" environment of shipboard spaces. Consequently, both special precautions and an effective HAZMAT program are needed. The maintenance of safe and healthful working conditions for HAZMAT is a chain of command responsibility. Implementation begins with the commanding officer and extends to the individual Sailor.

b. The HMC&M requirements contained in this chapter incorporate the requirements of the OSHA Hazard Communication (HAZCOM) Standard. The HAZCOM standard has been aligned with the Globally Harmonized System (GHS) of Classification and Labeling of Chemicals as established by the United Nations. Additional information about HAZCOM and GHS is contained in the glossary.

c. All U.S. Navy ships are required by reference (a) to implement the Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). This program is a HAZMAT control and management plan calling for HAZMAT to be centrally controlled onboard ships. CHRIMP requires the establishment and installation of hazardous material minimization centers (HAZMINCEN) on ships for the centralized management of shipboard HAZMAT, used and excess HAZMAT and empty HAZMAT containers. The HAZMINCEN is an issue and reuse site with HAZMAT inventory tracking software. Execution of CHRIMP reduces on board quantities of HAZMAT through effective management while maintaining levels required to support operational requirements. Reference (b) provides guidance for the implementation and management of a CHRIMP program. This policy establishes the minimally acceptable supply management procedures and are mandatory unless specifically stated as being optional.

2. Applicability

a. Background. Special precautions are required for the stowage, handling, and use of HAZMAT aboard ships and submarines. This chapter combined with references (b) and (c) (and reference (d) for submarines) are the governing documents for HAZMAT management and are intended to provide information on policy, responsibilities and training. Reference (c) (NSTM 670) contains storage requirements, management implementation guidance, and precautions for handling HAZMAT. Reference (c) consists of three volumes, as per the following subparagraphs 2a(1) through 2a(3).

(1) Volume I contains requirements on storage and segregation, and consolidation and transfer of HAZMAT. Volume I also has requirements for the establishment of a HAZMINCEN including satellite locker management.

(2) Volume II contains the Hazardous Materials Users Guide (HMUG), and provides storage, compatibility, and safety requirements and health information for personnel responsible for using, storing, and handling chemicals.

(3) Volume III provides ship HAZMINCEN managers standardized guidance toward operating an effective HAZMINCEN program.

b. For Surface Ships. Responsibilities and procedures for HAZMAT aboard surface ships are contained in paragraph 6.

c. For Submarines. Responsibilities and procedures for HAZMAT aboard submarines are contained in paragraph 7. Chapter D15 of this instruction manual provides additional guidance to submarines for materials considered an atmosphere contaminant per reference (d).

3. Terminology

a. Hazardous Material (HAZMAT). HAZMAT is any material that, because of its quantity, concentration, or physical or chemical characteristics, may pose a substantial hazard to human health or the environment when incorrectly used, purposefully released, or accidentally spilled. This definition includes flammable and combustible materials, toxic materials, corrosive materials (including acids and bases), oxidizing materials, aerosol containers and compressed gases.

(1) Excluded are those materials specifically cited as exclusions in section 1910.1200 of Title 29, CFR, such as materials that do not require a safety data sheet (SDS), Food, Drug and Cosmetics Act items (e.g., packaged personal care products), articles (e.g., electronics or end items), ionizing (e.g., check sources for radiation monitors) and non-ionizing radiation (e.g., radio frequency (RF) heat sealers, microwave or laser products) and biological hazards (e.g., products containing living organisms).

(2) This does not include material that require special handling and disposal procedures including ammunition, weapons, explosives, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical materials, medical waste, infectious materials, bulk fuels, asbestos, lead, lithium batteries, radioactive materials, and other submarine atmosphere control materials. Guidance and direction for these materials can be found in other related documentation (e.g., Submarine Atmosphere Control Manual, Navy Lithium Battery Safety Program Responsibilities and Procedures (NAVSEA S9310-AQ-SAF-010), OPNAVINSTs, and NSTMs).

b. Submarine Material (SM). Reference (d) contains information on the SM control program which contains information on SM. SM is defined as all non-metallic materials and toxicologically significant metals (e.g. beryllium, cadmium, lead, and mercury). HAZMAT used in submarine operations, maintenance, and processes is a subset of SM with guidance provided in chapter D15.

c. Hazardous Waste (HW). An HW is a solid waste or combination of solid waste which, because of its quantity, concentration or physical, chemical or infectious characteristics, may: (1) cause or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or (2) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. The term solid waste includes liquid, semi-solid, or contained gaseous material. Ships by definition do not generate HW but generate used or excess HAZMAT which is turned over to the shore facility that determines if the HAZMAT must be disposed of as a HW, as required by reference (a).

d. Used Hazardous Material. Used HAZMAT is material that has been used in a shipboard process or maintenance action and for which there is no further, immediate use on board the ship

possessing the material. Such material may ultimately be used on another ship, within the shore establishment, for the same purpose or a purpose other than that for which it was initially manufactured.

e. Excess Hazardous Material. Excess HAZMAT is unused material in unopened, properly sealed containers for which there is no further, immediate use on board the ship possessing the material. Such material may ultimately be used on another ship, within the shore establishment, for the same purpose or a purpose other than that for which it was initially manufactured.

Note: It is the responsibility of the shore receiving facility to determine if used or excess HAZMAT offloaded can be reused or disposed of as HW.

f. Consolidated Hazardous Material Reutilization and Inventory Management Program (CHRIMP). A HAZMAT control and management program that requires HAZMAT (used and excess HAZMAT and empty HAZMAT containers) to be centrally controlled onboard ships and submarines. CHRIMP requires the establishment and installation of HAZMINCENs. CHRIMP includes centralized inventory management; procurement; storage; issue, receipt, and reissue; and collection, consolidation, and offload of HAZMAT.

g. The Hazardous Material Minimization Center (HAZMINCEN). The HAZMINCEN utilizes facilities, equipment, and procedures to execute CHRIMP. HAZMINCEN designs can vary greatly, depending on the size of the ship, mission, and requirements for HAZMAT. The smallest ships (submarines, MCMs, PCs, and LCSs) often require little HAZMAT and are too small to include a dedicated HAZMINCEN storeroom or office. For MCM and LCS ships, HAZMAT is stored in a small flammable liquid storeroom(s) and centrally managed and controlled by the supply department. Other ships, (cruisers (CG) and DDGs) have a flammable liquid storeroom(s), a paint issue storeroom, and utilize satellite lockers for other HAZMAT. HAZMAT on these ships can be issued from the flammable liquids storeroom, and centrally managed and controlled by the supply department. On these smaller ships, there usually is insufficient space to allow for a dedicated HAZMAT consolidation space. Consolidation usually takes place in the flammable liquid storeroom. On larger platforms (amphibious transport dock (LPD), dock landing ship (LSD), amphibious assault ship dock (LHD), amphibious assault ship (LHA), and CVN), the ship is large enough to support a separate HAZMINCEN office, multiple HAZMAT storerooms, issue room(s), and a consolidation space.

h. Safety Data Sheet (SDS). A document that contains the potential health effects of exposure to chemicals, or other potentially dangerous substances. It contains hazard evaluations on the use, storage, handling and emergency procedures related to that material. The SDS contains much more information about the material than the label and it is prepared by the manufacturer or distributor. It is intended to state what the hazards of the product are, how to use the product safely, what to do if accidents occur, how to recognize symptoms of overexposure, and what to do if such incidents occur. If the HAZMAT coordinator receives an SDS for a product that is not included (i.e., SDS not loaded or the product chemical formulation

has changed) in the online Hazardous Material Information Resource System (HMIRS), they must e-mail the SDS to Naval Supply Systems (NAVSUP) Weapons Support System (WSS) Hazardous Material and Pollution Prevention Department (N26) at wraps.prime.fct@navy.mil to be loaded into the HMIRS. Include an electronic copy of the SDS and the following information; NSN, commercial and government entity (CAGE) code, and part number of the item.

i. Hazardous Material Information Resource System (HMIRS). A DoD automated system developed and maintained by the Defense Logistics Agency. HMIRS is the central repository for SDS for the United States Government Military Services and civil agencies. It also contains value-added information supplied by the Service or agency focal points. This value-added data includes HAZCOM warning labels and transportation information. HMIRS provides this data for HAZMATs purchased by the Federal Government through the DoD and civil agencies. The system assists Federal Government personnel who handle, store, transport, use, or dispose of HAZMATs. NAVSUP WSS distributes the Navy-unique version of the HMIRS digital optical disc (DVD) annually. Ships and submarines should utilize the online version of HMIRS when possible. The DVDs only contain a subset of SDSs information from the HMIRS.

j. Hazard Characteristic Code (HCC). A two-digit alphanumeric code that provides a means of categorizing HAZMAT for space utilization management and compatible storage. HCCs are included in the Hazardous Material Inventory Control System for Windows (HICSWIN) and Submarine Hazardous Material Inventory and Management System (SHIMS) programs at the national item identification number level. HCCs are also found at the SDSs level in the HMIRS application. Any questions or challenges of HCCs should be sent to NAVSUP WSS (N26) via e-mail at wraps.prime.fct@navy.mil.

k. Special Material Content Code (SMCC). A code utilized to indicate that an item represents or contains peculiar material requiring special treatment or management control such as HAZMAT or other special characteristics (i.e., magnetic or electro static sensitive (ESDS)). HAZMAT is identified by the following SMCCs B, C, D, F, G, H, I, J, K, L, N, O, P, Q, R, S, T, U, V, W, X, Z, 5, 7, and 8. SMCC "O" identifies material with "off-gassing" considerations applicable to submarines.

l. The Ships Hazardous Materials List (SHML). The SHML is the master HAZMAT authorized use list for surface ships and embarked detachments. The list was developed to ensure only approved HAZMAT authorized for use aboard ship is brought aboard ships and is available at https://nll.navsup.navy.mil/shml/shmlmain.cfm.

m. Type-Ships Hazardous Materials List (T-SHML). A subset of the master SHML tailored to a class or classes of ships. T-SHMLs have been built into HICSWIN as the authorized use list for each ship. T-SHMLs are updated and distributed monthly to ship supply departments. Ships of a class not covered under the existing T-SHMLs must use the master SHML as their authorized use list.

n. Allowed on Board (AOB). A code on the SHML that identifies when a HAZMAT can be stored and used on board. A SHML AOB code of "A" indicates the material is authorized for shipboard use. A SHML AOB code of "P" indicates material is prohibited for shipboard use and must not be stored or used aboard ship. A SHML AOB code of "R" indicates material having shipboard use restrictions. A SHML AOB code of "O" indicates material is obsolete, due to Navy interest being discontinued or national item identification number or Navy item control number being cancelled. A SHML AOB code of "N" indicates material has not been reviewed to determine if the material is authorized for shipboard use.

o. Material Management Indicator (MMI). The MMI code on the SHML identifies which HAZMAT the HAZMINCEN controls and manages.

(1) An MMI code of "Y-Yes" indicates that the HAZMINCEN must actively manage the material in the HAZMINCEN by providing appropriate storage, issuing, and tracking of material.

(2) An MMI code of "N-No" indicates the HAZMAT needs to be tracked in HICSWIN, but does not require storing in or daily issuing from the HAZMINCEN, to ensure compliance with the HMC&M requisition requirements cited in paragraph 4. Due to the expertise and frequent use by a particular department, these materials do not need to be managed by the HAZMINCEN. Examples of MMI code "N-No" materials are: batteries, photographic chemicals, and welding rods.

p. The Hazardous Material Inventory Control System for Windows (HICSWIN). HICSWIN is the principal software system used on Navy surface ships for implementing the Navy's CHRIMP. PCs and submarines do not have HICSWIN onboard.

q. The Submarine Hazardous Material Inventory and Management System (SHIMS). SHIMS is a menu driven HAZMAT inventory and management tool for use aboard submarines to easily track, identify storage location, and determine which HAZMAT has been approved for procurement and use. SHIMS allows submarines to be in full compliance with this instruction manual and applicable atmospheric control requirements. It assists the operator in the systematic, positive control and management of HAZMAT.

r. Submarine Material Control List (SMCL). SMCL is the master authorized use list for submarines as established by reference (d). The SMCL is regularly updated and the most up-to-date SMCL is available from the Naval Logistics Library (https://nll.navsup.navy.mil) or My Navy Portal (https://my.navy.mil).

s. SHML or SMCL Feedback Report (SFR). A report that requests an item be reviewed to validate the operational and maintenance application requirement for an item. If a valid requirement exists and no other authorized material is suitable, the item will be added to the SHML or SMCL.

4. HMC&M Requisition and Labeling

a. HAZMAT Ordering. HAZMAT must only be ordered if a valid requirement exists (PMS, technical manual, allowance parts list, AEL, or approved general use consumable) and the HAZMAT is authorized on the T-SHML (surface ships) or SMCL (submarines).

(1) If there is a valid requirement for HAZMAT not listed on the T-SHML and SMCL, an SHML or SFR including justification for that material must be submitted. HAZMAT must not be procured until the SFR has been reviewed and the ship provided with the final determination. Only in extreme cases where delaying the procurement would impact mission or safety should material be procured without SFR review and only with the commanding officer's permission.

(2) The ship must obtain an SDS from the manufacturer or supplier prior to approval of a new product for purchase or use and retain the SDS aboard. A SFR must include the HMIRS SDS number if known. Submittal of an SFR for a material which is not currently identified in HMIRS should be accompanied by a manufacturer's SDS. Surface ships submit all SFRs to the NAVSUP WSS Pollution Prevention and Havardous Material Afloat Division (N261), via e-mail, wraps.prime.fct@navy.mil notifying the appropriate TYCOM and procurement department of the pending action. Submarines submit SFRs to Naval Surface Warfare Center (NAVSURFWARCEN), Carderock Division, Hazardous Material Management Branch (Code 634).

b. HAZMAT Open Purchase. Navy policy is that, to the maximum extent feasible, ships must only procure and use standard stock HAZMAT. If ships or other commands are approached by commercial vendors offering HAZMAT not listed in the SHML or SMCL for shipboard use or for substitution for stock-numbered HAZMAT, they must refer vendors to the shore side HAZMINCEN or NAVSUP WSS, Code NAVSUP WSS N261 via e-mail at wraps.prime.fct@navy.mil. For submarines refer vendors to NAVSURFWARCEN), Carderock Division Code 634 via e-mail at shims.smcl@navy.mil.

Note: For HAZMAT locally acquired (e.g., NAVSUP Servmart store, credit card) all HAZMAT requests must be reviewed against the SHML or SMCL prior to purchase to ensure that the material is authorized onboard. All HAZMAT locally purchased must be provided to the supply department for recording in HICSWIN or SHIMS as applicable.

c. HAZMAT Receipt

(1) The supply department must check all containers of HAZMAT upon receipt to ensure that they contain a manufacturer's label. They must refuse a container not so marked.

(2) When authorized HAZMAT containers are accepted and brought aboard, they must be immediately placed in a stowage location based on the HCC associated with the product and per the stowage requirements of reference (c). The HCC can be found on HMIRS SDS or in the HICSWIN or SHIMS applications. If the HCC is not on the HMIRS SDS, contact NAVSUP WSS Code N261.

(3) The HAZMINCEN will be the receiving point for all HAZMAT delivered to the ship. This will allow HAZMAT data to be entered into the HICSWIN software. For submarines the supply department will be the central receiving point for HAZMAT to allow entry into SHIMS.

d. HAZMAT Container Labeling. All HAZMAT containers must be labeled either with the original manufacturers label, DD 2521 Hazardous Chemical Warning Label (8-½ x 11), or DD 2522 Hazardous Chemical Warning Label (4 x 6), or one generated by the ship if the original label is damaged or secondary containers are used. Labels must always be in English but may also contain other languages as needed to meet local requirements. Ship generated labels must be per the following subparagraphs 4d(1) and 4d(2).

(1) Labels for shipboard identification of HAZMAT containers must clearly identify at a minimum the product name, the manufacturer's name, stock number (if applicable), HCC (applies to surface ships only), and the nature of the hazard (e.g., flammable, corrosive). A label may be a tag, sign, placard or gummed sticker. NFPA labels are not authorized labels for shipboard HAZMAT. All material transferred into another container, such as a spray bottle, small dropper bottle, or grease gun must be labeled with the minimum required information. For grease guns, a metal dog tag may be attached or the product name and NSN may be engraved on the gun if desired.

(2) If the material is used and not in its original container, the HAZMINCEN or submarine supply department must ensure that the material is labeled as required above. In addition, complete and attach to the container OPNAV 5100/18 Used Hazardous Material to identify the material as used HAZMAT. This label also includes information on the process in which the material was used (e.g., used spring bearing lube oil, circuit board cleaning solvent, dried out epoxy paint, etc.), any known impurities that the material might contain based on routine PMS analysis (e.g., Naval Oil Analysis Program) test results) and any special storage requirements. This information is necessary to assist the shore activity in properly storing the used HAZMAT and filling out disposal documents if the material is processed as waste. HAZMAT that cannot be identified requires an expensive chemical analyses to properly identify the HAZMAT so that it can be disposed of properly. Chemical analysis costs are chargeable to ships operating target funds or TYCOM line of accounting.

Note: DD 2521 and DD 2522 labels are valid until the GHS compliant markings are available in HMIRS.

5. Training

a. The HAZMAT coordinator must receive the Afloat HAZMAT Coordinator course (A-8B-0008) in route at the Navy Supply Corps School's basic and department head courses. HAZMAT coordinators who are not supply corps officers must complete the HAZMAT coordinator Navy e-learning online course (CSS-HAZMAT-030-2.0) at My Navy Portal. The course must be completed prior to, or within 2 months, of being assigned this duty.

b. At a minimum, the HAZMAT supervisor must be a graduate of the HMC&M Technician (SNEC 9595) course (A-322-2600 or A-322-2601). The HAZMAT supervisor and other HAZMINCEN assigned personnel must also be a graduate of the CHRIMP and HICS Technician course (CSS-CHMRIMP-1.1) taught on My Naval Portal/Learning Management System (This does not apply to submarines or PCs).

c. HAZMINCEN and paint locker personnel must receive training prior to assuming their duties and semi-annually thereafter on proper handling, issuing, labeling, stowage, receipt processing, inventories, spill response and disposal procedures.

d. HAZMAT awareness training must be provided at indoctrination and annually thereafter to all personnel. This training must include information on the process for requesting material from the HAZMINCEN, reutilization, handling, storing (compatibility), using, disposal, spill response (HAZMAT and oil initial spill response and reporting), and how to use an SDS, what it is, what it contains, and where a copy is available for review. For submarine personnel ensure basic atmospheric control information related to HAZMAT is included.

6. Surface Ship Responsibilities

a. Commanding Officer

(1) Appoint and assign, in writing, a commissioned officer within the supply department as the HAZMAT coordinator. The HAZMAT coordinator must have completed training as required by paragraph 5 prior to assignment.

(2) Assign in writing a leading petty officer (E5 or E6) as the HAZMAT supervisor to operate the HAZMINCEN. The HAZMAT supervisor must have completed training as required by paragraph 5.

Note: Ships and afloat activities specifically designated by the TYCOM in which the number of assigned officers is limited and appointment would pose an excessive burden to the ship may assign a chief or leading petty officer as HAZMAT coordinator.

(3) Approve, by signature, SHML SFRs. A designated O-5 or above may be appointed, in writing, to approve SFRs for the commanding officer.

(4) Ensure compliance with OPNAV transfer and disposal policy guidance provided in reference (a). Report to the fleet commanders by message, information to the chain of command, any conditions or system or equipment malfunctions that results in an overboard discharge of HAZMAT into or upon the marine environment per reference (a) and applicable operations orders.

Note: The requirements detailed herein must not preclude the overboard discharge of HAZMAT during an emergency where failure to discharge would clearly endanger the health or safety of shipboard personnel or would risk severe damage to the ship.

b. Executive Officer

(1) Upon request from the HAZMAT coordinator, safety officer and damage control assistant (DCA) approve work-center HAZMAT storage locations and lockers in writing, as applicable, to support daily evolutions.

(2) Ensure supply and safety departments make monthly satellite locker inspections and quarterly storeroom inspections. Ensure findings and action taken to correct deficiencies is documented.

(3) Ensure HAZMAT brought on board by contractors and shipyard representatives is controlled and offloaded per contractual requirements.

(4) Ensure that all-hands HAZMAT awareness training is included in the ship's long-range training plan (see paragraph 5).

(5) Prior to getting underway, ensure that no HAZMAT remains on the pier but is properly turned into the shore facility. HAZMAT must be transported per reference (e).

c. Department Heads

(1) Ensure that HAZMAT retained within their work-centers is required for the operations and maintenance of assigned equipment and does not exceed the quantity needed to satisfy operational requirements.

(2) Receive and review the HAZMINCEN delinquent containers report generated from HICSWIN. Ensure action is taken to correct outstanding and repeated delinquencies.

(3) Ensure that department personnel receive HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

(4) Ensure used or excess HAZMAT is properly turned into the HAZMINCEN for turn over to the shore activity offload personnel.

d. Supply Officer

(1) Ensure implementation of CHRIMP through the operation of a HAZMINCEN. CHRIMP support is provided by NAVSUP Fleet Logistics Center.

(2) Ensure only HAZMAT authorized for shipboard use by the T-SHML is requisitioned, or if necessary to do so, that an SFR is promptly submitted. Ensure SFRs are signed by the commanding officer (or a designated O-5 or above) and transmitted to NAVSUP WSS for processing.

e. HAZMAT Coordinator

(1) Complete training, as specified in paragraph 5.

(2) Provide HAZMAT awareness training for all personnel as required by paragraph 5.

(3) Ensure that all SDSs received are included in the online HMIRS. If the SDS is not included (i.e., SDS not loaded or the product chemical formulation has changed), the HAZMAT coordinator must e-mail the SDS to NAVSUP WSS (N26) at wraps.prime.fct@navy.mil to be loaded into the HMIRS. Include an electronic copy of the SDS and the following information: NSN, CAGE, and part number for the product.

Note: The term "readily available" does not mean that an SDS must be available in any specific time frame. As long as an SDS can be obtained prior to using HAZMAT, and there are no significant physical or administrative barriers that inhibit gaining access to an SDS, then the SDS is readily available. SDSs may be maintained on the outside of a HAZMAT storage locker or in a work center or work space binder, but it is not required.

(4) Ensure only HAZMAT authorized for shipboard use by the T-SHML is requisitioned, or if necessary to do so, that an SFR is promptly submitted. Ensure SFRs are signed by the commanding officer (or a designated O-5 or above) and transmitted to NAVSUP WSS Code N261 for processing.

(5) Work with the supply department or stock control officer to ensure all HAZMAT orders are approved by the HAZMINCEN prior to ordering or signing all purchase requests for HAZMAT items.

(6) Conduct monthly satellite locker inspections in coordination with the safety officer. Additional locker inspection recommendations can be found in reference (c).

(7) Quarterly inspect all HAZMAT storerooms in coordination with the safety officer.

(8) Request executive officer approval for work-center HAZMAT storage locations and lockers, in writing, as applicable, to support daily evolutions. Coordinate approval of locker locations with the safety officer and DCA. Maintain a list of approved locker locations.

(9) Act as the ship's single point of contact in the offload of used and excess HAZMAT. Comply with the following in subparagraphs 6e(9)(a) and 6e(9)(b).

(a) Receive, segregate, and consolidate used HAZMAT and ensure contents of offloaded HAZMAT are labeled per this chapter.

(b) Supervise document preparation for offload of used and excess HAZMAT.

(10) Manage embarked unit (Marines, airwing squadrons, detachments, special forces, etc.) HAZMAT per the following subparagraphs 6e(10)(a) through 6e(10)(c).

(a) Ensure embarked units do not bring onboard prohibited HAZMAT; embarked unit HAZMAT must be screened against the ships T-SHML to ensure it is authorized for use onboard ship. Embarked units must provide a valid requirement for material needed onboard ship (e.g., maintenance procedure, technical manual, etc.).

(b) Ensure embarked units submit requirements for HAZMAT to the ship prior to embarking. Sufficient notice must be given to allow the ship to order and receive the HAZMAT.

(c) Ensure embarked unit takes responsibility for the offload of their HAZMAT (upon departure of the embarked unit or aircraft).

(11) Run HICSWIN storage compatibility report on a weekly basis.

f. HAZMAT Supervisor

(1) Operate the HAZMINCEN per this chapter. Additional guidance can be found in reference (b). Maintain HICSWIN and provide control and inventory management of designated shipboard HAZMAT. Ensure receipt, compatible stowage, consolidation, issue, inventory and tracking of designated HAZMAT issued from the HAZMINCEN.

(2) The HAZMAT supervisor must complete training, as specified in paragraph 5.

(3) Provide training to HAZMINCEN and paint locker personnel as required by paragraph 5.

g. Division Officers

(1) Ensure that only NAVSEASYSCOM-approved, in-space storage lockers are used and that locations and installations are approved by the executive officer via the HAZMAT coordinator and safety officer. Ensure lockers are properly installed for sea worthiness and labeled per reference (c).

(2) Ensure that HAZMAT retained within work centers is specific to the operations maintenance of assigned equipment. No more than 1 month of PMS required HAZMAT is allowed to be issued by the HAZMINCEN to the work center to be retained in work-center HAZMAT satellite lockers. Longer storage to address special needs must be authorized, in writing, by the HAZMAT coordinator per reference (c). PCs are not required to have a "strip ship" sign on their satellite locker.

(3) Ensure used or excess HAZMAT is properly returned to the HAZMINCEN.

(4) Ensure that approved personal protective clothing and equipment are available for HAZMAT operations and personnel are trained in their proper use and maintenance as described in chapter B12. Follow specific direction on applicable PMS cards.

(5) Ensure that division personnel receive HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

h. Safety Officer

(1) When received from the HAZMAT coordinator, request executive officer approval for work-center HAZMAT storage locations and lockers, in writing, as applicable, to support daily evolutions.

(2) Conduct monthly satellite locker inspections in coordination with the HAZMAT coordinator. Additional locker inspection guidance is found in reference (c).

(3) Quarterly, inspect all HAZMAT storerooms in coordination with the HAZMAT coordinator. Additional locker inspection recommendations can be found in reference (c).

(4) Evaluate the HAZMAT program at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

(5) Report all HAZMAT mishaps as required by reference (f).

i. DCA

(1) When received from the HAZMAT coordinator, request executive officer approval for work-center HAZMAT storage locations and lockers, in writing, as applicable, to support daily evolutions.

(2) Train and supervise ship's damage control teams in combating spills of HAZMAT and oil. Ships must conduct and document at least one HAZMAT or oil spill response drill for each duty section annually per reference (a). Refer to appendices B3-A and B3-B for HAZMAT spill response guidance. Reporting requirements for a HAZMAT spill or oil spill which goes over the side are found in reference (a).

(3) Maintain the HAZMAT spill response kit. All ships must maintain, as directed by the AEL, the following HAZMAT spill response kits: AEL 2-550024007 (for surface ships), 2-550024008 (for small craft) and 2-550024009 (for MCM ships) for onboard response operations only.

(4) Inspect HAZMAT spill kits quarterly and replenish material as required.

j. Main Propulsion Assistant

(1) Develop and implement a shipboard oil spill contingency plan, using the Navy's shipboard oil spill contingency plan guide per references (a) and (g). This plan includes information on spill response team makeup, spill cleanup equipment location, internal and external spill reporting criteria, as well as procedures that are unique to the ship.

(2) Maintain the oil spill response kit. All ships must maintain the number of oil spill kits as required by AEL 2-550024006. PCs do not require the oil spill response kit if they have a HAZMAT spill response kit.

(3) Inspect oil spill kits quarterly and replenish material as required.

k. MDR

(1) Assist the HAZMAT coordinator and HAZMAT supervisor and work-center supervisors in training personnel regarding health information and PPE requirements for the HAZMAT they are using.

(2) Provide medical assistance in the event of a HAZMAT spill or mishap involving HAZMAT. Use SDS information provided by the HAZMAT coordinator.

l. Division Supply Petty Officers and Repair Parts Petty Officers. Request HAZMAT from the HAZMINCEN and ensure before HAZMAT is ordered that a valid requirement exists

(specifically required by a maintenance procedure or other shipboard operation). HAZMAT listed on the T-SHML must be used to limit open procurement of HAZMAT. Submit relevant information so that HAZMINCEN personnel can submit an SFR whenever requesting new HAZMAT not previously authorized by the T-SHML.

m. Embarked Unit Supply Petty Officers and Repair Parts Petty Officer

(1) Submit requirements for HAZMAT to the ship prior to embarking. Provide a valid requirement for additional material needed on board ship (e.g., maintenance procedure, technical manual, etc.). Ensure HAZMAT is screened against the ships T-SHML to ensure it is authorized for use on board ship. Sufficient notice must be given to allow the ship to order and receive the HAZMAT.

(2) Offload all embarked unit HAZMAT (not supplied by the ship) brought onboard per applicable requirements.

n. Work-center Supervisors

(1) Ensure that required PPE are maintained and used per the PMS and HMUG in reference (c).

(2) Ensure that work-center personnel receive HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

(3) Ensure before HAZMAT is ordered that a valid requirement exists (specifically required by a maintenance procedure or other shipboard operation). HAZMAT listed on the T-SHML must be used to limit open procurement of HAZMAT. Submit relevant information so that HAZMINCEN personnel can submit an SFR whenever requesting HAZMAT not authorized by the T-SHML.

(4) Ensure any unauthorized HAZMAT is turned in to the HAZMINCEN for disposal.

(5) Ensure an electronic or hard copy of the HMUG (reference (c), volume II) is available as applicable for use by work-center personnel that use HAZMAT. Applicable sections can be copied and posted in areas where specific HAZMAT groups are frequently handled, used, or stored.

(6) Ensure all work-center HAZMAT satellite lockers are properly installed and secured, inventoried (see MRC), have necessary placards posted, and that containers are properly labeled per this manual.

o. All Hands

(1) Properly stow or return HAZMAT to approved satellite locker or the HAZMINCEN upon completion of use or no later than the end of the workday.

(2) Properly use and handle HAZMAT per reference (a) and the applicable SDS.

(3) Collect and segregate any used HAZMAT or residue resulting from use of HAZMAT for turn-in to the HAZMINCEN.

(4) Report any oil or HAZMAT spills to the OOD or damage control central or central control station.

(5) Complete HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

7. Submarine Responsibilties

a. Commanding Officer

(1) Assign the supply officer, in writing, as the HAZMAT coordinator. The HAZMAT coordinator must have completed training as required by paragraph 5 prior to assignment.

(2) Assign a lead petty officer, in writing, as the HAZMAT supervisor. The HAZMAT supervisor must be a graduate of the HMC&M technician (SNEC code 9595) Course.

(3) Report to the fleet commanders by message, information to the chain of command, any conditions or system or equipment malfunctions that results in an overboard discharge of HAZMAT into or upon the marine environment per reference (a) and applicable operations orders.

(4) Approve, by signature, SMCL SFRs.

b. Executive Officer

(1) Grant written permission to carry on board any restricted SM during an underway period. Refer to chapter D15 and reference (d) for definitions of SM control usage categories.

(2) Ensure assigned personnel follow the conditions under which restricted or limited SM are stored or used on board to minimize the release (off-gassing, mists, or vapors) of potential atmospheric contaminants into the submarine.

(3) Ensure restricted (R) and SM items pending for classification are not used on board while underway.

(4) Ensure that all-hands HAZMAT awareness training is included in the ship's long range training plan (see paragraph 5).

(5) Prior to getting underway, ensure that no HAZMAT remains on the pier but is properly turned into the shore facility. HAZMAT must be transported per reference (e).

c. Department Heads

(1) Ensure that HAZMAT retained within their work-centers is unique to the operations and maintenance of assigned equipment and does not exceed the quantity needed to satisfy operational requirements.

(2) Ensure USED or excess HAZMAT is properly returned to the supply officer for turn over to the shore activity.

(3) Report all SM found with a restricted (R) or limited (L) use code that have not been logged in SHIMS to the supply officer for logging, labeling, and assignment of approved storage location, or disposal.

(4) Report all SM found that are not listed (categorized) in the SMCL to the supply officer. SM not listed in the SMCL are prohibited per reference (d).

(5) Ensure that restricted SM authorized for in port use only are removed from the submarine when no longer needed. Inform the supply officer of their removal to allow documentation in SHIMS. Obtain written permission from the executive officer to retain on board restricted SM during underway.

(6) Ensure that all HAZMAT in their custody are used, handled, and stowed per the requirements of chapter D15.

(7) Ensure that department personnel receive HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

d. Supply Officer (HAZMAT Coordinator) and HAZMAT Supervisor

(1) Ensure that management of shipboard HAZMAT follows procedures outlined in this chapter and chapter D15.

(2) Complete training, as specified in paragraph 5.

(3) The HAZMAT supervisor must complete training, as specified in paragraph 5.

(4) Ensure an SDS is on file (either paper copy, HMIRS DVDs or digital media) for all types and brands of HAZMAT taken aboard. Ensure that hard copy SDSs are readily accessible to personnel and their supervisors. Maintain HMIRS which contains SDS information. Submit SDSs which are not on the HMIRS system to NAVSUP WSS, Code N261.

Note: The term "readily available" does not mean that an SDS must be available in any specific time frame. As long as an SDS can be obtained prior to using HAZMAT, and there are no significant physical or administrative barriers that inhibit gaining access to an SDS, then the SDS is readily available. SDSs may be maintained on the outside of a HAZMAT storage locker or in a work center or work space binder but it is not required.

(5) Ensure no prohibited SM is brought on board.

(6) Maintain the submarine atmosphere contaminant log in SHIMS per reference (d).

(7) Ensure all SM brought on board is authorized for storage and use on board by the SMCL. Affix an atmosphere contaminant tag (reference (d)) to all SM containers upon issue and mark with pre-designated usage category for any material that is restricted (R) or limited use (L). Atmosphere contaminant tags can be printed from SHIMS.

(8) Initiate an investigation of any item suspected of being an atmosphere contaminant per the procedures of reference (d) and submit an SFR, per paragraph 2 of chapter D15.

(9) Ensure that all restricted (R) and limited use (L) SM are inventoried every 6 months or prior to a change of command.

(10) Review the atmosphere material contaminant log weekly in port and monthly underway.

(11) Ensure only SM authorized for shipboard use by SMCL is requisitioned, or if necessary to do so, that an SMCL SFR is promptly submitted requesting certification per the requirements of reference (d). Ensure SMCL SFRs are signed by the commanding officer.

(12) Act as the ship's single point of contact in the offload of used and excess HAZMAT. Comply with the following in subparagraphs 4d(12)(a) through 4d(12)(c).

(a) Receive, segregate, and consolidate used HAZMAT and ensure contents of offloaded HAZMAT are labeled per this chapter.

(b) Supervise document preparation for offload of used and excess HAZMAT.

(c) Ensure all contractor and shipyard representatives offload all SM brought on board following completion of their work.

(13) Provide HAZMAT awareness training for all personnel as required by paragraph 5.

(14) Ensure that the SMCL within SHIMS is updated quarterly.

e. Division Officers

(1) Ensure when HAZMAT is transferred into other containers the new containers are properly marked with the information specified in subparagraph 4d(2).

(2) Contact the HAZMAT coordinator and HAZMAT supervisor to ensure used or excess HAZMAT is properly off-loaded.

(3) Ensure that approved personal protective clothing and equipment are available for HAZMAT operations and personnel are trained in their proper use and maintenance as described in chapter B12. Follow specific direction on applicable PMS cards.

(4) Ensure that divisional personnel receive HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

(5) Mark any printed circuit board (PCB)-containing electrical or electronic components per chapter D15, subparagraph 5c.

f. Safety Officer

(1) Evaluate the HAZMAT program at least annually. Chapter A3 contains information on conducting self-assessment evaluations. If the supply officer is assigned as the safety officer, another commissioned officer will evaluate the HAZMAT program.

(2) Report all HAZMAT mishaps as required by reference (f).

g. DCA

(1) Develop and implement a spill contingency plan, using the Navy's submarine oil and hazardous substance spill contingency plan guide per reference (h). These plans include information on spill response team makeup, internal and external spill reporting criteria, as well as procedures that are unique to the submarine. The DCA must follow the toxic gas bill in preparation for possible HAZMAT spills or releases to the environment. Reporting requirements for a HAZMAT or oil spill which goes over the side are found in reference (a).

(2) Train and supervise submarine damage control teams in combating spills of HAZMAT using the toxic gas bill and the commands spill contingency plan. Submarines must conduct and document at least one HAZMAT or toxic gas bill drill for each duty section annually per reference (a). Submarine TYCOMs have provided additional guidance in the submarine organization and regulations manual concerning HAZMAT spill response. Reporting requirements for a HAZMAT spill which goes over the side are found in reference (a).

(3) To respond to propylene glycol dinitrate (OTTO) fuel and HAZMAT spills all submarines must maintain the OTTO II fuel spill kit (AEL A0006350027).

h. Repair parts petty officer must ensure before SM is ordered, that a valid requirement (specifically required by a maintenance procedure or other shipboard operation) exists. SM listed on the SMCL must be used to the maximum extent practicable. When requesting SM not authorized by the SMCL, submit relevant information so that the HAZMAT coordinator or HAZMAT supervisor can submit an SMCL SFR.

i. MDR

(1) Assist work-center supervisors in training personnel regarding health information and PPE requirements for the HAZMAT they are using.

(2) Provide medical assistance in the event of a HAZMAT spill or mishap involving HAZMAT. Use SDS information provided by the supply officer.

j. Work-center Supervisors

(1) Ensure that approved personal protective clothing and equipment are maintained and utilized.

(2) Ensure that prior to using or handling any HAZMAT, work-center personnel have been trained on the hazards associated with that material and are familiar with what an SDS is, what it contains, and where a copy is available for review.

(3) Ensure that a valid maintenance requirement exists for any HAZMAT item not listed in the SMCL and initiate an SMCL SFR requesting material certification per the requirements of reference (d).

(4) Ensure a hard copy or digital media of the HMUG (reference (c), volume II) is available as applicable for use by work-center personnel that use HAZMAT. Applicable sections can be copied and posted in areas where specific HAZMAT groups are frequently handled, used, or stored.

k. All Hands

(1) Ensure that HAZMAT is returned to appropriate stowage upon completion of use or at the end of the workday, whichever is earlier.

(2) Properly use and handle HAZMAT per reference (c) and the applicable SDS.

(3) Collect and segregate any used HAZMAT or residue resulting from the use of HAZMAT for proper offload to the supply department.

(4) Report any oil or HAZMAT spills to the duty officer (in port) or the chief of the watch (underway).

(5) Report any violation of HAZMAT use, storage, and handling precautions to the workcenter supervisor for resolution and correction.

(6) Be alert to prevent the on board storage and use of restricted material during underway operations without prior approval and authorization from the executive officer. Ensure limited material is being used per SMCL guidance.

(7) Complete HAZMAT awareness training, as required by paragraph 5, prior to handling or using HAZMAT.

APPENDIX B3-A
HAZARDOUS MATERIAL (HAZMAT) AND OIL SPILL RESPONSE PROCEDURES (SURFACE SHIPS ONLY)

1. Introduction. Because of the extremely hazardous nature of many materials used aboard ships, only trained personnel are authorized to respond to a HAZMAT or oil spill. Personnel must be trained by the DCA or supervisory personnel to clean up small spills of oil and HAZMAT. Appropriate material SDS must be used to conduct training.

a. For descriptive purposes, the spill response procedures have been divided into nine phases:

(1) Discovery and notification.

(2) Initiation of action.

(3) Evaluation.

(4) Containment and damage control.

(5) Dispersion of gases and vapors.

(6) Cleanup and decontamination.

(7) Disposal of contaminated materials.

(8) Certification for re-entry.

(9) Follow-up reports and spill response kit replenishment.

b. Each response phase is not a separate response action entirely independent of all other phases. Several phases may occur simultaneously and may involve common elements in their operation. For example, containment and damage control may also involve cleanup and disposal techniques.

2. Spill Discovery and Notification

a. Spills or potential spills of oil or HAZMAT may be discovered by regularly scheduled inspections of storerooms and workshops, by detection devices such as fire alarms and oxygen deficiency detectors, and during routine operations. All discoveries of spills or situations that may lead to a spill must be reported immediately to supervisory personnel and the officer of the

deck (OOD) or command duty officer (CDO). Crewmembers are not to remain in the area to investigate the spill. Whenever possible, however, the discoverer or initial response team must report the information contained in the following subparagraphs 2a(1) through 2a(9).

(1) Time of spill discovery.

(2) Location of spill.

(3) Identification of spilled material.

(4) Behavior of material (reactions observed).

(5) Source of spill (e.g., tank or container).

(6) Personnel in vicinity of spill (list by name and department).

(7) Volume of spill.

(8) Anticipated movement of spill (e.g., leakage to lower deck passage from amidships toward galley, floating in water toward pier, etc.).

(9) Labeling or placarding information (copy data from spilled container only after exposure to spill is eliminated).

b. Overboard spills of reportable quantities of oil (in bilgewater or as oily waste) and HAZMAT must be reported per reference (a).

3. Initiation of Action. Coordination and direction of spill response efforts at the scene of an oil or HAZMAT spill must be accomplished by the ship's OOD, CDO, fire marshal, damage control party leader, or senior person at the scene, as appropriate, who must initiate the following actions:

CAUTION:

Do not enter the contaminated area until
the necessary protective clothing and equipment have been determined

a. Evacuate all personnel from areas that may be exposed to the spilled material.

b. Cordon off the affected area.

c. Arrange first aid for injured personnel.

d. Establish a command post and communications network.

e. Prevent spills from entering other compartments by any means that do not involve personnel exposure to the spill, such as closing drains, ventilation ducts, doors, and hatches.

f. Disperse gases or vapors to weather using local exhaust ventilation (see chapter A4, subparagraph 3b(2) note) or by natural ventilation such as opening doors or hatches. If atmosphere is suspected to be flammable or explosive, only explosion-proof fans must be used for ventilation.

g. Eliminate any fire or explosion hazards such as electrical equipment, incompatible materials, and open flames.

4. Evaluation. Proper evaluation of a spill can prevent fires, explosions, personal injury, or permit steps to lessen their impact. This evaluation consists of the three steps in the following subparagraphs 4a through 4c.

a. Obtain as much of the following information in subparagraphs 4a(1) and 4a(2) as possible from container labels and SDS before starting response actions.

(1) Type and concentration of the spilled material.

(2) Hazardous characteristics of the spilled material, such as:

(a) flash point;

(b) toxicity;

(c) corrosiveness;

(d) potentially incompatible substances;

(e) effects resulting from exposure (fainting, dizziness, skin or eye irritation, nausea); and

(f) first aid measures for exposure.

b. Determine dangerous conditions or potential consequences of the spill, including those listed in the following subparagraphs 4b(1) through 4b(5).

(1) Fire or explosion.

(2) Presence of oxygen-deficient atmosphere in compartment.

(3) Presence of toxic or explosive gases.

(4) Possibility of dangerous vapors being drawn into ship's ventilating system.

(5) Other HAZMAT in the compartment that would play a role in a fire or explosion or is incompatible with the spilled material.

c. Determine from the SDS the appropriate spill response equipment and protective clothing necessary for safe and effective response.

5. Containment and Damage Control. Actions taken during this phase are directed toward controlling the immediate spread of the spill and minimizing the impact to the ship and crew. Depending on the type of spill, some or all of the following procedures in subparagraphs 5a through 5d may be employed.

a. Fight fire (if any), being careful to use firefighting methods compatible with the material involved. Firefighting procedures are provided in reference (i).

b. Shut off or otherwise stem the spill at its source, whenever feasible, by:

(1) replacing leaking containers;

(2) plugging leaks in tanks;

(3) emptying tank of remaining contents;

(4) encapsulating a leaking container into a larger, liquid-tight container; and

(5) segregating leaking containers.

c. Predict spill movement and take further action to prevent the spill from possibly entering other compartments by closing scuppers, drains, ventilation ducts, doors, or hatches.

d. Contain liquid material using barriers, such as sand, sorbents, or other equipment suitable to dam the flow.

6. Dispersion of Gas or Vapor. If a flammable gas or vapor is released as a result of the spill, the gas or vapor must be dispersed or diluted as soon as possible. The gas or vapor must not be allowed to enter other compartments. Have the gas free engineer check the spill area for lower explosive limit and toxicity. The atmosphere can then be dispersed using explosion proof ventilation (see chapter A4, subparagraph 3b(2) note).

7. Cleanup and Decontamination. During this response phase, personnel, as directed by the on scene leader, must employ the spill cleanup materials from the oil spill response kit AEL 2-550024006 or the HAZMAT spill response kit AEL 2-550024007 (for surface ships), 2-550024008 (for small craft), and 2-550024009 (for MCM vessels) as applicable. The material in these spill response kits must only be used for spill response operations. All surfaces must be thoroughly cleaned of the spilled material. After the spill cleanup, the compartment must be thoroughly ventilated. Reusable protective clothing must be thoroughly decontaminated and otherwise maintained before it is returned to its proper storage location.

Note: Identification of specific requirements for respiratory protection and proper use of this equipment is a critical aspect of all cleanup and decontamination operations. Materials from the HAZMAT spill response kit can be used for the cleanup of mercury. In the case of a mercury spill, response procedures are outlined in appendix B3-B.

8. Disposal of Contaminated Materials. All non-reusable cleanup materials are to be placed in impermeable containers, labeled, stored and disposed of per reference (a). These materials include unrecoverable protective clothing, sorbents, rags, brooms, and containers.

9. Certification for Safe Re-Entry. The spaces affected by the spill must be certified safe by the OOD or CDO before normal shipboard operations are resumed in that space. The OOD or CDO must ascertain the following in subparagraphs 9a through 9c before allowing re-entry.

a. All surfaces (deck, counters, bulkheads, and overheads) have been thoroughly cleaned of the spilled material.

b. All compartments have been adequately ventilated as determined from analysis by the gas free engineer.

c. All contaminated cleanup materials, including protective clothing, have been packaged, marked and handled as used HAZMAT.

10. Follow-up Reports and Spill Response Kit Replenishment

a. Reporting procedures for overboard oil or HAZMAT spills are contained in reference (a). The report must contain the information in the following subparagraphs 10a(1) through 10a(9).

(1) Date spill occurred.

(2) Spill location.

(3) Identity of spilled material.

(4) Cause(s) of spill.

(5) Damage or injuries resulting from the spill.

(6) Response and cleanup measures taken.

(7) Any problems encountered.

(8) Method of disposing of contaminated material.

(9) Action taken to prevent the repeat of a similar spill.

b. All depleted spill response kit components must be replenished with new stock and the kit returned to its designated storage location.

APPENDIX B3-B
MERCURY SPILL RESPONSE AND CLEANUP PROCEDURES
(SURFACE SHIPS ONLY)

1. Mercury Spill Cleanup Procedures. Procedures must vary according to the size and complexity of the mercury spill. Refer to references (j) and (k).

Note: Do not enter the contaminated area until the necessary protective clothing and equipment have been determined and properly donned.

a. Broken Fluorescent Bulbs

(1) Set up local exhaust ventilation.

(2) Carefully scoop up glass pieces and powder using stiff paper, cardboard, or a squeegee and dustpan.

Note: Never use a vacuum to clean up mercury, as it will put mercury into the air and increase exposure, or a broom, as it will break the mercury into smaller droplets and spread them.

(3) Use duct tape to pick up any remaining small glass fragments and powder.

(4) Clean the area with a solution of Acton Technologies, Inc. HgX® mercury decontaminant from the HAZMAT spill response kit.

Note: Never use household cleaners to clean up a mercury spill, particularly products that contain ammonia or chlorine. These chemicals will react violently with mercury, releasing toxic gas.

(5) Double bag and seal all contaminated materials, cleanup equipment and protective clothing, and dispose as HAZMAT.

b. Small Spills. Clean mercury spills of less than 2 ounces immediately as per the following subparagraphs 1b(1) through 1b(6).

(1) If the spill is in a confined area, set up local exhaust ventilation. If ventilation cannot be provided, a suitable respirator should be worn.

Note: Eating, drinking, or using tobacco products is prohibited during spill cleanup operations.

(2) Use a squeegee and dust pan (or two pieces of stiff paper) to push the mercury beads together, and scoop them up.

(3) Shine a flashlight (at many different, low angles) on the area to find any remaining mercury beads. Light will reflect off the mercury beads to help locate them. Use duct tape to pick up the remaining mercury beads.

(4) Wipe down spill area with HgX® solution from the spill kit.

(5) Double bag and seal all contaminated materials, cleanup equipment, and protective clothing and dispose as HAZMAT.

(6) Ensure cleanup personnel thoroughly wash hands and exposed areas with soap and water after cleanup.

c. Large Spills. Immediately clean mercury spills of greater than 2 ounces as per the following subparagraphs 1c(1) through 1c(9).

(1) Stop work operations in the area.

(2) Surround the spill area with various sorbents from the HAZMAT spill kit or rags to prevent spreading. Divert the mercury from drains, cracks, and crevices.

(3) Warn personnel of the spill and its location, evacuate the area, and establish safe boundaries.

(4) Call the DCA so the emergency response team can respond. Describe the nature and location of the spill.

(5) Use a mercury vapor meter to determine mercury vapor and degree of hazard, if possible.

(6) Use a squeegee and dust pan (or two-piece of stiff paper) to push the mercury beads together, and scoop them up.

(7) Shine a flashlight (at many different, low angles) on the area to find any remaining mercury beads. Light will reflect off the mercury beads to help locate them. Use duct tape to pick up the remaining mercury beads.

(8) Wipe down spill area with HgX® solution from the spill kit if available.

(9) Double bag and seal all contaminated materials, cleanup equipment, and protective clothing, and dispose as HAZMAT.

2. Mercury Waste Disposal. Mercury is an environmental pollutant and must not be discharged into any body of water or released into any ship's waste disposal system. Disposal should be coordinated with the HAZMAT coordinator and shore facility. All non-reusable cleanup materials are to be placed in impermeable containers, stored and disposed of per table 35-4 of reference (a). These materials include unrecoverable protective clothing, dustpans, squeegees, rags, and containers.

Notes:
1. If clothing comes in direct contact with broken glass, mercury-containing powder or liquid mercury that may stick to the fabric, the clothing should be placed in a double bag and disposed of as HAZMAT. Do not wash the clothing because mercury fragments in the clothing may contaminate the machine and pollute the ship's collection, holding and transfer (CHT) system.
2. Report to medical to evaluate and document potential exposure..

SECTION B

CHAPTER 4

NOISE ABATEMENT AND HEARING CONSERVATION

Ref: (a) DoD Instruction 6055.12, DoD Hearing Conservation Program (HCP), of 3 December 2010
(b) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Recordkeeping Manual
(c) NMCPHC Technical Manual, TM-6290.91-B, Industrial Hygiene Field Operations Manual
(d) NMCPHC Technical Manual, TM-6260.51.99-2, Navy Medical Department Hearing Conservation Program Procedures
(e) MIL-STD-1472, Design Criteria Human Engineering
(f) American National Standard Specification for Audiometers, S3.6-2010, American National Standards Institute
(g) American National Standard Specification for Maximum Permissible Ambient Noise Levels for Audiometric Test Rooms, ANSI/ASA S3.1-1999 (R2013)

1. Discussion

a. Per reference (a), the goal of the noise abatement and hearing conservation program (HCP) is to reduce excessive noise, prevent noise-induced hearing loss and assure auditory readiness of all Navy personnel. The primary means of accomplishing this is by protecting Navy personnel from hazardous noise levels through the application of engineering controls. PPE (e.g., earplugs or muffs, or both) must be used when engineering controls and administrative controls are not able to limit noise levels below hazardous levels.

b. Noise-induced hearing loss is the fleet's number one occupational health hazard. High intensity noise exposure results from a wide variety of shipboard operations, including gun or missile fire, aircraft noise, and ship's propulsion systems. A successful HCP that preserves hearing is critical to safety, mission success and career sustainability.

2. Noise Abatement and Hearing Conservation Responsibilities

a. Commanding Officer

(1) Ensure that the HCP is established and maintained within the command and demonstrate proactive leadership in the prevention of occupational noise-induced hearing loss.

(2) Ensure that an adequate, appropriate, and readily accessible supply of hearing protective devices (HPD) (disposable earplugs or noise muffs, or both) with appropriate noise

reduction rating is available in work areas and passage ways leading to high noise areas. HPDs must be replaced as necessary whenever they become dirty or damaged.

b. Safety Officer

(1) Request assistance from an IH or occupational audiologist to have noise measurement and exposure analysis (survey) of areas and equipment conducted.

(2) Maintain a record of noise hazardous areas and equipment. The baseline or periodic IH surveys must serve as documentation. Ensure that noise hazardous spaces and noise hazardous equipment are posted and labeled accordingly.

(3) Ensure that HPDs are readily available in noise hazard work areas and that personnel wear HPDs correctly. Ensure that HPDs are worn for all noise hazardous operations and evolutions conducted in noise hazardous areas.

(4) Ensure the program is evaluated at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

(5) Ensure that all work related permanent threshold shift (PTS) are reported as required by reference (b).

c. Afloat IHOs (e.g., carrier and tender IHOs)

(1) Maintain and ensure proper calibration of sound level measuring equipment.

(2) Annually, certify installed audiometric testing booths for use inport and underway.

d. Division Officers

(1) Ensure personnel exposed to hazardous noise wear the correct hearing protection as required by the IH survey and hazardous noise warning labels.

(2) Ensure that a space or piece of equipment that is designated as noise hazardous is properly posted and labeled.

(3) Coordinate with the MDR to ensure that personnel in the HCP report for all required audiograms (annual and follow-up audiograms, diagnostic evaluations, and fitness for duty evaluations) and training per paragraph 8.

(4) Ensure that personnel who require follow-up testing due to a significant threshold shift (STS) are excluded from noise areas, defined as areas 80 decibel A scale (dB(A)) or greater for continuous or 140 dB sound pressure level (SPL) peak, for at least 14 hours before the scheduled retests. Hearing protection may not be used to meet this requirement.

Note: Noise exclusion must not be imposed for individuals scheduled for an annual audiogram.

e. MDR

(1) Coordinate with division officers to identify and maintain a current roster of personnel exposed to hazardous levels of occupational noise, as guided by the baseline or other IH surveys.

(2) Conduct and document training per paragraph 8 for all hands during indoctrination and annually thereafter. Training assistance is available from MTF subject matter experts to include operational, occupational audiologists and hearing conservation staff.

(3) Consult the command IH survey or an occupational audiologist or other occupational health professional to determine the type of HPDs required for personnel. Maintain an adequate stock of non-disposable HPDs in various sizes to properly fit wearers.

(4) Schedule personnel enrolled in the HCP for annual audiometric testing. Ensure results of hearing tests performed for hearing conservation and personal noise dosimetry documentation become a permanent part of an individual's electronic medical record. For ships that can perform audiometric testing ensure that all test results have been entered into each individual's health record, uploaded to the Defense Occupational and Environmental Health Readiness System – Hearing Conservation (DOEHRS–HC) data repository, and that all appropriate and necessary follow-up actions are completed. Report hearing readiness status via electronic report; see chapter A3, paragraph 6, for additional information on medical surveillance requirements.

(5) Verify that personnel who demonstrate a positive STS (worsening) on an annual test have been excluded from noise areas, defined as areas 80 dBA or greater for continuous or 140 dB peak SPL, for at least 14 hours before the scheduled re-test and that hearing protection was not used to meet this requirement.

(6) If audiometric testing is performed within the MDR's command, ensure audiometric booths are certified and audiometers are appropriately calibrated annually. Technicians conducting audiometric testing will hold current DoD occupational hearing conservation certification through completion of an approved DoD or Navy sponsored course following guidelines set forth by the Council for Accreditation in Occupational Hearing Conservation.

(7) Ensure that all audiograms demonstrating an unresolved STS after appropriate follow-up are reviewed and documented by a physician, audiologist, or otologist in determining if the changes are permanent.

(8) Report, to the safety officer, all work-related PTSs per reference (a).

(9) Develop and maintain collaborative working relationships with occupational audiology professionals in order to implement and coordinate effective workplace practices and procedures to prevent noise induced hearing loss. Occupational audiology professionals provide and assist with audiometric medical surveillance testing, diagnostic audiology evaluations and dispositioning, HPD consultations, and subject matter expert hearing conservation training.

f. All Hands

(1) Comply with hazardous noise warning labels wherever they appear, either in spaces or on equipment.

(2) Properly wear assigned HPDs.

(3) Undergo annual and any required follow-up audiometric testing if enrolled in the HCP.

(4) Protect hearing from recreational and off duty noise hazards.

(5) Complete annual noise abatement and hearing conservation training as required by paragraph 8.

(6) Refrain from using portable electronic listening devices, such as music and media players and cellular phones in industrial areas and in work areas where high noise hazards have been identified.

3. Noise Measurement and Exposure Assessment. To effectively control noise, it is necessary that the noise be accurately measured according to standard procedures as outlined in reference (c) and that the measurements are properly evaluated against current criteria. Measurement of environment noise levels is also necessary to identify unacceptable levels and personnel at risk.

Note: For new construction ships, an airborne noise survey conducted by the shipbuilder for contract performance is not an acceptable substitute for the required noise survey and personal noise exposure assessment once the ship is loaded out with personnel and gear.

a. HCP. Personnel must be entered into the HCP when they are routinely (i.e., 1 or more days per year) exposed in an occupational environment exposed as follows:

(1) Continuous and intermittent noise that has an 8-hour time-weighted average (TWA) noise level of 85 dBA or greater.

(2) Impact or impulse SPLs of 140 dBP or greater.

b. Noise Measurements

(1) Noise measurements must be taken as part of the IH survey. A noise survey is required if one has not been performed, if the ship has completed a major repair availability, had significant work done on engineering systems, or if new equipment has been installed.

(2) Only personnel trained per references (c) and (d) are allowed conduct noise surveys. These personnel include industrial hygienists, occupational audiologists or by other personnel trained by an industrial hygienist or occupational audiologist. Detailed information on noise measurement procedures may be found in reference (c).

(3) Reference (d) requires that all personnel exposed at or above an 8-hour TWA of 85 decibels A scale (dBA) must be notified of the results of the monitoring. The results of personal noise dosimetry monitoring that exceed this level must be forwarded to the MDR who will notify exposed personnel.

c. Exposure Assessment

(1) The analysis of noise measurements to assess the hazard potential is a complex task that must be performed by an industrial hygienist, occupational audiologist or by other personnel trained by an industrial hygienist or occupational audiologist. The exposure assessment must be accomplished per reference (c).

(2) Work environments found to have noise levels equal to or greater than 85 dBA (continuous or intermittent), or 140 decibel pressure (dBP) SPL for impact or impulse noise must be analyzed to determine the potential hazard and must be resurveyed within 30 days of any significant modifications or changes in work routine which could impact and alter the noise intensity and exposure level.

(3) Entry of personnel into a HCP will be based on the results of the IH exposure assessment and relevant criteria for exposure intensity and frequency are considered at risk and must be included in audiometric testing. The IH survey identifies tasks, processes, operations or similar exposure groups where exposures are unacceptable. In the absence of an industrial hygienist's or occupational audiologist's assessment to the contrary, personnel who work in noise hazardous areas or with equipment that produces hazardous noise, defined as equal to or exceeding 85 dBA for continuous or 140 dBP SPL, must be included in the HCP. Implementation of all available measures may not be necessary in every case. For example, visitors to a noise hazardous area must be required to wear hearing protection, but would not be required to have their hearing tested or be included on a roster of noise exposed personnel. See appendix B4-A for additional information.

(4) Information regarding removal of personnel from the HCP is provided in appendix B4-A.

4. Noise Abatement

a. Engineering controls for noise abatement or reduction of noise at the source must be explored first before implementing other methods of hearing loss prevention. Areas and equipment that contain or produce potentially hazardous noise should be modified to reduce noise levels to within acceptable limits wherever it is technologically and operationally feasible.

b. Engineering noise abatement actions will normally be accomplished during ship or equipment design, construction or testing. Hazardous noise areas and equipment not identified during construction or post overhaul noise surveys are most likely due to malfunctioning equipment. Engineering noise abatement actions recommended by the industrial hygienist or resulting from INSURV inspections must be forwarded to NAVSEASYSCOM and the TYCOM for evaluation and approval. Additional information on noise abatement in new ship design is contained in reference (e).

c. The secondary means of protecting people are administrative controls, (e.g., limiting times of exposure or enforcing safe stay times). Due to design, safety, and operational requirements on ships, administrative controls are often not feasible. In these instances, provision of the most protective HPDs or HPD combinations is critical. Consult occupational audiology or IH on selection of the appropriate protective devices.

5. Identifying and Labeling of Hazardous Noise Areas and Equipment

a. The designation of hazardous noise areas and equipment will be based on the criteria in the following subparagraphs 5a(1) and 5a(2).

(1) Areas or equipment where the noise levels are 85 dBA or greater but less than 96 dBA or 140 dBP or greater but less than 165 dBP must be labeled as noise hazardous and require the use of single hearing protection.

(2) Areas or equipment where the noise levels are 96 dBA or greater or 165 dBP or greater must be labeled as noise hazardous and require the use of double hearing protection.

b. All potentially hazardous noise areas and equipment must be clearly identified by signs located at their entrances, boundaries or on the tool or equipment. Each tool or piece of equipment producing noise levels of 85 dBA or greater, including vehicles, must be conspicuously marked to alert personnel of the potential hazard. The exception must be when the entire space is designated as a hazardous noise area and the equipment is stationary. Exteriors, but not interiors, of military combatant equipment are excluded from the labeling requirement. In addition, personnel operating and maintaining combatant equipment must be made fully aware of hazardous noise exposure conditions.

c. NAVMED 6260/2 Hazardous Noise Warning Decal and NAVMED 6260/2A Hazardous Noise Labels (Wear Double) are approved for marking hazardous individual pieces of equipment or tools.

(1) Noise hazard warning signs and labels must be annotated as to the circumstances or operations that create the noise hazardous condition when hearing protection is required (e.g., when generator is operating).

(2) Normally the outside of doors and hatches leading into a noise hazardous area must be posted. However, topside and weather surfaces of a ship must not be posted. In the event that a particular area is a noise hazardous area and has an entrance from a weather deck, the inside of the weather deck door or hatch must be posted.

6. Hearing Protection Devices (HPD)

a. HPDs are considered an interim protective measure while installing engineering control measures. HPDs must constitute a permanent measure only if engineering and administrative controls are not technologically, economically, or operationally feasible. HPD recommendations are contained in the baseline and periodic IH surveys.

b. When hazardous noise sources are operating, personnel must wear HPDs regardless of exposure time.

c. Single HPDs (ear plugs or circumaural muffs) must be worn by all personnel when they enter or work in an area where the operations generate SPLs.

(1) 85 dBA or greater but less than 96 dBA continuous.

(2) Greater than or equal to 140 dBP impulse noise level but less than 165 dBP, such as weapons fire, etc.

d. Double HPDs (ear plugs and circumaural muffs) must be worn by all personnel when they enter or work in an area where the operations generate SPLs.

(1) 96 dBA or greater continuous.

(2) Greater than or equal to 165 dBP noise level. Exposure to impulse noise, to include all forms of weapon fire equal to or exceeding 165 dBP (to include live fire operational training) must wear double HPDs. All personnel exposed under any circumstances to simulated combat sounds (gunfire, artillery or missile firing) or live fire operational training must wear HPDs. Commanders will dictate the use of hearing protection in combat based on mission requirements and the ability of the HPD to facilitate communication and situational awareness.

e. Use of custom earplugs is authorized. Only audiologists, otolaryngologists, and medical providers professionally trained in ear impression techniques may take impressions of the ear necessary to make the custom earplugs. Medical personnel trained to fit preformed and custom earplugs must examine the fit and condition of preformed and custom earplugs at least annually. As with all PPE, cost is the responsibility of the individual command.

f. Preformed sized earplugs must be fitted and issued only under the supervision of personnel specifically trained to fit earplugs. All activities must ensure proper initial fitting and supervise the correct use of HPDs. The NMCPHC Web site at: http://www.nmcphc.med.navy.mil identifies guidance and links to sites with additional information on selecting HPDs that have been tested for attenuation under American National Standards Institute requirements. Consult an occupational audiologist or industrial hygienist for specifics.

g. Hearing aids may not be used in conjunction with or in place of HPDs except as approved by an audiologist or otolaryngologist on a case-by-case basis.

7. Audiometric Testing and Medical Evaluation

a. Reference (Baseline) Audiogram. All active duty personnel must receive a baseline audiogram upon entry into naval service. Test results are uploaded to the DOEHRS-HC central data repository as well as recorded on a DD 2215 Reference Audiogram. Audiometric testing performed at military entrance processing stations must not be used as a baseline audiogram. Civil Service employees assigned to work in noise hazardous work areas must receive a baseline audiogram prior to beginning work in noise hazardous areas.

b. Monitoring Audiograms. All personnel in the HCP must receive an audiogram annually, beginning within 1 year of assignment to those duties, unless their exposure has been found to be of insufficient intensity or duration to require enrollment, as determined by the command safety officer or manager, based on a noise survey. Test results must be uploaded to the DOEHRS-HC central Data Repository as well as recorded on a DD 2216 Hearing Conservation Data. Placement in the HCP, annual audiograms, and appropriate follow-up testing must continue for as long as the person remains in a noise hazardous environment. Appendix B4-A provides detailed information on audiometric testing.

c. Termination Audiograms. Civilian personnel must receive a hearing test when removed from the HCP or prior to termination of service. Active duty personnel must only receive termination audiograms upon military retirement or separation.

d. Other Hearing Tests. Hearing tests performed for reasons other than hearing conservation or routine physicals, such as complaints of hearing difficulties, difficulty understanding conversational speech or a sensation of ringing or fullness in the ear(s), must be

performed as indicated by a medical provider. The results of these tests should be recorded on a diagnostic audiology evaluation form with clinical notation on SF 600 Chronological Record of Medical Care and maintained in the health record. If this type of testing is conducted using DOEHRS-HC microprocessor audiometry it will be recorded as a "non-hearing conservation" test.

8. Training

a. All personnel must receive training relative to the HCP prior to working in noise hazardous areas or with noise hazardous equipment and annually thereafter. Initial training topics must include:

(1) the rationale for the HCP including the effects of noise on hearing;

(2) designated noise hazardous areas and equipment;

(3) proper use and maintenance of HPDs, including the advantages and disadvantages of each type of device;

(4) the necessity for hearing testing, and a description of test procedures;

(5) mandatory requirement to wear assigned hearing protection, and administrative actions that may result from failure to comply;

(6) off-duty hearing health hazards;

(7) the effects of hearing loss on career longevity, promotion and retention; and

(8) communication in high-noise environments.

b. Annual refresher training must be conducted for personnel enrolled in the HCP as required by subparagraph 8a. Often this training is accomplished in conjunction with the annual audiogram. If training assistance is required, the MDR should seek assistance from the MTF occupational or operational audiologists or subject matter experts.

9. Recordkeeping

a. The MDR must maintain a current roster of personnel who work in designated noise hazardous areas and must coordinate with division officers to update this roster semi-annually. The MDR must manage an effective process for scheduling annual audiometric examinations of these personnel and work collaboratively with division officers to ensure compliance.

b. Results of audiograms performed for hearing conservation purposes and the results of exposure assessments must be permanently recorded, uploaded to the DOEHRS-HC data repository and also retained in the member's health record. Baseline and reference audiograms which have been superseded as a result of the follow-up process must be retained in the individual's health record along with relevant evaluation, disposition and referral notations.

APPENDIX B4-A
AUDIOMETRIC TESTING AND MEDICAL EVALUATION

This appendix provides detailed information regarding hearing conservation that will be of value to the ship's medical and safety departments.

1. Hearing Test. Audiometers used in the performance of audiometric testing must conform to the standards defined in the most current edition of reference (f). Hearing tests must be pure tone, air conduction hearing threshold examinations to include, as a minimum, test frequencies of 500, 1,000, 2,000, 3,000, 4,000 and 6,000 hertz (Hz) and must be taken separately for each ear. Tests must be performed by an audiologist, otolaryngologist, a qualified physician or by a person certified by the NMCPHC or the equivalent organization of another U.S. Military Service following the guidelines set forth by the Council for Accreditation in Occupational Hearing Conservation. Hearing tests must be conducted in an audiometric booth or test room with internal ambient sound levels not exceeding those prescribed in reference (g).

a. Audiometric test booths and test rooms must be certified annually by an industrial hygienist, audiologist or other qualified personnel under their direct supervision for the conditions in which it is being used (inport or underway).

b. The use of noise excluding audiometric earphones is not permitted to augment the performance of a deficient (e.g., non-certifiable) audiometric test booth or test room. Their use for minimizing ambient noise masking effects during testing is allowed within a certified audiometric test booth or test room.

2. Reference (Baseline) Audiograms

a. All personnel included in the HCP must have a DD 2215 in their medical record and the test results uploaded to DOEHRS-HC data repository.

b. All reference audiograms must be preceded by at least 14 hours without exposure to workplace noise exceeding 80 dBA. This requirement may not be met by wearing HPDs. Reference (baseline) audiograms will not be conducted if there is evidence of a transient medical condition that would affect hearing threshold.

c. Personnel who do not have a reference audiogram filed in their health record must not be assigned to duty in a designated hazardous noise area involving exposure to hazardous noise until a reference audiogram has been performed. Elevated thresholds may require an audiometric fitness for duty evaluation, consult reference (c).

3. Monitoring Audiograms. All personnel enrolled in the HCP must receive a monitoring audiogram annually for as long as they remain enrolled. Additional audiograms may also be

conducted when there are individual complaints of hearing difficulties (e.g., difficulty in understanding speech or a sensation of ringing or fullness in the ear(s)). At the discretion of an audiologist or MO, evaluation and medical record entries will be necessary to discover and document the existence of occupational versus non-occupational etiology.

a. Consult reference (d) for detailed medical department guidance for the provision of monitoring audiometry, follow-up testing, and case management of personnel with noise-induced hearing loss.

b. The monitoring audiogram must be compared to the most current reference audiogram to determine if an STS has occurred.

(1) STS is defined as a change in hearing averaging 10 dB or more at 2000, 3000, and 4000 Hz in either ear. If the annual audiogram shows no STS, the individual must be returned to duty and recalled for hearing testing in 1 year.

(2) When an STS is identified, additional monitoring hearing tests must be performed to determine if the threshold shift is temporary or permanent in nature. The member's division officer and MDR will be informed of the time and place for follow-up testing.

(3) If the annual audiogram shows negative STS (improved hearing), then the individual should be re-tested immediately to determine if the baseline or reference test was in error, hearing has actually improved, or the annual test was invalid. If the repeat audiogram continues to show a negative STS and is plus or minus 5 dB from the annual test, re-establish the reference based on the first follow-up test and repeat the test in 1 year. This reestablished baseline does not require review of the audiologist or physician. The safety authority will enter the PTS into WESS per reference (b).

(4) If the annual audiogram shows a positive STS toward deteriorated hearing, then the individual must be re-tested following at least 14 hours of exclusion from noise levels in excess of 80 dBA. Because the presence of an STS implies that the hearing protection used may be inadequate, physical exclusion from noise may not be accomplished by the use of hearing protection. The physical exclusion period is referred to as "auditory rest." The required 14 hours of "auditory rest" is usually sufficient to allow a temporary STS to return to pre-exposure levels.

c. Follow-up number 1.

(1) If the first follow-up audiogram shows no STS relative to the reference audiogram (i.e., STS has resolved), personnel must have their HPDs refitted, be re-indoctrinated in their use, and returned to duty to be recalled for a hearing test in 1 year.

(2) If the first follow-up supports the existence of STS, then a possible conductive or mechanical basis for the shift must be ruled out before proceeding with follow-up. The preferred

method to rule out conductive hearing loss is through screening tympanometry and otoscopy, administered by the audiometric technician or MDR. Subjects who demonstrate normal otoscopy and tympanometry should have that fact noted on an SF 600, and may then immediately receive their second follow-up hearing test. If tympanometry is unavailable, then any health care provider can provide examination and clearance to continue the audiometric test sequence. Otoscopic and tympanometric anomalies requires medical evaluation prior to resuming the test sequence.

(3) At any point in the monitoring process, the MO has the option of discontinuing the sequence and referring the patient to an audiologist for further evaluation, if results appear invalid or if a severe condition is suspected.

d. Follow-up number 2.

(1) If the second follow-up test shows no STS relative to the reference audiogram, personnel must have their HPDs refitted, be re-trained in their use, and be returned to duty. An audiogram must be conducted within 1 year from the date of the second follow-up test.

(2) If the second follow-up test continues to show STS relative to the reference audiogram, the health care provider will refer the individual for diagnostic evaluation or consultation with an audiologist. However, for personnel who continue to demonstrate essentially normal hearing sensitivity despite their threshold shift, the audiologist or suitably trained physician who would otherwise receive the referral may elect to provide a written protocol for case management. The protocol may include the option of shipboard counseling and revision of the reference audiogram without additional testing or review.

(3) An STS will be considered a PTS when so determined and documented by an audiologist or appropriately trained physician and a new reference audiogram established. This re-established reference audiogram does in no way replace the original baseline or reference audiogram established at the start of service, which may still be used to determine hearing losses at the termination of military service. Individuals will be informed in writing within 21 days of any PTS toward deteriorated hearing. When the PTS results from exposure to hazardous noise levels, the hearing loss must be reported in writing by the MDR to the safety officer and department head; they in turn will determine if a possible breach in the hearing conservation control procedures has occurred, resulting in a hearing loss.

e. Any individual who has hearing loss in both ears in which the sum of thresholds at the frequencies of 3000, 4000, and 6000 Hz equals or exceeds a total of 270 dB or has their DD 2215 re-established 3 times will not be assigned to duties involving exposure to hazardous noise until evaluated and waived by an audiologist, otologist, or occupational medicine physician.

4. Removal Audiograms. Individuals who are removed from the HCP must be given an audiogram to document auditory status at the time of removal from noise hazardous duties. Results of this test will be recorded on DD 2216 as well as uploaded to the DOEHRS-HC data repository. Removal of individuals who are already included in the HCP will be made only by an audiologist or qualified physician.

5. Termination Audiograms. Personnel must receive a hearing test when removed from the HCP or within 30 days prior to termination of service. Active duty personnel must only receive termination audiograms upon military retirement or separation.

SECTION B

CHAPTER 5

SIGHT CONSERVATION

Ref: (a) American National Standard for Occupational and Educational Personal Eye and Face Protection Devices, ANSI Z87.1-2015 (NOTAL)
(b) NAVSAFECEN Chemical Eye and Face Protection Matrix (NOTAL)
(c) American National Standard for Emergency Eyewash and Shower Equipment, ANSI/ISEA Z358.1-2014 (NOTAL)

1. Discussion

a. Navy policy requires that personnel working in eye-hazard areas or operations are provided adequate eye protection at Government expense. Examples of potentially eye hazardous operations are: warfighting and operational training, cutting and welding, drilling, grinding, milling, chipping, sand blasting, other dust and particle producing operations and pouring or handling molten metals or corrosive liquids and solids. Personnel in the immediate vicinity of such operations or entering a posted eye hazard area must wear eye protective equipment.

b. Devices for eye protection, such as safety glasses, chipper's goggles, welder's goggles, chemical goggles, and face shields, must be selected using the guidance provided in appendix B5-A and tables B5-A-1 and B5-A-2. This appendix complies with reference (a). As a minimum, the protective devices provided must be approved by the ANSI, labeled "Z87" or “Z87+” in the case of ballistic eye protection devices, and adequate for the hazards specified.

2. Program Responsibilities

a. Commanding Officer

(1) Ensure that an effective sight conservation program is established.

(2) Place emphasis on leadership by example regarding wearing of sight protection equipment.

b. Safety Officer

(1) Evaluate areas, processes, and equipment for sight hazards if not previously evaluated or modifications have been made. Determine appropriate sight protective equipment per the

baseline IH survey, or reference (b). Assistance may be requested from an IH if difficulty in making such a determination is experienced.

(2) Maintain a current listing of all areas and processes that require eye protection and those areas that require eye wash or deluge shower facilities. A list of eye hazardous areas and processes and eye wash or deluge shower requirements is provided in the baseline IH survey.

(3) Conduct training as required by paragraph 7.

(4) Evaluate the program at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

(5) Ensure safety eyewear obtained by the command has permanent side shields that meet the ANSI test requirements for that specific frame. These side shields are not to be removed.

c. Division Officers

(1) Ensure that areas identified as eye hazardous are properly marked and labeled per paragraph 3.

(2) Ensure personnel use proper eye protective devices when required.

(3) Refer personnel who wear corrective eyewear and work in eye hazard areas to the medical department to obtain prescription safety eyewear.

d. MDR. Provide personnel who require corrective lenses and work in eye hazard areas, with prescription eyewear. Safety eyewear must have side shields that meet the ANSI test requirements.

e. All Hands

(1) Comply with posted eye hazard warning labels.

(2) Properly wear required eye protective equipment.

3. Designation of Eye-Hazardous Areas and Processes. The ship (or construction and repair yard) must mark permanently installed equipment and processes that are eye-hazard areas with deck striping and a “caution” sign.

a. Mark the deck around an immediate eye hazard with a 2- to 3-inch black and yellow striped or checkerboard tape or similarly painted. This tape is available under NSN

9Q/990-01-342-5934 (checkerboard) or 9Q/9905-01-342-5933 (striped). Place the deck marking around equipment operator areas in the vicinity of where the eye hazard is generated (e.g., where there are flying chips from a lathe).

b. Mount the eye hazard sign directly above the hazard, component, machinery, boundary bulkhead, or door in a conspicuous location. The “caution” sign must conform to NSN 9Q/9905-01-100-8203, "CAUTION, Eye Protection Required in This Area." Eye hazard signs or labels are also available through open purchase. Eye hazard signs and labels are not required on individual tools.

Note: Avoid placing the deck markings or eye hazard signs at the entrance of a space or shop if only selected areas of the shop are eye hazardous. Marking the entire shop as an eye hazardous area requires all personnel in or entering the shop while any equipment is in operation to wear PPE and requires that appropriate PPE is available at the entrance to the shop.

Note: For submarine Engine Room work areas, use temporary boundaries to mark the area. The use of rope and a “Machine Operation in Progress – Eye Protection Required” sign is required to mark the boundaries. See chapter D1, subparagraph 3d(1) for details.

4. Issue and Maintenance of Sight Protection Equipment

a. Issue. The ship must provide and issue appropriate eye protection at Government expense. The list of eye hazards the safety officer maintains identifies required eye protective equipment. All eye and face protection including safety glasses (frames), ballistic eye protection devices, chemical splash goggles, welding and chipping goggles, welding helmets, and face shields must be labeled "Z87.1" or “Z87.1+” indicating compliance with ANSI standard ANSI-Z87.1. Such eye and face protection equipment is available through the supply system or open purchase. Appendix B5-A contains information that describes the general types of protective eyewear frequently used on board ships.

b. Prescription Protective Eyewear. As determined by the safety officer and MDR, prescription safety glasses may be necessary for some individuals. Prescription protective eyewear must be obtained through the medical department. Open purchase procedures may be used to obtain refractive services and prescription safety lenses. DD 771 Eyewear Prescription, or as designated by BUMED, will be used in all services and equipment procurement. The prescription and procurement forms must be entered into the crew member's medical record. Prescription protective eyewear is only indicated when the individual is required to wear safety glasses for a significant portion of their daily work. For intermittent work requiring eye protection, goggles can be worn over regular prescription glasses.

c. Maintenance of Protective Eyewear. Personnel must maintain personal protective eyewear in a clean and fully operational condition. Before re-issue, non-corrective eye protection must be sanitized with hot, soapy water and rinsed of all traces of soap or detergent. Eye protection equipment must then be immersed for 10 minutes in a disinfectant, rinsed, and air-dried. Personnel must immediately report lost or damaged protective eyewear to their work-center supervisor.

5. Temporary Protective Eyewear. Where protective eyewear is necessary, the command must provide safety glasses or goggles to visitors and others who must enter or pass through eye hazardous areas. In addition, the command must provide them to personnel awaiting corrective or protective eyewear.

6. Emergency Eyewash and Deluge Shower Facilities. Emergency eyewash stations are primary first aid for splashes or exposures to corrosive materials. Corrosives may cause severe and progressive damage to the eyes and skin, so immediate, on-site means of washing them from the eyes and skin is vital. Emergency eyewash stations are not normally required in areas where non-corrosive liquids, irritants, metal chips, or debris may contact the eyes, since the damage normally does not progress while the person is transiting to medical attention.

a. General Requirements. The ship must have an adequate number of properly maintained and inspected eyewash facilities, installed in locations with corrosive hazards, and properly posted with signs identifying their locations. Per reference (b), approved emergency eyewash equipment (permanent plumbed or portable) must meet the requirements listed in the following subparagraphs 6a(1) through 6a(13).

(1) Be capable of flushing the eyes with potable water at a minimum flow rate of 0.4 gallons per minute for 15 continuous minutes.

(2) Have a water delivery velocity low enough not to be injurious to the user's eyes. When the valve is properly set, the flow from both nozzles should meet equidistant at the center of the bowl.

(3) Have a one-motion (e.g., paddle or pull strap), stay-open valve, such that when activated the eyewash will remain on to allow the user to hold open their eyelids to facilitate flushing. The valve must remain open without the use of the operator’s hands until intentionally closed.

Note: For MCMs that have faucet mounted eyewash stations in the medical treatment room that require two motions to activate: these eyewash stations are intended for flushing eye treatment for personnel being treated by medical personnel and not intended for use by injured personnel for emergency use. Therefore, the requirement for one motion use does not apply to these eyewash stations.

(4) Be on the same level, unobstructed and easily accessible within 10-second travel of the identified eye hazard.

(5) Be installed such that the travel route to the eyewash is free of trip hazards or overhead strike hazards and positioned in such a way as to pose no hazard to the user (e.g., near electrical fixtures, down a ladder, through a door, near obstructions, in a confined area).

(6) Be positioned with the eyewash nozzle(s) not less than 33 inches or more than 45 inches above the deck, and 6 inches minimum from the nearest wall or obstruction.

(7) Protect eyewash nozzles from airborne contaminants and debris. Whatever means is used to afford such protection (plastic caps, cups, cover), its removal must not require a separate motion by the operator when activating the unit.

(8) Deliver tepid flushing water (60 to 100 degrees Fahrenheit).

(9) Ensure potable water valves to eyewash stations and deluge showers are locked open with a lock-shield key or metal, tamper-proof lanyard and marked as a "W" fitting.

(10) Be positioned with the shower head height not less than 82 inches or more than 96 inches above the deck, and 16 inches minimum from the nearest wall or obstruction.

(11) For shower heads the actuator must be easily accessible no higher than 69 inches above the deck.

(12) Ensure all emergency eyewash and shower equipment is maintained through the planned maintenance system (PMS).

(13) Clearly mark eyewash stations with a green and white eyewash sign. Signs must be either NSN 9905-01-345-4521, an international type or other similar sign. Post signs in a visible location close to the eyewash unit.

b. Eyewash Stations. On surface ships, eyewash stations are typically installed in locations where corrosive materials are used. Eyewash stations must be located in the areas listed below in subparagraphs 6b(1) through 6b(7) and as documented in the baseline and follow-on IH surveys.

(1) Main and auxiliary machinery spaces, battery charging areas. Eyewash station must not be installed in CHT pump rooms.

(2) Medical treatment area does not apply to PC. For MCM, see the above subparagraph 6a(3) note.

(3) Chemical, water testing, and medical laboratories.

(4) Darkrooms and X-ray developing areas, if liquid chemicals are used.

(5) HAZMAT issue and storerooms, if HAZMAT is dispensed. Used HAZMAT collection areas where HAZMAT is consolidated for disposal. Do not put an eyewash unit in a calcium hypochlorite or bromine storeroom.

(6) Paint mixing and issue rooms.

(7) Oil labs. For MCMs the eyewash station is located in the laundry room directly across the passageway from the oil lab. The oil lab door must be latched open while handling oil products.

c. Eyewash Bottles. Approved eyewash bottles are available through the supply system under NSN 4230-01-294-2118. Bottles must be factory sealed to ensure the solution is sterile and have an expiration date or shelf life. Bottles cannot be refilled after the seal is broken. Eyewash bottles must not be used on surface ships. For propulsion plant spaces of nuclear powered submarines, eyewash bottles may be used in lieu of permanent or portable eyewash stations and must be readily available in nucleonics and water chemistry rooms and secondary analysis stations.

d. Combination Shower and Eyewash Station. As specified in reference (c), a combination of emergency shower with eyewash station with drain and stay-open valve must be available in all areas where the eyes and skin of crew members may be exposed to corrosive materials. Corrosives are frequently found in the locations listed below in subparagraphs 6d(1) through 6d(6), and should be evaluated for installation of a combination of emergency shower with eyewash unit:

(1) Battery shop or locker (wet cell testing, electrolyte handling).

Note: Gel-type lead acid batteries that are valve-regulated lead acid (VRLA) are maintenance-free and therefore require no access to hazardous electrolytes. Combination shower and eyewash units are not required for charging areas of gel-type VRLA batteries.

(2) Oxygen-nitrogen producer room.

(3) Combat systems areas handling Isopar® fluids.

(4) Rubber and plastic shop.

(5) Composite material repair shop.

(6) Non-destructive test and inspection shops.

e. Portable Eyewash Stations. For those spaces that require an emergency shower, or eyewash, but where potable water and drainage are not feasible, the ship must properly install a self-contained portable eyewash. The portable eyewash unit design must comply with the same criteria for function and installation as listed in subparagraph 6a including the appropriate PMS.

f. Emergency Use. After emergency use of an eyewash station or deluge shower the injured person must be escorted to sick bay to be examined by the MDR.

g. Remotely Located Eyewash Facilities. Permanently plumbed emergency showers and eyewashes, located in remote locations or minimally manned areas must be provided with an audible alarm interlocking with the activation device of the unit. The alarm is intended to alert personnel in a manned area that someone is using an eyewash facility in a remote area and may not have anyone in the immediate vicinity to render aid. The alarm must be located in one of the following appropriate areas: outside the protected area or shop, in the associated enclosed operating station, in a nearby manned space, central control station or in damage control central.

Note: For remotely located eyewash facilities without an audible alarm, observe the two-man rule when eye-hazard operations are performed until the alarm system is installed. A label plate must be placed at eye level in the immediate vicinity of the alarm and must be inscribed:

WARNING

WHEN THE EMERGENCY SHOWER (EYEWASH) IN THE (SHOP OR SPACE LOCATION) HAS BEEN ACTIVATED, PROVIDE IMMEDIATE ASSISTANCE TO PERSONNEL AND NOTIFY SICK BAY.

7. Training. The safety officer must conduct training for all newly reporting personnel during indoctrination and annually thereafter. Topics that must be covered in the training program include:

a. types of eye hazard areas and processes;

b. types of eye protection;

c. eyewash location and proper use (particularly personnel working with corrosive materials); and

d. proper action when personnel experience mishaps involving particles or liquids in the eye, or use an eyewash station.

Note: No attempt should be made to remove a particle lodged in the eyeball, or wash an eye that has been cut in any way. Contact the medical department immediately.

APPENDIX B5-A
TYPES OF PROTECTIVE EYEWEAR

Appropriate eye and face protection is required in all areas that are designated as eye hazardous. A selection chart for eye and face protection for different work operations, and a welding filter shade protection chart, are shown in tables B5-A-1 and B5-A-2. The following is a short description of the various types of protective eyewear:

a. Safety Glasses and Spectacles. Safety glasses are to be worn in those areas where there is a possibility of flying objects, particulates, or dust entering the eye. Those spectacles with suitable filter lenses are permitted for use with gas welding operations on light work and for inspections. Sun glasses, rated as safety glasses and marked with "Z87," with side-shields, may be used for outdoor work when sun protection is desired. Note: safety sun glasses are not suitable as ultraviolet protection from welding, cutting, or burning operations.

b. Chemical Goggles. Chemical goggles provide the eyes and eye area with protection from liquids, splashes, mists, vapors, and spray. Goggles may consist of a flexible frame or a rigid frame with a separate, cushioned fitting surface, and are held in place with a supporting band. Chemical goggles with ventilation must be splash resistant (covered vents vice perforations). Vented chemical goggles do not protect eyes against corrosive mists, vapors, gases, or aerosols.

c. Welding Goggles. Welding goggles provide protection against glare and injurious radiation, as well as from flying objects, chips, and metal splashes. Eyecup-type goggles are designed to be worn alone, while cover-type goggles are designed to fit over corrective spectacles. The lens filter of welding goggles is shaded to protect the eyes from ultraviolet, infrared, and visible rays generated by the work operations.

d. Chipping Goggles. Chipping goggles protect the eyes from relatively large flying objects generated by such operations as chipping, lathing, grinding, and chiseling. Eyecup-type goggles may be worn alone, or cover-type goggles may be fitted over corrective spectacles.

e. Welding Helmets. Welding helmets are made up of a bowl-shaped or modified bowl-shaped device equipped with a shade 14 or greater filter. These helmets are designed for use during various kinds of arc welding and heavy gas cutting and provide the welder's eyes, face, ears, and neck with protection against intense radiation and weld spatter.

f. Face Shields. Face shields provide protection to the face and neck from flying particles, liquids, or sprays. Face shields alone do not provide adequate protection against these hazards and must be worn with protective eyewear.

g. Ballistic Eye Protection Devices. Ballistic eye protection devices provide an additional level of protection above that provided by standard safety eyewear for high impact situations. These devices may replace standard safety glasses. Ballistic eye protection devices are classified as either spectacle or goggle systems. Spectacle systems provide enough frame face form for the primary protector to double as side impact protection. Many of these spectacle and goggle systems accept optical inserts for personnel requiring vision correction. These devices and optical inserts should be qualified as a military approved ballistic protective device prior to procurement.

Note: Ballistic eye protection spectacles systems have built-in side impact protection that is part of the primary protector shield.

TABLE B5-A-1 - EYE AND FACE PROTECTION SELECTION C

APPLICATIONS		
OPERATION	HAZARDS	PROTECTORS
Acetylene-Burning Acetylene-Cutting Acetylene-Welding	Sparks, Harmful Rays, Molten Metal, Flying Particles	7
Chemical Handling	Splash, Acid Burns	2 (For severe exposure, add 6)
Chipping	Flying Particles	1, 3, 4, 5
Electric (Arc) Welding	Sparks, Intense Rays, Molten Metal tinted lenses	8 (In combination with 4, 5, in advisable)
Furnace Operations	Glare, Heat, Molten Metal	7, 8, (For severe exposure, add 6)
Grinding-Light	Flying Particles	1, 2, 3, 4 (For severe exposure, add 6)
Laboratory	Chemical Splash, Glass Breakage	2 (6 when in combination with 4)
Machining	Flying Particles severe exposure, add 6)	1, 2, 3, 4 (For
Molten Metals	Heat, Glare, Sparks	7 (6 in combination with 4)
Spot Welding	Flying Particles, Sparks	1, 2, 3, 4, (Tinted lenses advisable, for severe exposure, add 6)
Warfighting, Combat Training Operations	Projectiles, Glare, Wind and Dust	10

Eye and Face Protectors Key:

1 - Goggles, chemical, flexible fitting, non-ventilated (chemical splash proof/vapor proof)
2 - Goggles, chemical, flexible fitting, indirect ventilation (chemical splash proof)
3 - Goggles, impact, flexible fitting, ventilated (do not use for chemical protection)
4 - Safety glasses and spectacles, impact, with side shields (do not use for chemical protection)
5 - Chipping goggles, clear (do not use for chemical protection)
6 - Face shield, industrial, clear (do not use for electrical work)
7 - Welding goggles, various tinted lenses
8 - Welding helmet, various tinted lenses
9 - Flight deck goggles, for air and helicopter operations only (not for industrial processes or chemical protection)
10 - Ballistic protection devices

TABLE B5-A-2 - WELDING FILTER SHADE PROTECTION CHART

WELDING OPERATION	SUGGESTED SHADE NUMBER*
Shielded Metal-Arc Welding, up to 5/32 inch (4 millimeters (mm)) electrodes	10
Shielded Metal-Arc Welding, 3/16 to 1/4 inch (4.8 to 6.4 mm) electrodes	12
Shielded Metal-Arc Welding, over 1/4 inch (6.4 mm) electrodes	14
Gas Metal-Arc Welding (Nonferrous)	11
Gas Metal-Arc Welding (Ferrous)	12
Gas Tungsten-Arc Welding	12
Atomic Hydrogen Welding	12
Carbon Arc Welding	14
Torch Soldering	2 or 3
Torch Brazing	3 or 4
Light Cutting, up to 1 inch (25 mm)	3 or 4
Medium Cutting, 1 to 6 inch (25 to 150 mm)	4 or 5
Heavy Cutting, over 6 inch (150 mm)	5 or 6
Gas Welding (Light) up to 1/8 inch (3.2 mm)	4 or 5
Gas Welding (Medium) 1/8 to 1/2 inch (3.2 to 12.7 mm)	5 or 6
Gas Welding (Heavy) over 1/2 inch (12.7 mm)	6 or 8
Fire Watch for any Welding or Cutting Operation	3

*The choice of a filter shade may be made on the basis of visual acuity and may therefore vary widely from one individual to another, particularly under different current densities, materials, and welding processes. However, the degree of protection from radiant energy afforded by the filter plate or lens when chosen to allow visual acuity will still remain in excess of the needs of eye filter protection. Filter plate shades as low as shade eight have proven suitably radiation-absorbent for protection from the arc-welding processes.

NOTES:

1. In gas welding or oxygen cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the operation (spectrum).

2. Automatic darkening welding helmets and shields can be used as long as they meet ANSI Z87.1 requirements, are marked as ANSI approved, and will darken to the shade required for the type of welding being done.

SECTION B

CHAPTER 6

RESPIRATORY PROTECTION

Ref: (a) OPNAVINST 5100.23G, Navy Safety and Occupational Health Program Manual
(b) 29 CFR 1910.134, Respiratory Protection
(c) NSTM 077, Personal Protective Equipment
(d) NSTM 074, Volume 3, Gas Free Engineering
(e) NAVSEA S9213-33-MMA-000/V, Radiological Controls for Ships
(f) 42 CFR 84, Approval of Respiratory Protection Devices
(g) Compressed Gas Association, Inc., Commodity Specification for Air, Pamphlet G-7.1-2011 (NOTAL)
(h) NAVSEA S9510-AB-ATM-010(U), Nuclear Powered Submarine Atmosphere Control Manual
(i) NAVSEA SS521-AG-PRO-010, U.S. Navy Diving Manual, Vol 1, Chapter 4
(j) NIOSH Certified Equipment List

1. Discussion

a. This chapter establishes requirements and responsibilities for shipboard respiratory protection. Reference (a) covers respiratory protection for shore commands as derived from OSHA standards detailed in reference (b). Afloat respiratory protection policy is contained in this chapter as outlined in paragraph 2 below.

b. Many repair and maintenance operations generate air contaminants that are dangerous if inhaled. Engineering controls (e.g., local exhaust ventilation) are the most effective methods of protecting personnel against such contaminants. However, when engineering controls are not practical or feasible, respirators are necessary to protect personnel against inhalation hazards.

2. Applicability

a. This chapter applies to all personnel and visitors who enter an area where respiratory protection is necessary. The respirator requirements in this chapter will serve as the basic shipboard respirator SOP.

b. Contractors are responsible for providing their own respirator program guidance and respiratory protection equipment.

c. This chapter does not address damage control, gas free engineering, diving, OTTO fuel II, or chemical, biological, radiological, nuclear and high-yield explosive (CBRNE) emergency response.

Note: Use and maintenance information on self-contained breathing apparatus (SCBA), search and rescue SCBAs, emergency escape breathing device (EEBD), emergency air breathing (EAB) system, or military gas masks (MCU-2A/P) can be found in references (c) and (d).

d. The provisions of this chapter do not apply to personnel wearing respiratory protection for the sole purpose of protection against airborne radioactive contamination associated with the naval nuclear propulsion program. Guidance for this area is found in reference (e).

e. Voluntary respirator use, as contained in reference (a), is not authorized for forces afloat.

f. Disposable particulate or dust respirators (commonly white with two elastic straps) must not be used on ships with the exception of medical which is required to maintain N95 respirators for tuberculosis use.

g. Medical and surgical masks (blue or green) do not provide protection against air contaminants. They are for medical and dental use only and must never be used as air-purifying respirators.

h. For surface ships. Responsibilities and procedures for respiratory protection aboard surface ships are contained in chapter B11, paragraph 2.

i. For submarines. Responsibilities and procedures for respiratory protection aboard submarines are contained in chapter B12, paragraph 2.

3. Types of Respirators. The three basic types of respirators are air-purifying, supplied air, and SCBA. In contrast to air-purifying respirators, which filter out airborne contaminants, supplied-air respirators and SCBA are “atmosphere-supplying” respirators because they supply a breathable atmosphere to the respirator wearer.

a. Air-Purifying Respirators. These respirators remove air contaminants by filtering, absorbing, adsorbing, or chemically reacting with the contaminants as they pass through the respirator canister or cartridge. Personnel must only use this type of respirator where adequate oxygen (19.5 to 23.5 percent by volume) is available. The Navy uses both half mask and full facepiece negative pressure air-purifying respirators. Full facepiece respirators provide a higher degree of protection (see appendix B6-A). Air-purifying respirators are available as reusable elastomeric facepieces with replaceable cartridges and filters and as disposable respirators with

the filter built-in as an integral part of the respirator. Air-purifying respirators are effective only when used with the appropriate cartridges, filters, and pre-filters for the air contaminants present.

(1) Powered air-purifying respirators (PAPR) filter out airborne contaminants as a battery-powered fan draws air through the filter. The motorized fan produces a positive pressure inside the facepiece and reduces breathing resistance. PAPRs provide higher levels of protection than negative pressure air-purifying respirators (see appendix B6-A).

(2) PAPRs and negative pressure, air-purifying respirators are equipped with different types of filters and cartridges depending on the type of contaminant(s) against which inhalation protection is needed as described in paragraph 4.

Note: Military gas masks, such as the MCU-2A/P, are only to be used for CBRNE warfare, CBRNE warfare training, and nuclear accidents. Military gas masks must never be used in place of NIOSH approved air-purifying respirators.

b. Atmosphere Supplying Respirators. Both supplied-air (air-line) respirators and SCBAs are subdivided into three modes of operation, which include demand, pressure demand, and continuous flow.

(1) Demand. Demand respirators are available only with tight-fitting facepieces because air only flows through demand regulators when inhalation produces negative pressure inside the facepiece. Negative pressure can only occur with tight-fitting respirators. Negative pressure inside the facepiece causes any face seal leakage to enter into the demand respirator. With the exception of the Ocenco, Inc. M-20.2 escape only respirator and the installed EAB on submarines, use of demand respirators is prohibited. The EAB is a military unique system and the primary respiratory protection required on submarines at sea.

(2) Pressure Demand. Pressure demand regulators available only with tight-fitting facepieces maintain positive pressure inside the facepiece at all times thus preventing contaminant leakage into the facepiece. There is a spring located on the outside of the regulator diaphragm, which allows air to flow through the regulator to the facepiece. Another spring located in the exhalation valve maintains positive pressure in the facepiece at all times. This spring releases any excess pressure in the facepiece through the exhalation valve instead of allowing the excess pressure to escape through the face seal.

(3) Continuous Flow. Available with a facepiece, hood, helmet, or suit, continuous flow regulators provide a continuous flow of air, which maintains a positive pressure within the respirator, thus preventing inward contaminant leakage.

c. Supplied-Air (air-line) Respirators

(1) These respirators provide a breathable atmosphere to the respirator wearer through an airline hose. They consist of a facepiece, hood, helmet, or suit; breathing tube; regulator; and an air-line hose connecting the respirator to a source of compressed breathing air, such as an air compressor (see warning below), ambient air breathing apparatus (AABA), or compressed air cylinder(s). Personnel must use these respirators in place of chemical cartridge, air purifying respirators when:

(a) a cartridge change out schedule has not been established and implemented;

(b) there are no appropriate end-of-service life indicator respirators; and

(c) the contaminant is of such high concentration or toxicity that an air-purifying respirator is inadequate.

(2) The maximum NIOSH approved length of hose connecting the compressed breathing air source to the respirator is 300 feet unless a shorter maximum length is specified on the NIOSH approval. The NIOSH approval for each air-line respirator applies to the combination of the respirator and air supply hose as a unit and specifically to the part numbers listed on the approval label. Any use of another manufacturer's respirator or hose automatically invalidates the approval.

(3) Air-line couplings must be incompatible with outlet couplings for other gas systems to prevent inadvertent servicing with non-respirable gases or oxygen.

WARNING

LEAVE THE AREA IMMEDIATELY WHEN THE COMPRESSOR FAILURE ALARM IS ACTIVATED OR IF AN AIR PRESSURE DROP IS SENSED.

4. Respirator Filters and Cartridges

a. Particulate air-purifying respirators use cartridges, filters, and pre-filters designed to protect against inhalation of aerosols (e.g., solid or liquid particles dispersed in air), such as nuisance (e.g., non-toxic) dusts, toxic dusts, fogs, fumes, mists, smokes and sprays either singly or in combination.

(1) Reference (f) lists nine classifications of non-powered particulate air-purifying respirators certified under three filter classes: N, R and P class series filters. Each class has three levels of filter efficiency: 95 percent, 99 percent, and 99.97 percent (designated 100 in this system). N100, R100, and P100 filters are equivalent to HEPA filters.

Note: Only P-100 or HEPA filters can be used when utilizing the irritant smoke protocol for fit-testing.

(2) P-class series filters can be used in oil aerosols. N-class series filters cannot be used in oil aerosols. R-class series filters can only be used for a single shift in oil aerosols. P100 filters are the only magenta colored filters for negative pressure, air-purifying respirators. PAPRs must be equipped with filters meeting the criteria for HEPA filters, which are also magenta in color.

Note: When breathing difficulty is encountered with a particulate air-purifying respirator (increased resistance due to partial clogging) the filter(s) must be replaced. Personnel should promptly leave the area and replace the particulate air-purifying respirator or filter before returning.

b. Gas and vapor air-purifying respirators use cartridges and canisters that remove contaminants through absorption and adsorption. Typically, a cartridge removes a specific type or class of gas or vapor (e.g., organic vapors or acid gases) or a specific individual contaminant like ammonia. Chemical cartridge and canister respirators may be used (up to their maximum use concentration provided the immediately dangerous to life or health (IDLH) is not exceeded) for protection against gas and vapor contaminants, including substances without good warning properties (such as isocyanates), if a cartridge change out schedule is developed and implemented.

Note: Information on respirators to be used in IDLH atmospheres is found in reference (d).

(1) Detecting the odor or other warning properties of gases and vapors inside the respirator is not permitted as the basis for when to change chemical canisters and cartridges. Change chemical canisters and cartridges according to manufacturer's directions or based on objective data contained in the IH survey. The IH survey must identify and evaluate the respiratory hazard(s) in the workplace. This evaluation must include a reasonable estimate of personnel exposure to respiratory hazards. The change out schedule for chemical cartridges must be determined by the RPPM based upon the information provided in the IH survey, and his or her knowledge of workplace environmental conditions affecting cartridge service life. The supporting industrial hygienist can be consulted by the RPPM on specific cases as needed. Under no circumstances will the change out schedule for chemical cartridges exceed 8 hours.

Note: If the user notices any warning properties (e.g., odor, taste, respiratory irritation, or eye irritation (with a full facepiece respirator)) while wearing a chemical cartridge respirator, they should promptly leave the area and replace the cartridge or canister before returning even if this occurs before the scheduled cartridge change out time.

(2) Combination cartridges and canisters are available that combine the capabilities of 2 or more type cartridges into a single cartridge (e.g., organic vapor and particulate removal, organic vapor and ammonia removal).

(3) Many respirator manufacturers allow the user to combine particulate filters to chemical cartridges by attaching a pre-filter in front of the cartridge by some means, such as a retainer ring. Such systems are commonly used to protect against an atmosphere containing both gas and vapor and particulate contaminants, such as produced by spray painting.

(4) See table B6-1 for specific information on color coding. Identify respirator cartridges, canisters and filters by the information provided on the approval labels as well as the color-coding.

TABLE B6-1
RESPIRATOR FILTER COLOR CODING [A]

CONTAMINANT(s)	COLOR CODE [B]	CONTAMINANT EXAMPLES [C]
Acid gases	White	chlorine (Cl), chlorine dioxide (ClO_2), hydrogen sulfide (H_2S), hydrogen chloride (HCl), sulfur dioxide (SO_2), hydrogen fluoride (HF)
Organic vapors	Brown	most organic vapors [e.g., xylene ($C_6H_4(CH_3)_2$), toluene ($C_6H_5(CH_3)$)]
Basic gases	Green	ammonia (NH_3), methylamine (CH_3NH_2)
Formaldehyde	Tan	formaldehyde (HCHO)
Carbon monoxide	Blue	carbon monoxide (CO)
Mercury Vapors	Orange	mercury (Hg)
Other vapors and gases or combinations not listed above	Olive	nitrogen oxides (NOX), hydrogen cyanide (HCN), methyl bromide (CH_3Br), ethylene oxide ($(CH_2)_2O$), arsine (AsH_3)
All aerosols (High Efficiency filter)	Purple	dusts, mists, fumes, droplets, bacteria, viruses, radionuclides
CBRN	Black	See note D.

[A] Adapted from ANSI Z88.7-2010

[B] Multiple contaminant filtering elements have all applicable colors.

[C] Not all cartridges or canisters are suitable for all contaminants within the contaminant class. See the filter labels for specific contaminant designations for which the filtering element is suitable.

[D] CBRN canisters are suitable for many of the contaminants within all of the classes listed.

5. Breathing Air Requirements

a. Air Quality

(1) For surface ships, including carriers, compressed breathing air or the air output of pumps or compressors which are sources of breathing air for air-line respirators or SCBAs must meet at least the minimum requirements for grade-D breathing air in table B6-2 as required by references (b) and (g).

TABLE B6-2
SURFACE SHIP, INCLUDING CARRIERS COMPRESSED BREATHING AIR PURITY REQUIREMENTS
FOR ATMOSPHERE SUPPLYING RESPIRATORS

Characteristic	Based on Reference (h) Requirements
Oxygen content (v/v)	19.5 – 23.5%
Oil (Condensed)	$\leqslant$ 5 milligram/meter cubed ($mg/m^{3)}$
Carbon monoxide (CO)	$\leqslant$ 10 parts per million (ppm)
Carbon dioxide (CO_2)	$\leqslant$ 1,000 ppm
Water content	A dew point $\leqslant$ -65ºF (20 mg/m^3) (34 ppm v/v) or the dew point must be 10˚ F lower than the coldest temperature where the respirator is worn.
Odor	No pronounced odor

(2) For submarines, the air purity of the general submarine environment is an acceptable quality for the compressed breathing air of atmosphere supplying respirators and must meet the minimum requirements in table B6-3 as required by reference (h).

TABLE B6-3
SUBMARINE COMPRESSED AIR PURITY REQUIREMENTS
FOR ATMOSPHERE SUPPLYING RESPIRATORS

Characteristic	Based on Reference (i) Requirements
Oxygen content (v/v)	17.1 - 21%
Oil (Condensed)	$\leqslant$ 5 mg/m^3
CO	$\leqslant$ 10 ppm
CO_2	$\leqslant$ 5,000 ppm
Water content	A dew point $\leqslant$ -60ºF (34 ppm v/v) or the dew point must be 10˚ F lower than the coldest temperature where the respirator is worn.
Odor	No pronounced odor

Note: When there is reason to suspect that higher levels of air contaminants may be present in the high pressure air compressor supply air source; the high pressure air compressor should not be used to re-charge high pressure air flasks. This could occur under conditions of: vent fog precipitator malfunctioning, recent use of diesel generators, or recent use of high temperature paints, etc.

b. Frequency of Testing. The air output of compressors used to produce breathing air, on ships and submarines, must be tested at least quarterly or more often following the applicable PMS card. Testing requirements for diving air are contained in reference (i), located at https://www.cdc.gov/niosh/npptl/topics/respirators/CEL/default.html.

c. Carbon Monoxide (CO) or High Temperature Alarms for Breathing Air Compressors Containing Oil. Ships must equip compressor systems with either high-temperature or CO monitor and alarm systems or both, to control CO levels. High-temperature cut-off switches on fixed compressors, which shut down the compressor at a temperature below which the lubricating oil breaks down (i.e., thermal degradation point), meet the requirement for high-temperature alarms, provided that quarterly monitoring meets the requirements for Grade-D breathing air. Ships must equip all new and upgraded fixed breathing air compressor systems with high-temperature cut-off switches. New and upgraded portable breathing air compressor systems will be equipped or operated with CO monitor and alarm systems during SCBA air cylinder charging operations. Calibrate monitor and alarm systems on compressors used for supplying breathing air according to the manufacturer's instructions.

d. AABA. Periodic testing of the air quality from an AABA is not required. AABAs must not be used for entry into IDLH atmospheres. Air intakes for portable pumps such as the AABA must be placed in an area free of contaminants.

e. Ship's Low Pressure (LP) Air Compressors. Ship's LP air is not suitable for use as breathing air unless specifically tested and certified to meet the purity standards in subparagraph 5a.

f. Sonar Dome Entry Requirements for DDG- and CG-Class Ships Only. Since the LP air compressors on DDGs and CGs cannot meet the moisture content for grade-D air standards in subparagraph 5a, the provisions in the following subparagraphs 5f(1) and 5f(2) apply for breathing air during sonar dome entry while completing maintenance requirement card (MRC) syscom xx fef3 x on mip 1651/005 for DDGs and MRC syscom xx feg8 x on mip 1651/005 for CGs.

(1) For sonar dome entry, LP air must meet the following requirements in subparagraphs 5f(1)(a) through 5f(1)(e) utilizing a combination of draeger testing kit and four-gas analyzers to verify.

(a) Oxygen content (v/v) of 19.5 to 23.5 percent

(b) Hydrocarbon (condensed) content of 5 milligrams per cubic meter of air or less

(c) CO content of 10 ppm or less

(d) CO_2 content of 1,000 ppm or less

(e) Lack of noticeable odor

(2) Ensure positive communications are maintained while sonar dome and air lock are occupied or in use. This air quality sample test will be required to be taken prior to sonar dome entry, and every 8 hours as long as the sonar dome remains on air. The air quality ample test must be logged in the combat systems smooth log.

6. Respirator Selection and Respirators for Shipboard Repair and Maintenance Operations. The IH survey must identify and evaluate respiratory hazard(s) in the workplace; this evaluation must include a reasonable estimate of personnel exposure to respiratory hazards. RPPMs must follow the guidance in the IH survey report, which lists the types of respirators selected for protection against inhalation hazards for various shipboard processes. If there is any doubt as to the type of respirator required to protect against a particular contaminant, consult an IH.

a. Approved Respirators. Only respirators certified by either NIOSH or NIOSH and the Mine Safety and Health Administration (MSHA) are allowed to be issued. Reference (j) can be used to identify if a respirator is NIOSH approved.

b. Ordering Respirators. Respirator purchasing information can be obtained from respirator manufacturers, Servmart, the DoD FedMALL on the Defense Logistics Agency Web site, www.dla.mil, or through the General Services Administration Web site, www.gsaadvantage.gov

c. Assigned Protection Factor (APF). The APF is the level of respiratory protection provided by a properly functioning and properly used respirator when all elements of an effective respirator program are established and enforced. For example, half mask air-purifying respirators have an APF of 10, which means they provide protection up to 10 times the occupational exposure limit (OEL); full face air-purifying respirators have an APF of 50, which means they provide protection up to 50 times the OEL. Navy APFs are provided in appendix B6-A. Appendix B6-A should be used in conjunction with the detailed program requirements in chapters B1 and B10 for asbestos and lead.

d. Fit Test. A fit test is the use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. Qualitative fit testing uses a challenge agent to determine if an individual can smell or taste the agent to determine if they have a good respirator fit. Quantitative fit testing provides a numerical value, called a fit factor that provides an objective determination of how well a respirator fits an individual. See appendix B6-B for information on qualitative and quantitative fit testing.

e. Fit Factor. The fit factor is a numeric expression of how well a tight-fitting respirator fits a wearer during a quantitative fit test (QNFT). It is the ratio of the measured challenge agent concentration outside the respirator to its concentration inside the respirator.

7. Medical Evaluations. Military personnel, who have been confirmed by the MDR as having no deployment limiting medical conditions, and with a current periodic health assessment (PHA), as required in reference (a), are considered qualified to wear any type of respiratory protection.

8. Respirator Fit Testing. Each individual required to use a respirator with a tight-fitting facepiece in non-casualty situations, including SCBAs used for non-casualty situations, must be fit tested before initially being issued or using a respirator and annually thereafter. Fit testing must conform to the procedures in appendix B6-B.

a. All tight-fitting positive and negative pressure respirators must be either qualitatively or quantitatively fit tested initially and annually thereafter. Qualitatively fit tested negative pressure, air purifying respirators can only be worn in atmospheres up to 10 times the OEL. Full face, negative pressure, air purifying respirators must be quantitatively fit tested to be worn in atmospheres between 10 and 50 times the OEL (minimum passing fit factor for tight fitting full face respirators is 500). Quantitative fit testing, if required, will be requested from the local Navy environmental preventive medicine unit, the cognizant MTF, or other shore based commands.

Note: Positive pressure respirator means a respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator. Negative pressure respirator (tight-fitting) means a respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

b. Fit-testing for SCBAs or EABs is not required for shipboard emergency response, including firefighting training ashore for these emergencies.

c. The RPPM must ensure appropriate recordkeeping on fit testing results and they are documented and contain the minimum elements listed below in subparagraphs 8a(3)(a) through 8a(3)(i).

(1) Name, rate or rank, division or department.

(2) Date of current PHA.

(3) Date of current training.

(4) Date of fit test.

(5) Name of fit test operator.

(6) Fit test method: qualitative (e.g., Bitrex™, Saccharine Mist, Isoamyl Acetate (IAA), Irritant Smoke) or quantitative (e.g., PortaCount™, controlled negative pressure, TDA-99M (joint service mask leakage tester (JSMLT))).

(7) Type of cartridge(s) or filter used in the fit test.

(8) Test results (e.g., pass or fail for qualitative or fit factor for QNFT).

(9) Make (brand), model and size of respirator(s) fit tested.

9. Respirator Maintenance, Cleaning, Inspection, and Storage

a. For respirators to maintain their NIOSH certification they must be maintained, cleaned, disinfected, inspected, repaired, and stored per manufacturers' instruction. Maintenance, cleaning, inspection, and storage requirements for SCBAs are contained in reference (c). Only personnel who have been trained as required in paragraph 10 must maintain respirators.

b. All respirators must be inspected routinely before and after each use. Follow manufacturer's recommendations for respirator inspection. General inspection guidance to identify respirator deficiencies is listed below in subparagraphs 9b(1) through 9b(8).

(1) Head Straps or Head Harness. Examine straps or harness for breaks, loss of elasticity, broken or malfunctioning buckles and attachments (full facepiece only), excessively worn serrations on the head harness which might permit slippage.

(2) Facepiece. Examine facepiece for excessive dirt; cracks, tears, holes, or distortion from improper storage; inflexibility; cracked or badly scratched lenses in full facepieces; incorrectly mounted full facepiece lens or broken or missing mounting clips; cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) (if required).

(3) Inhalation and Exhalation Valves. Examine exhalation valves for foreign material, such as detergent residue, dust particles, or human hair under the valve seat; cracks, tears, or distortion in the valve material; improper insertion of the valve body in the facepiece; cracks, breaks, or chips in the valve body, particularly in the sealing surface; missing or defective exhalation valve cover; improper installation of the valve in the valve body.

(4) Cartridge, Canister, or Filter. Incorrect cartridge, canister, or filter for the hazard; incorrect installation, loose connections, missing or worn gaskets, or cross-threading in holder; expired shelf-life date on cartridge or canister; evidence of prior use of sorbent cartridge or canister, indicated by absence of sealing material, tape, foil, etc., over inlet.

(5) Corrugated Breathing Tubes. Broken or missing end connectors; missing or loose hose clamps; deterioration, determined by stretching the tube and looking for cracks.

(6) Harness of a Front- or Back-mounted Gas Mask. Damage or wear to the canister holder which may prevent its being held securely in place; broken harness straps or fastening.

(7) Hoods or Helmets. Examine for rips and tears and seam integrity; examine the protective headgear, if required, for general condition, with emphasis on the suspension inside the headgear; examine the protective face shield, if any, for cracks or breaks or impaired vision due to rebounding abrasive particles; ensure the protective screen is intact and secured correctly over the face shield of abrasive blasting hoods.

(8) Air Supply Systems. Examine for integrity and good condition of the air supply lines and hoses, including attachments and end fittings; correct operation and condition of all regulators, valves, or other air-flow regulators.

c. Respirators must be cleaned and sanitized according to manufacturer's instructions, which generally follow the guidelines below in subparagraphs 9c(1) through 9c(8).

(1) Remove and discard all used cartridges and filters.

(2) Disassemble and hand wash the facepiece and parts in a warm water and mild dishwashing detergent solution. Strong cleaning agents can damage respirator parts. Temperatures above 43 degrees Celsius (110 degrees Fahrenheit) and vigorous mechanical agitation must be avoided. Solvents (e.g., paint removers) that can affect rubber and other parts, must not be used. Ultrasonic or other suitable washers may be used per manufacturer's instructions.

(3) Sanitize the facepiece using one of the following methods in subparagraphs 9c(3)(a) through 9c(3)(c).

(a) Immerse the facepiece for 2 minutes in a bleach solution (made from mixing either 2 milliliter (ml) 5.25 percent bleach per liter of tap water or 2 teaspoons 5.25 percent bleach per gallon of tap water); or (b) Immerse the facepiece for 2 minutes in a 50 ppm iodine solution made by mixing 1 tablespoon or 15 ml of (1.75 percent aqueous iodine solution) in 1.5 gallons of tap water; or

(c) Immerse the facepiece for 2 minutes in a warm water (temperature must not exceed 43 degrees Celsius or 110 degrees Fahrenheit) solution of approved commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

(4) Rinse in clean warm water not to exceed a temperature above 43 degrees Celsius (110 degrees Fahrenheit).

(5) Air-dry in a clean uncontaminated area in such a way as to prevent distortion of the facepiece. If drying cabinets are used, the drying temperature must not exceed 43 degrees Celsius or 110 degrees Fahrenheit.

(6) Reassemble and re-inspect the respirator. If replacement parts are necessary, they must be obtained and installed or the respirator must be removed from service until the unserviceable parts are replaced. If parts are not available and cannot be obtained, discard the entire facepiece as it cannot be used without all the parts in place. Interchanging parts from another respirator manufacturer is prohibited.

(7) Place respirator in a clean plastic bag or other container and seal. Zip-lock® plastic bags are preferred. Ensure the respirator (especially underneath the valves) is completely dry before sealing to prevent mildew.

(8) Place the plastic bag containing the facepiece flat; in a clean, dry, uncontaminated area without crowding to minimize distortion of the respirator facepiece.

d. Personnel will not service or repair any respirators for which they have not been specifically trained. No work will be performed on reducing valves, regulators or alarms of atmosphere-supplying respirators (e.g., air-line respirators and SCBAs). These items must be returned to the manufacturer for all repairs and adjustments.

10. Training

a. RPPMs must attend the Respiratory Protection Program Management Course (CIN A-493-0072) available from NAVSAFENVTRACEN. If this course is not available, RPPMs may attend one of the alternate training courses identified in reference (a), section 1512, if approved by the TYCOM.

b. RPPMs must train personnel assigned to issue respiratory protective equipment on respirator selection, care, cleaning, maintenance, and the general requirements of this chapter. Training must be given prior to assignment and annually thereafter.

c. Submarine respiratory protection assistants (RPA) must be trained by the designated RPPM. Training must include local guidance and program SOPs, respirator user training, respirator selection, fit-testing procedures, care, cleaning, and maintenance, and the general requirements of this chapter. Training must be conducted upon initial assignment and annually thereafter.

Note: For submarines with multiple crews, each crew must have at least one RPA.

d. RPPMs and RPAs, or personnel assigned and trained to issue respirators, must ensure that all personnel required to wear respirators are trained and can demonstrate a working knowledge of the aspects of respiratory protection in the following subparagraphs 10d(1) through 10d(12).

(1) The nature and degree of respiratory hazards.

(2) Respirator selection based on specific hazards (e.g., intended use).

(3) Why the respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.

(4) The limitations and capabilities of the respirator.

(5) Effective use of the respirator in an emergency situation when the respirator malfunctions or fails.

(6) Inspecting, donning, using and removing the respirator. Understand how to perform a positive and negative user seal check prior to each use of the respirator per manufacturers' instructions, which are generally performed as described below in subparagraphs 10d(6)(a) and 10d(6)(b).

(a) Positive pressure user seal check. Place the palm or thumb over the exhalation valve and press lightly. Exhale gently. The respirator is properly sealed if no air leaks out around the edges and a slight positive pressure is felt inside the facepiece.

(b) Negative pressure user seal check. Place the palm(s) over the cartridge(s) or canister inlet. Inhale gently. The respirator is properly sealed, if no air leaks in around the edges and a slight negative pressure is felt inside the facepiece as it collapses slightly toward the face.

(7) The procedures for care, cleaning, maintenance, and storage of the respirator.

(8) How to recognize medical signs and symptoms that may limit or prevent the effective use of respirators.

(9) Wearing contact lenses in contaminated atmospheres with respiratory protection is permitted as long as eye and face protection is worn as appropriate for workers exposed to eye injury hazards.

(10) Know when to change chemical cartridges and canisters according to the established change out schedule.

(11) Understand conditions that are prohibited because they interfere with the respirator seal. Tight fitting respirators must not be worn when conditions such as facial hair, facial scars, or prescription eyeglasses prevent a good respirator seal.

(12) Wearing of spectacles, corrective glasses, face shields, goggles or other eye and face protection equipment must not interfere with the seal of the facepiece to the face.

11. Surface Ship Responsibilities

a. Commanding Officer. Appoint an RPPM in writing and ensure that he or she has the resources necessary to establish a comprehensive respiratory protection program.

Note: For CVNs, the IHO must be the RPPM. For MCM, PC, and LCS ships, an RPPM is not required. These ships do not normally perform any jobs that would require respirators. If a respirator is required by the IH survey for a specific task, the MCM, PC, LCS ships must contact their local shore maintenance support group to obtain respirator services.

b. RPPM

(1) Complete the required training as specified in subparagraph 10a prior to assuming the position.

(2) Ensure a copy of the baseline or periodic IH survey is available. The IH survey will provide recommendations on the types of respiratory protection required for various processes, areas, and situations; and recommend respirator cartridge change out schedules.

(3) Establish a central control point(s) for issuing and maintaining respiratory protection equipment. Divisions that frequently use respirators and personnel who are assigned individual respirators may maintain custody of their own respiratory protection if approved and monitored by the RPPM. Divisions or individuals who maintain their own respiratory protection must be responsible for its proper use, maintenance, and storage.

(4) Ensure a sufficient supply of NIOSH approved respirators, spare parts, and expendable supplies (e.g., cartridges and filters) are maintained. There should be a sufficient number of respirators and sizes so that the respirator is acceptable to, and correctly fits the user. Note: Respirator parts and filters are not interchangeable. All parts of the respirator must be components of the complete NIOSH approved respirator assemblage. In other words, ensure that all components are of the same manufacturer's make and model respirator (e.g., Brand X facepiece must have Brand X filters).

(5) Maintain a current roster of personnel enrolled in the respiratory protection program and ensure that all respirator users have received medical evaluations required by paragraph 7.

(6) Train respirator personnel as required in paragraph 10.

(7) Ensure fit testing is performed and documented as required in paragraph 8.

(8) Ensure respirators are inspected, cleaned, disinfected, stored, maintained, and repaired as required in paragraph 9. Maintain a copy of all respirator user manuals.

(9) Follow this chapter which is the respirator SOP governing the selection, care, issue, and use of respirators. Post the respirator protection summary from the IH survey at respirator issue points and the paint locker.

(10) Evaluate the program at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

c. Division Officers

(1) Ensure that personnel who require a respirator are sent to the RPPM for respiratory training and issue.

(2) Ensure personnel are provided with and issued required respiratory protection equipment. The IH survey and workplace evaluations provide information regarding work tasks which require respiratory protection.

d. MDR

(1) Confirm that personnel, who are issued respirators, have no deployment limiting medical conditions and have a current annual PHA as required in paragraph 7.

(2) Assist the RPPM in identifying and evaluating hazards and selecting appropriate respirators, as recommended in the IH survey.

e. Personnel Issuing Respiratory Protective Equipment. Issue respirators only to personnel who are trained, medically certified as contained in paragraph 7, and successfully fit tested for the respirator(s) being issued.

f. Personnel Required to Wear a Respirator

(1) Use and maintain the respirator issued according to the instructions and training received in paragraph 10.

(2) Inspect the respirator before and after each use.

(3) Perform a positive and negative user seal check prior to each use

(4) Report any malfunction of the respirator to their immediate supervisor.

(5) Prevent damage to or loss of the respirator.

(6) Change respirator cartridges and canisters according to directions from the RPPM when issued.

12. Submarine Responsibilities. Respiratory protection program requirements are only applicable to submarine operations while in port.

a. Naval Submarine Support Commands (NSSC) or Commander Submarine Squadron. Appoint an RPPM in writing and ensure that the RPPM has the resources necessary to establish a comprehensive respiratory protection program and provide support to all submarine units assigned.

b. RPPM at NSSCs or Commander Submarine Squadron

(1) Complete the required training as specified in subparagraph 10a prior to assuming the position.

(2) Coordinate with the submarine IMA, squadrons or NSSC to establish a central respirator control point for issuing, maintaining, and storing respirators.

(3) Ensure a sufficient supply of NIOSH approved respirators, spare parts, and expendable supplies (e.g., cartridges and filters) are maintained. There should be a sufficient number of respirator models and sizes so that the respirator is acceptable to and correctly fits the user.

Note: Respirator parts and filters are not interchangeable. All parts of the respirator must be components of the complete NIOSH approved respirator assemblage. In other words, ensure that all components are of the same manufacturer's make and model respirator (e.g., Brand X facepiece must have Brand X filters).

(4) Maintain, in conjunction with the submarine RPA a current roster of personnel enrolled in the respiratory protection program for each submarine, and ensure that all respirator users have received medical evaluations required by paragraph 7.

(5) Train personnel that will wear respirators as required in paragraph 10. If the RPA is to conduct this training, ensure that submarine respirator protection lesson plan is provided.

(6) Ensure fit testing is performed and documented as required in paragraph 8. Fit testing may be conducted by squadron, NSSC RPPM, submarine RPA, supporting IMA, or other sources.

(7) Provide the submarine RPA and the supporting submarine IMA or central respirator control point an electronic copy of respirator fit test results.

(8) If the RPA is to conduct fit testing, ensure that sufficient supplies are available to conduct fit testing.

(9) For respirators needed while underway (e.g., nuclear welders), provide guidance to submarine RPAs and supply officers on the selection of proper types and quantity to maintain.

(10) The RPPM in charge of the central respirator control point will ensure respirators are inspected, cleaned, disinfected, stored, maintained, and repaired as required in paragraph 9. The RPPM will also maintain a copy of all respirator user manuals. The squadron or NSSC RPPM will normally control the central respirator control point.

(11) Follow this chapter which is the respirator SOP governing the selection, care, issue, and use of respirators.

(12) Provide a letter verifying that the submarine RPA had been trained on his or her role in the respiratory protection program and the requirements in paragraph 10. This training must be conducted upon initial assignment and annually thereafter. Maintain copies of all letters verifying RPA training completion.

(13) Evaluate the program at least annually and evaluate compliance of each submarine unit at least once during each in port availability period to include a review of procedures, fit testing and training conducted by appointed RPAs. Chapter A3 contains information on conducting self-assessment evaluations.

c. Supporting Submarine IMAs

(1) Assist the squadron or NSSC RPPM in training RPAs as requested and scheduled during off crew status.

(2) Coordinate with the squadron or NSSC RPPM to establish a respirator central control point for issuing, maintaining, and storing respirators.

(3) Assist the squadron or NSSC RPPM as requested in providing RPAs with a standard submarine respiratory protection lesson plan for training. Ensure sufficient supplies to conduct fit testing and training are provided to the RPPM as requested.

d. Submarine Commanding Officers. Appoint at least one RPA for each submarine crew.

e. RPA

(1) Receive training by the squadron or NSSC designated RPPM on his or her role in the respiratory protection program and the requirements in paragraph 10. Training must be conducted upon initial assignment and annually thereafter. Maintain copies of all letters verifying RPA training completion.

(2) Assist in the submarine respiratory program requirements for the unit as directed by the NSSC or Squadron RPPM.

(3) Follow this chapter which is the respirator SOP and any supplementary guidance provided by the NSSC or squadron RPPM.

(4) Ensure respirator personnel are trained as required in paragraph 10.

(5) If directed by the squadron or NSSC RPPM, ensure fit testing is performed and documented as required in paragraph 8. Provide the squadron or NSSC RPPM and supporting submarine IMA or central respirator control point an electronic copy of respirator fit test results.

f. Division Officers

(1) Ensure that personnel who require a respirator are sent to the RPPM or RPA for respiratory training and issue.

(2) For respirators needed while in port, ensure personnel obtain required respirator from the supporting submarine IMA, NSSC, or squadron.

(3) Ensure non-disposable respirators are returned to the central respirator control point when work is completed and prior to getting underway.

(4) Provide respirators needed while underway (e.g., nuclear systems welders).

g. MDR

(1) Confirm that personnel, who are issued respirators, have no deployment limiting medical conditions and have a current annual PHA as required in paragraph 7.

(2) Assist the RPPM or RPA or both in identifying and evaluating hazards and selecting appropriate respirators, as recommended in the IH survey.

h. Personnel Required to Wear a Respirator

(1) Use and maintain the respirator issued according to the instructions and training received in paragraph 10.

(2) Inspect the respirator before and after each use.

(3) Perform a positive and negative user seal check prior to each use.

(4) Report any malfunction of the respirator to their immediate supervisor.

(5) Prevent damage to or loss of the respirator.

(6) Change respirator cartridges and canisters according to directions from the RPPM or RPA when issued.

APPENDIX B6-A
ASSIGNED PROTECTION FACTORS (APF) [D]

Type of Respirator [A, B]	Quarter Mask	Half mask	Full Facepiece	Helmet or hood	Loose-fitting Face-piece
1. Air-Purifying Respirator.	5	10	10/50 [G]		
N95 Filtering Facepiece Respirators		5			
2. Powered Air-Purifying Respirator (PAPR)		50	1000	25/1000 [C]	25
3. Supplied-Air Respirator (SAR) [Air-line Respirator] [E]					
Demand mode		10	10/50 [G]		
Continuous flow mode		50	1000	25/1000 [C]	25
Pressure-demand or other positive-pressure mode		50	1000 [F]		
4. Self-Contained Breathing Apparatus (SCBA)					
Demand mode		10	10/50 [G]	50	
Pressure-demand or other positive-pressure mode (e.g., open or closed circuit)			10,000	10,000	

[A] RPPMs may select respirators with greater protection factors than what is required by the hazard.
[B] APFs are only applicable if all elements of an effective respirator program are established and enforced per this chapter.
[C] The employer must have evidence that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. According to OSHA, they will post acceptable protection factor testing protocols and maintain a list of hooded respirators demonstrated to achieve an APF of 1,000. In the absence of such testing, all other PAPRs and SARs with helmets or hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.
[D] These APFs do not apply to respirators used solely for escape. For escape respirators used in association with contaminants that are regulated by OSHA substance specific standards (e.g., acrylonitrile, formaldehyde, benzene) refer to the appropriate substance-specific standards. Subparagraph (d)(2)(ii) of reference (b) states that "*Respirators provided only for escape from IDLH atmospheres must be NIOSH certified for escape from the atmosphere in which they will be used.*"
[E] When using a combination respirator, ensure that the APF is appropriate to the mode of operation in which the respirator is being used. For example, a combination full facepiece pressure-demand SAR with an air-purifying canister would have an APF of 1,000 in the pressure-demand mode; but would have an APF of 50 in the negative pressure air-purifying mode.
[F] The protection provided by combination, full facepiece pressure-demand SARs with auxiliary SCBA is equivalent to the protection provided by full facepiece pressure-demand SCBA; therefore, the APF of 10,000 for pressure-demand SCBA applies.
[G] APF is 10 when qualitatively fit tested and 50 when quantitatively fit tested. Refer to chapter B6, subparagraph 8a(1), for additional details.

APPENDIX B6-B
RESPIRATOR FIT TEST PROTOCOLS

1. Qualitative Fit Testing Procedures - General Requirements. The fit test operator must conduct fit testing using the following procedures. The general requirements in this appendix apply to all OSHA-accepted fit test methods, both qualitative fit test (QLFT) (summarized in table B6-B-1) and QNFT.

TABLE B6-B-1
TEST ENCLOSURE OR HOOD AND CARTRIDGE OR FILTER REQUIREMENTS FOR QLFT PROTOCOLS

TEST CHEMICAL	TEST ENCLOSURE OR HOOD REQUIRED	CARTRIDGE OR FILTER REQUIRED	MINIMUM FILTER EFFICIENCY REQUIRED
Isoamyl acetate (IAA) or Isopentyl acetate	Yes	Organic Vapor Cartridge	
Saccharin	Yes	Particulate Filter	Any 95%
Bitrex™ (denatonium benzoate)	Yes	Particulate Filter	Any 95%
Irritant Smoke (stannic chloride)	No*	Particulate Filter	Only P100

*Perform test only in an area with adequate ventilation.

a. Fit testing of atmosphere-supplying respirators and tight-fitting PAPR must be in the negative pressure mode.

b. The test subject must be allowed to pick the most acceptable respirator from a sufficient number of approved respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.

c. Prior to the selection process, the test subject must be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension, and how to determine an acceptable fit. A mirror must be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.

d. The test subject must be informed that he or she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.

e. The test subject must be instructed to hold each chosen facepiece up to the face and eliminate those that obviously do not give an acceptable fit.

f. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least 5 minutes to assess comfort. If the test subject is not familiar with using a particular respirator, the test subject must be directed to don the mask several times and to adjust the straps each time to become adept at setting proper tension on the straps.

g. Assessment of comfort must include a review of the points in the following subparagraphs 1g(1) through 1g(4) with the test subject and allowing the test subject adequate time to determine the comfort of the respirator.

(1) Position of the mask on the nose.

(2) Room for eye protection for half mask respirators.

(3) Room to talk.

(4) Position of mask on face and cheeks.

h. The following criteria in subparagraphs 1h(1) through 1h(6) must be used to help determine the adequacy of the respirator fit.

(1) Chin properly placed.

(2) Adequate strap tension, not overly tightened.

(3) Fit across bridge of the nose.

(4) Respirator of proper size to span distance from nose to chin.

(5) Tendency of respirator to slip.

(6) Self-observation in mirror to evaluate fit and respirator position.

i. The test subject must perform a negative and positive user seal check, as described below. Before conducting the negative and positive pressure checks, the subject must be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece must be selected and retested if the test subject fails the user seal check tests.

(1) Positive Pressure User Seal Check. Place the palm or thumb over the exhalation valve and press lightly. Exhale gently. The respirator is properly sealed if no air leaks out around the edges and a slight positive pressure is felt inside the facepiece.

(2) Negative Pressure User Seal Check. Place the palm(s) over the cartridge(s) or canister inlet. Inhale gently. The respirator is properly sealed if no air leaks in around the edges and a slight negative pressure is felt inside the facepiece as it collapses slightly toward the face.

j. The test must not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Fit testing will not be conducted if any foreign material interferes with the respirator sealing surface, such as eye ware temple (bare or straps), jewelry, and gels, creams, or cosmetics.

k. If a test subject exhibits difficulty in breathing during the tests, she or he must be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

l. If the employee finds the fit of the respirator unacceptable, the test subject must be given the opportunity to select a different respirator and to be retested.

m. Prior to the commencement of the fit test, the test subject must be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process must include a description of the test exercises that the subject will be performing. The respirator to be tested must be worn for at least 5 minutes before the start of the fit test.

n. The fit-test must be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.

o. The following test exercises listed in subparagraphs 1o(1) through 1o(9) are to be performed for all fit-testing methods prescribed in this appendix. The test subject must perform exercises, in the test environment, in the following manner.

(1) Normal breathing. In a normal standing position, without talking, the subject must breathe normally.

(2) Deep breathing. In a normal standing position, the subject must breathe slowly and deeply, taking caution so as not to hyperventilate.

(3) Turning head side to side. Standing in place, the subject must slowly turn his or her head from side to side between the extreme positions on each side. The head must be held at each extreme momentarily so the subject can inhale at each side.

(4) Moving head up and down. Standing in place, the subject must slowly move his or her head up and down. The subject must be instructed to inhale in the up position (i.e., when looking toward the ceiling).

(5) Talking. The subject must talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

Rainbow Passage:

> "When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow."

(6) Grimace. The test subject must grimace by smiling or frowning. (This applies only to QNFT testing; it is not performed for QLFT.)

(7) Bending over. The test subject must bend at the waist as if he or she were to touch his or her toes. Jogging in place must be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.

(8) Normal breathing. In a normal standing position, without talking, the subject must breathe normally.

(9) Each test exercise must be performed for 1 minute except for the grimace exercise which must be performed for 15 seconds. The test subject must be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator must be tried. The respirator must not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

2. QLFT Protocols

a. IAA Protocol

Note: Respirators must be equipped with organic vapor filters during IAA fit test. This protocol is not appropriate to fit test filtering facepiece respirators or elastomeric respirators equipped with particulate filters because IAA vapor will pass through the particulate filters.

(1) Odor Threshold Screening. Odor threshold screening, performed without wearing a respirator, is intended to determine if the individual tested can detect the odor of IAA at low levels.

(a) Three 1-liter glass jars with metal lids are required.

(b) Odor-free water (e.g., distilled or spring water) at approximately 25 degrees Celsius (77 degrees Fahrenheit) must be used for the solutions.

(c) The IAA (also known as isopentyl acetate) stock solution is prepared by adding 1 ml of pure IAA to 800 ml of odor-free water in a 1-liter jar, closing the lid and shaking for 30 seconds. A new solution must be prepared at least weekly.

(d) The screening test must be conducted in a room separate from the room used for actual fit testing. The two rooms must be well-ventilated to prevent the odor of IAA from becoming evident in the general room air where testing takes place.

(e) The odor test solution is prepared in a second jar by placing 0.4 ml of the stock solution into 500 ml of odor-free water using a clean dropper or pipette. The solution must be shaken for 30 seconds and allowed to stand for 2 to 3 minutes so that the IAA concentration above the liquid may reach equilibrium. This solution must be used for only 1 day.

(f) A test blank must be prepared in a third jar by adding 500 cubic centimeters (cc) of odor-free water.

(g) The odor test and test blank jar lids must be labeled (e.g., 1 and 2) for jar identification. Labels must be placed on the lids so that they can be peeled off periodically and switched to maintain the integrity of the test.

(h) The following instruction must be typed on a card and placed on the table in front of the two test jars (i.e., 1 and 2):

> "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two bottles in front of you contain water. One of these bottles also contains a small amount of banana oil. Be sure the covers are on tight, then shake each bottle for 2 seconds. Unscrew the lid of each bottle, one at a time, and sniff at the mouth of the bottle. Indicate to the test conductor which bottle contains banana oil."

(i) The mixtures used in the IAA odor detection test must be prepared in an area separate from where the test is performed, in order to prevent olfactory fatigue in the subject.

(j) If the test subject is unable to correctly identify the jar containing the odor test solution, the IAA QLFT must not be performed.

(k) If the test subject correctly identifies the jar containing the odor test solution, the test subject may proceed to respirator selection and fit testing.

(2) IAA Fit-Test Procedure

(a) The fit test chamber must be a clear 55-gallon drum liner or plastic sheeting suspended inverted over a 2-foot diameter frame so that the top of the chamber is about 6 inches above the test subject's head. The inside top center of the chamber must have a small hook attached.

(b) Each respirator used for the fitting and fit testing must be equipped with organic vapor cartridges or offer protection against organic vapors.

(c) After selecting, donning, and properly adjusting a respirator, the test subject must wear it to the fit testing room. This room must be separate from the room used for odor threshold screening and respirator selection, and must be well ventilated, as by an exhaust fan or lab hood, to prevent general room contamination.

(d) A copy of the test exercises and any prepared text from which the subject is to read must be taped to the inside of the test chamber.

(e) Upon entering the test chamber, the test subject must be given a 6-inch by 5-inch piece of paper towel, or other porous, absorbent, single-ply material, folded in half and wetted with 0.75 ml of pure IAA. The test subject must hang the wet towel on the hook at the top of the chamber.

(f) Allow 2 minutes for the IAA test concentration to stabilize before starting the fit test exercises. This would be an appropriate time to talk with the test subject: to explain the fit test, the importance of his or her cooperation, and the purpose for the test exercises.

(g) If at any time during the test, the subject detects the banana-like odor of IAA, the test is failed. The subject must quickly exit from the test chamber and leave the test area to avoid olfactory fatigue.

(h) If the test is failed, the subject must return to the selection room and remove the respirator. The test subject must repeat the odor sensitivity test, per subparagraph 2a(1), select and put on another respirator, return to the test area and again begin the fit test procedure described in subparagraphs 2a(2)(a) through 2a(2)(g) above. The process continues until a respirator that fits well has been found. Should the odor sensitivity test be failed, the subject must wait at least 5 minutes before retesting. Odor sensitivity will usually have returned by this time.

(i) If the subject passes the test, the efficiency of the test procedure must be demonstrated by having the subject break the respirator face seal and take a breath before exiting the chamber.

(j) When the test subject leaves the chamber, the subject must remove the saturated towel and return it to the person conducting the test, so that there is no significant IAA concentration buildup in the chamber during subsequent tests. The used towels must be kept in a self-sealing plastic bag to keep the test area from being contaminated

b. Saccharin Solution Aerosol Protocol. The entire screening and testing procedure must be explained to the test subject prior to the conduct of the screening test.

(1) Taste Threshold Screening. The saccharin taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of saccharin.

(a) The threshold screening uses the same enclosure as described in the IAA fit test procedure.

(b) The test subject must don the test enclosure. Throughout the threshold screening test, the test subject must breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he or she detects a sweet taste.

Note: If the test subject eats or drinks something sweet before the screening test, he or she may be unable to taste the weak saccharin solution.

(c) Using a DeVilbiss Model 40 inhalation medication nebulizer or equivalent, the test conductor must spray the threshold check solution into the enclosure. The nozzle is directed away from the nose and mouth of the person. This nebulizer must be clearly marked to distinguish it from the fit test solution nebulizer.

(d) The threshold check solution is prepared by dissolving 0.83 gram of sodium saccharin United States Pharmacopeia (USP) in 100 ml of warm water.

(e) To produce the aerosol, the nebulizer bulb is firmly squeezed so that it collapses completely, then released and allowed to fully expand.

(f) Ten squeezes are repeated rapidly and then the test subject is asked whether the saccharin can be tasted. If the test subject reports tasting the sweet taste during the 10 squeezes, the screening test is completed. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

(g) If the first response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

(h) If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the saccharin is tasted. If the test subject reports tasting the sweet taste during the third set of 10 squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

(i) The test conductor will take note of the number of squeezes required to solicit a taste response.

(j) If the saccharin is not tasted after 30 squeezes the test subject is unable to taste saccharin and may not perform the saccharin fit test.

(k) If a taste response is elicited, the test subject must be asked to take note of the taste for reference in the fit test.

(l) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(m) The nebulizer must be thoroughly rinsed in water, shaken dry, and refilled at least each morning and afternoon or at least every 4 hours.

(2) Saccharin Solution Aerosol Fit Test Procedure

(a) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(b) The fit test uses the same enclosure as described in the IAA fit test procedure.

(c) The test subject must enter the enclosure while wearing the respirator selected. The respirator must be properly adjusted and equipped with a particulate filter(s).

(d) A second DeVilbiss Model 40 inhalation medication nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer must be clearly marked to distinguish it from the screening test solution nebulizer.

(e) The fit test solution is prepared by adding 83 grams of sodium saccharin to 100 ml of warm water.

(f) As before, the test subject must breathe through the slightly open mouth with tongue extended, and report if he or she tastes the sweet taste of saccharin.

(g) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of saccharin fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20, or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test. A minimum of 10 squeezes is required.

(h) After generating the aerosol, the test subject must be instructed to perform the test exercises.

(i) Every 30 seconds the aerosol concentration must be replenished using one half the original number of squeezes used in the initial threshold screening (e.g., 5, 10, or 15).

(j) The test subject must indicate to the test conductor if the taste of saccharin is detected at any time during the fit test. If the test subject does not report tasting the saccharin, the test is passed.

(k) If the taste of saccharin is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator must be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

(l) Since the nebulizer has a tendency to clog during use, the test operator must make periodic checks of the nebulizer to ensure that it is not clogged. If clogging is found at the end of the test session, the test is invalid.

c. Bitrex TM (Denatonium Benzoate) Solution Aerosol QLFT Protocol. The Bitrex TM (Denatonium benzoate) solution aerosol QLFT protocol uses the published saccharin test protocol because that protocol is widely accepted. Bitrex is routinely used as a taste aversion agent in household liquids which children should not be drinking and is endorsed by the American Medical Association, the National Safety Council, and the American Association of Poison Control Centers. The entire screening and testing procedure must be explained to the test subject prior to the conduct of the screening test.

(1) Taste Threshold Screening. The Bitrex taste threshold screening, performed without wearing a respirator, is intended to determine whether the individual being tested can detect the taste of Bitrex.

(a) The threshold screening uses the same enclosure as described in the IAA fit test procedure.

(b) The test subject must don the test enclosure. Throughout the threshold screening test, the test subject must breathe through his or her slightly open mouth with tongue extended. The subject is instructed to report when he or she detects a bitter taste.

(c) Using a DeVilbiss Model 40 inhalation medication nebulizer or equivalent, the test conductor must spray the Threshold Check Solution into the enclosure. This nebulizer must be clearly marked to distinguish it from the fit test solution nebulizer.

(d) The threshold check solution is prepared by adding 13.5 milligrams of Bitrex to 100 ml of 5 percent salt (NaCl) solution in distilled water.

(e) To produce the aerosol, the nebulizer bulb is firmly squeezed so that the bulb collapses completely, and is then released and allowed to fully expand.

(f) An initial 10 squeezes are repeated rapidly and then the test subject is asked whether the Bitrex can be tasted. If the test subject reports tasting the bitter taste during the 10 squeezes, the screening test is completed. The taste threshold is noted as 10 regardless of the number of squeezes actually completed.

(g) If the first response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the second 10 squeezes, the screening test is completed. The taste threshold is noted as 20 regardless of the number of squeezes actually completed.

(h) If the second response is negative, 10 more squeezes are repeated rapidly and the test subject is again asked whether the Bitrex is tasted. If the test subject reports tasting the bitter taste during the third set of 10 squeezes, the screening test is completed. The taste threshold is noted as 30 regardless of the number of squeezes actually completed.

(i) The test conductor will take note of the number of squeezes required to solicit a taste response.

(j) If the Bitrex is not tasted after 30 squeezes the test subject is unable to taste Bitrex and may not perform the Bitrex fit test.

(k) If a taste response is elicited, the test subject must be asked to take note of the taste for reference in the fit test.

(l) Correct use of the nebulizer means that approximately 1 ml of liquid is used at a time in the nebulizer body.

(m)The nebulizer must be thoroughly rinsed in water, shaken to dry, and refilled at least each morning and afternoon or at least every 4 hours.

(2) Bitrex Solution Aerosol Fit Test Procedure

(a) The test subject may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.

(b) The fit test uses the same enclosure as that described in the IAA fit test procedure.

(c) The test subject must enter the enclosure while wearing the respirator selected. The respirator must be properly adjusted and equipped with any type particulate filter(s).

(d) A second DeVilbiss Model 40 inhalation medication nebulizer or equivalent is used to spray the fit test solution into the enclosure. This nebulizer must be clearly marked to distinguish it from the screening test solution nebulizer.

(e) The fit-test solution is prepared by adding 337.5 mg of Bitrex to 200 ml of a 5 percent salt (sodium chloride (NaCl)) solution in warm water.

(f) As before, the test subject must breathe through his or her slightly open mouth with tongue extended, and be instructed to report if he or she tastes the bitter taste of Bitrex.

(g) The nebulizer is inserted into the hole in the front of the enclosure and an initial concentration of the fit test solution is sprayed into the enclosure using the same number of squeezes (either 10, 20, or 30 squeezes) based on the number of squeezes required to elicit a taste response as noted during the screening test.

(h) After generating the aerosol, the test subject must be instructed to perform the test exercises.

(i) Every 30 seconds the aerosol concentration must be replenished using one half the number of squeezes used in the initial threshold screening (e.g., 5, 10, or 15).

(j) The test subject must indicate to the test conductor if at any time during the fit test the taste of Bitrex is detected. If the test subject does not report tasting the Bitrex, the test is passed.

(k) If the taste of Bitrex is detected, the fit is deemed unsatisfactory and the test is failed. A different respirator must be tried and the entire test procedure is repeated (taste threshold screening and fit testing).

d. Irritant Smoke (Stannic Chloride) Protocol. This qualitative fit-test uses a person's response to the irritating chemicals released in the smoke produced by a stannic chloride ventilation smoke tube to detect leakage into the respirator.

(1) General Requirements and Precautions

(a) The respirator to be tested must be equipped with HEPA or P100 series filter(s).

(b) Only stannic chloride smoke tubes must be used for this protocol.

(c) No form of test enclosure or hood for the test subject must be used.

(d) The smoke can be irritating to the eyes, lungs, and nasal passages. The test conductor must take precautions to minimize the test subject's exposure to irritant smoke. Sensitivity varies, and certain individuals may respond to a greater degree to irritant smoke. Care must be taken when performing the sensitivity screening checks that determine whether the test subject can detect irritant smoke to use only the minimum amount of smoke necessary to elicit a response from the test subject.

(e) The fit test must be performed in an area with adequate ventilation to prevent exposure of the person conducting the fit test or the build-up of irritant smoke in the general atmosphere.

(2) Sensitivity Screening Check. The person to be tested must demonstrate his or her ability to detect a weak concentration of the irritant smoke.

(a) The test operator must break both ends of a ventilation smoke tube containing stannic chloride, and attach one end of the smoke tube to a low flow air pump set to deliver 200 milliliters per minute, or an aspirator squeeze bulb. The test operator must cover the other end of the smoke tube with a short piece of tubing to prevent potential injury from the jagged end of the smoke tube.

(b) The test operator must advise the test subject that the smoke can be irritating to the eyes, lungs, and nasal passages and instruct the subject to keep his or her eyes closed while the test is performed.

(c) The test subject must be allowed to smell a weak concentration of the irritant smoke before the respirator is donned to become familiar with its irritating properties and to determine if he or she can detect the irritating properties of the smoke. The test operator must carefully direct a small amount of the irritant smoke in the test subject's direction to determine that he or she can detect it.

(3) Irritant Smoke Fit Test Procedure

(a) The person being fit tested must don the respirator without assistance, and perform the required user seal check(s).

(b) If a half mask respirator is being fit tested, the test subject must be instructed to keep his or her eyes closed.

(c) The test operator must direct the stream of irritant smoke from the smoke tube toward the face seal area of the test subject, using the low flow pump or the squeeze bulb. The test operator must begin at least 12 inches from the facepiece and move the smoke stream around the whole perimeter of the mask. The operator must gradually make two more passes around the perimeter of the mask, moving to within 6 inches of the respirator.

(d) If the person being tested has not had an involuntary response or detected the irritant smoke or both, proceed with the test exercises.

(e) The fit test exercises must be performed by the test subject while the respirator seal is being continually challenged by the smoke, directed around the perimeter of the respirator at a distance of 6 inches.

(f) If the person being fit tested reports detecting the irritant smoke at any time, the test is failed. The person being retested must repeat the entire sensitivity check and fit test procedure.

(g) Each test subject passing the irritant smoke test without evidence of a response (involuntary cough, irritation) must be given a second sensitivity screening check, with the smoke from the same smoke tube used during the fit test, once the respirator has been removed, to determine whether he or she still reacts to the smoke. Failure to evoke a response must void the fit test.

(h) If a response is produced during this second sensitivity check, then the fit test is passed.

3. QNFT Protocols. Quantitative fit testing determines the amount of leakage occurring between the wearer's face and the sealing surface of the respirator.

a. Full face, negative pressure, air purifying respirators (demand mode SAR and demand mode SCBA) must be quantitatively fit tested to be worn in atmospheres between 10 and 50 times the OEL (minimum passing fit factor for full face respirators is 500).

b. All of the OSHA accepted quantitative fit testing methods set forth in appendix A of reference (b) are acceptable.

c. Quantitative fit testing, if required, will be requested from the local NAVENPVNTMEDU, the cognizant MTF, or other shore based commands. Quantitative fit testing must be performed following the QNFT protocols in appendix A of reference (b) and in conjunction with fit test apparatus instruction manuals.

SECTION B

CHAPTER 7

ELECTRICAL SAFETY

Ref: (a) NSTM, Chapter 300
(b) NAVSEA S0400-AD-URM-010/TUM, Tag-out Users' Manual
(c) OPNAVINST 6400.1C, Training, Certification, Supervision Program, and Employment of Independent Duty Corpsmen (IDCs)
(d) MIP 3000/001 Misc. Shipboard Electrical Equipment or MIP 3000/L01 Misc. Shipboard Electrical Equipment (LCS Class)
(e) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion. Reference (a) is the primary document for detailed technical guidance regarding electrical safety. This chapter addresses program management, responsibilities and training.

2. Responsibilities

a. Commanding Officer. Authorize all work on energized equipment per reference (a).

b. Safety Officer Ensure that the electrical safety program is evaluated at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

c. Electrical Safety Officer

(1) Establish an electrical tool issue room per paragraph 3.

(2) Ensure that applicable maintenance and repair are conducted per reference (b).

(3) Conduct training for all newly reporting personnel during indoctrination and annually thereafter as required by paragraph 5.

(4) Ensure that all ship electrical tools and equipment and personal electrical and electronic equipment received on board are authorized for shipboard use. Reference (a) contains guidance on determining suitability for shipboard use.

(5) Complete training per paragraph 5.

d. Supply Officer. Ensure that all electrical tools and equipment received on board are turned over to the electrical safety officer for a safety inspection prior to issue.

e. Independent Duty Corpsman. Maintain basic life support cardiopulmonary resuscitation (CPR) instructor qualifications as required by reference (c).

f. Division Officers

(1) Ensure that assigned personnel are trained per paragraph 5.

(2) Ensure that all electrical equipment, used in the division, have been visually inspected prior to use, and are electrically safety checked according to applicable references (a) and (d).

(3) Ensure that items open purchased or received from the Navy supply system are authorized for shipboard use and electrically safety checked prior to use. Reference (a) contains guidance on determining suitability for shipboard use.

(4) Ensure that all personnel experiencing any electrical shock report to medical.

g. All Hands

(1) Request permission from the electrical safety officer prior to bringing personal electrical or electronic equipment aboard. This requirement does not apply to battery-operated equipment incapable of being plugged into ships' electrical service.

(2) Report any condition, equipment or material that is believed to be unsafe.

(3) Report any electrical shock to their division officer and supervisor.

(4) Not make any alterations or additions to the ship's electrical system without permission from the electrical safety officer.

3. Portable Electrical Tool Issue (not applicable to submarines)

a. Surface ships must establish a centralized portable electrical tool issue room for issue of portable electrical tools. Larger ships may have more than one tool issue room. Small platforms to include MCM vessels, PCs and LCSs may incorporate tool issue as part of the electrical workshop.

b. Prior to issue of portable electric tools, the personnel assigned to issue tools must brief the tool users on general precautions for portable electrical equipment and issue any required PPE.

c. Certain divisions or work-centers (those that contain electrical or electronic ratings) may retain selected electrical tools or equipment in their permanent custody. These divisions will perform safety checks on their respective equipment and must not issue portable electrical tools to other divisions or work-centers.

d. Housekeeping items such as vacuum cleaners and floor buffers need not be retained in the electrical tool issue room but must be safety checked per reference (d).

e. Unsafe electrical tools should be clearly marked out-of-commission "OOC," be rendered incapable of being energized, and be kept in locked storage separate from the other tools.

4. Shore Power and Utilities

a. Shore power and utilities provided to the ship by shore activities are critical to the operation of the ship while in port. Evolutions involving the connection and disconnection of services create a higher probability of mishap or unplanned event including the potential release of energy. This is due to the number of involved commands and activities (ships force, port operations, public works, contractors, etc.) all potentially adhering to differing operational standards in various ports.

b. In order to appropriately mitigate hazards associated with the exchange of utilities between the ship and shore, the use of ORM, as defined in reference (e), must be used when planning and developing the processes for providing those utility services.

c. Paramount to proper application of ORM is ensuring that qualified personnel (ship's force, public works department, port operations, etc.) are involved and communicating to ensure common understanding of the hazards and the mitigations to be employed by which activity.

5. Training

a. All personnel, when reporting aboard, must receive indoctrination on basic electrical safety, including the requirements regarding use of PPE. Reference (a) may be used as a source of training material. The training must also include recognizing symptoms of electrical shock, electrical shock trauma, and emergency first aid responder techniques.

b. Each ship must have a certified American Heart Association CPR instructor on board.

c. At least 50 percent of cumulative personnel from all electrical and electronic associated ratings must be certified in CPR. The electrical and electronic associated ratings can be determined by looking at which rates and work centers carry PMS MIP 3000 (series).

d. Personnel who issue portable electric tools must complete the "Electrical Tool Issue Room Petty Officer," watch station 313 in the Engineering Collaterals and Qualifications Standard (PQS), NAVEDTRA 43704.

e. The electrical safety officer must complete watch station 304 of the SPA PQS (NAVEDTRA 43460).

SECTION B

CHAPTER 8

GAS FREE ENGINEERING

Ref: (a) NSTM, NAVSEA S9086-CH-STM-030/CH-074 V4, "Gas Free Engineering"
(b) COMUSFLTFORCOMINST 4790.3C, Joint Fleet Maintenance Manual (JFMM), Volume IV, Chapter 25

1. Discussion

a. No routine hazard, with the exception of ordnance, is as dangerous as the presence of potentially lethal atmospheres in ship's spaces. In many instances, potentially harmful gases or vapors are present in such a low concentration (ppm) that no adverse conditions are created. By design a ship has many confined spaces (especially tanks and voids) in which a multitude of both toxic and non-toxic gas or vapor creating substances and operations are used in the normal operation of the ship. Hazardous atmospheres may be created that can explode or cause asphyxiation. Compounding the problem is that many gases or vapors are not detected by the human ability of smell, and personnel attempting to save a fallen shipmate may themselves be overcome and killed by undetected vapors. It is for these reasons that every confined space must be considered hazardous and entry into or work in or on such spaces is prohibited until the space has been gas free tested by qualified gas free engineering personnel. This is known as gas free engineering.

b. Reference (a) provides policy, information, and technical guidance for gas free engineering and applies to all naval surface ships and submarines except reference (b) provides information for conducting gas free operations for all maintenance periods pier-side, in a civilian shipyard or drydock, or at a Navy maritime activity.

2. Responsibilities

a. Commanding Officer

(1) Establish a comprehensive gas free engineering program adequately staffed with personnel trained, qualified and certified to perform gas free engineering services.

(2) Ensure that all personnel comply with the requirements in references (a) and (b) as appropriate to the ship’s operational status.

b. Safety Officer Ensure that the gas free engineer program is evaluated at least annually. Reference (a) specifies the checklist that must be used for the annual self-assessment. Chapter A3 contains information on conducting self-assessment evaluations.

SECTION B

CHAPTER 9

NON-IONIZING RADIATION SAFETY

Ref: (a) IEEE C95.6, Standard for Safety Levels with Respect to Human Exposure to Electromagnetic Fields, 0 to 3 kHz (NOTAL)
(b) IEEE C95.1, Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz (NOTAL)
(c) ANSI Z136.1, The American National Standard for the Safe Use of Lasers (NOTAL)
(d) NAVSEAINST 9700.2, Integrated Topside Safety and Certification Program for Surface Ships
(e) OPNAVINST 5100.27B/MCO 5104.1C, Navy Laser Hazard Control Program
(f) NAVSEA OP 3565/NAVAIR 16-1-529, Volume 2, Electromagnetic Radiation Hazards (U) (Hazards to Ordinance)
(g) SECNAVINST 5100.14D, Military Exempt Lasers
(h) BUMEDINST 6470.19A, Laser Safety at Military Facilities and Research Laboratories
(i) American Conference of Government Industrial Hygienists - Threshold Limit Values and Biological Exposure Indices
(j) BUMEDINST 6470.23, Medical Management of Non-Ionizing Radiation Casualties
(k) NMCPHC-TM OM 6260, Medical Surveillance Procedures Manual and Medical Matrix
(l) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual

1. Discussion

a. This chapter applies to non-ionizing radiation hazards (RADHAZ) (e.g. communication transmitters, radar systems, radio frequency (RF) heat sealers, light amplification by stimulated emission of radiation (laser), and other sources of non-ionizing radiation such as broadband optical sources) that can be found on Navy ships and have the potential to affect the safety and health of personnel.

b. This chapter does not apply to nuclear power systems or weapons, calibration sources, non-destructive testing equipment or medical X-ray generating equipment.

c. Non-ionizing radiation is energy that propagates through space in the form of electromagnetic waves but possesses insufficient energy to ionize the material through which it

passes. Non-ionizing radiation comprises the lower energy portion of the electromagnetic radiation spectrum and can be further divided into two sub-categories: radio frequency radiation (RFR) and laser radiation.

d. RFR is conventionally referenced by its frequency and includes frequencies from approximately 0 hertz (Hz) to 300 gigahertz (GHz). Communication transmitters, radars, and RF heat sealers emit RFR.

Note: 1 Hz equals 1 cycle per second.

e. Laser radiation is conventionally referenced by its wavelength and includes wavelengths from approximately 10^4 nanometers (Infra-red) to 180 nanometers (ultra-violet). This includes the visible wavelengths between approximately 700 nanometers (red) to 400 nanometers (violet), with all the other colors in between these wavelengths (note the order - red, orange, yellow, green, blue, indigo, violet - mnemonic "ROY G. BIV").

Note: 1 nanometer equals 1 x $(10)^{-9}$ meters.

f. The mechanism for potential harmful biological effects for RF non-ionizing radiation depends on the frequency and magnitude of exposure. Predominant mechanisms for potential harmful biological effects as a function of frequency are; (0 to 1 Hz) magneto hydrodynamic effects (forces on flowing blood and other body fluids potentially stressing circulatory systems), (1 Hz to 5 MHz) electrostimulation (potentially causing involuntary muscle contraction thereby potentially causing falls), (100 kHz to 300 GHz) tissue heating (with potential thermal damage; for deep tissues between 100 kHz and 3 GHz and surface heating (skin) between 3 GHz and 300 GHz). The Navy adopts RFR controlled maximum permissible exposure (MPE) limits that are consistent with non-governmental consensus-based standards (see reference (a) for 0 Hz to 3 kHz and reference (b) for 3 kHz to 300 GHz).

Note: The RF exposure limits for controlled environments represent scientifically derived values to limit absorption of RF energy in the body, and to restrict the magnitude of RF currents induced in the body. This means that the amount of energy absorbed is insufficient to produce or cause adverse effects on health, even under repeated or long-term exposure conditions. The Navy also establishes maximum levels to prevent hazards from electromagnetic radiation to fuels (HERF) and hazards of electromagnetic radiation to ordnance (HERO).

g. The mechanism for potential harmful biological effects for laser (non-ionizing radiation) is energy deposition in excess of the MPE to biological tissue, primarily the eyes and skin, leading to damage. For laser exposures that are within the MPE limits, no permanent adverse biological effects are expected to occur even under repeated or long-term exposure conditions. The Navy adopts laser MPE limits that are consistent with non-governmental consensus-based standards, see reference (c).

2. Responsibilities

a. RF

(1) Commanding Officer

(a) Request a RADHAZ survey when:

1. the current RADHAZ survey is more than 5 years old per reference (d);

2. emitter systems have been added, relocated, or upgraded as a result of scheduled ship alteration or alteration installation since the last RADHAZ survey;

3. watch stations or work areas are moved or established in the proximity of emitter systems;

4. gasoline storage or transfer stations are relocated in the proximity of emitter systems; and

5. personnel are injured as a result of exposure to RFR and the command requires assistance in re-evaluating the current RADHAZ survey.

(b) Submit a confirmation letter to COMNAVSEASYSCOM Integrated Warfare Systems (SEA 05H), stating that the recommended control measures provided in the hazards of electromagnetic radiation to personnel (HERP) survey report have been implemented. COMNAVSEASYSCOM will then issue a RADHAZ certification naval message per reference (d).

(c) Ensure personnel are trained to be familiar with potential RF exposure hazards and appropriate protective measures as required by paragraph 3.

(2) Division Officers (responsible for work-centers and areas with identified RADHAZs)

(a) Ensure RFR hazard areas are posted with the appropriate warning signs and deck markings.

(b) Ensure that awareness and hazard recognition training is given for all personnel assigned to work or stand duty in RADHAZ areas to prevent exceeding MPE limits.

(c) Investigate, document, and report all suspected RF incidents or mishaps involving suspected RF overexposures to personnel exposure per the governing references listed in paragraph 5.

b. Lasers

(1) Commanding Officer

(a) Appoint a command and an assistant laser system safety officer (LSSO) in writing if the command has class 3B, class 4, or any military exempted lasers, regardless of the laser hazard class. Command designation letters will be submitted to COMNAVSEASYSCOM Maintenance and Industrial Operations (SEA 04N) for record.

(b) Establish a laser safety program per reference (e) if the command is required to have an LSSO.

(c) Ensure LSSOs are trained as required in paragraph 3.

(d) Maintain a current inventory of all military exempt lasers, class 3B lasers (LA-9/P), and class 4 lasers, per reference (e).

(e) Establish a command laser safety committee (LSC) to be chaired by the LSSO. Appoint members to the LSC in writing.

(2) Division Officers (responsible for work-centers and areas with identified RADHAZs)

(a) Ensure that the LSSO has posted laser hazard areas with the appropriate warning signs per reference (e).

(b) Investigate, document, and report all suspected laser incidents or mishaps involving suspected laser overexposures to personnel exposure per the governing references listed in paragraph 5.

(3) LSSO

(a) Establish, implement, and maintain an effective laser safety program per reference (e).

(b) Chair the command LSC. Recommend to the commanding officer suitable subject matter experts to include members with expertise in laser systems technology and in the assessment of laser hazards. In addition to those subject matter experts, membership in the LSC may also include command safety representatives, physicians, education department representatives, and end users. Command leadership is also encouraged to participate. Where applicable, the LSC may be incorporated into the radiation safety committee.

(c) Ensure direct access to the commanding officer is provided for program status reports, non-conformance issues, or any concern that may impact safety, readiness, or mission objectives.

(d) Be responsible for labeling lasers and posting laser hazard areas.

(e) Provide training to personnel as required by paragraph 3.

(4) LSC. Establish and uphold policy and practices for the evaluation and control of laser hazards, including recommendations for appropriate laser safety training programs and materials. The committee must maintain an awareness of all new or revised laser safety systems and ensure these systems are approved by the DON Laser Safety Review Board (LSRB), per reference (e).

3. Training

a. RF

(1) All personnel assigned to work or stand duty in RADHAZ areas must receive initial and annual training on how to avoid exceeding MPE limits. Training must focus on awareness of the potential hazards of RF fields, established procedures and restrictions to control RF exposures, and personnel responsibility to limit their own exposures.

(2) RF and microwave radiation can induce electrical currents and voltages that may cause shocks and burns, premature activation of electro-explosive devices in ordnance, and arcs, which may ignite flammable materials. Information on the hazards of RF (electromagnetic) radiation to personnel, fuels, and ordnance is available in reference (f). Hazards of HERP and HERF can be found in volume I of reference (f). HERO can be found in volume II of reference (f).

b. Lasers

(1) All personnel assigned to work or stand duty in laser nominal hazard zones must receive initial and annual training on how to avoid exceeding MPE limits. Training must focus on awareness of the potential hazards of laser radiation, established procedures and restrictions to control over exposures, and personnel responsibility to limit their own exposures.

(2) All commands must have two graduates of the Administrative Laser Safety Officer (ALSO) certification course (A-493-0067), or one ALSO and one Technical Laser Safety Officer (TLSO) graduate. Both ALSO and TLSO certifications are valid for 4 years. ALSO training is available through a cadre of instructors throughout the fleet. A list of active ALSO instructors can be obtained from COMNAVSEASYSCOM (Lead Naval Technical Laboratory for Laser Safety) upon request, and online at the DON LSRB's Joint Knowledge Online

Intelink Web site, https://intelshare.intelink.gov/sites/jko/NavyLaserSafety/SitePages/Home.aspx. TLSO training is available through the Lead Naval Technical Laboratory for Laser Safety. Commands may set up training for designated LSSOs through the following Web site, http://www.navsea.navy.mil/Home/Warfare-Centers/NSWC-Dahlgren/What-We-Do/Naval-Laser-Safety/. Records of personnel certified as ALSO and TLSO are maintained by COMNAVSEASYSCOM via Corporate Enterprise Training Activity Resource Systems (CeTARS).

(3) The LSSO must ensure that all personnel who work or stand duty where Class 3B, Class 4, or military exempted lasers (including the LA-9/P Nonlethal Warning and Hailing Laser) receive initial and annual training. Training must cover potential hazards associated with accidental exposure to laser radiation, with particular emphasis on vulnerability of the eyes to being damaged by lasers, and appropriate protective measures.

4. Guidance

a. RF and microwaves from radar, communication equipment (transmitters), and RF heat sealers.

(1) These devices may emit hazardous levels of RFR. In addition to causing biological changes, RF and microwave radiation can induce electrical currents and voltages that may cause shocks and burns, premature activation of electro-explosive devices in ordnance, and arcs, which may ignite flammable materials. Information on the hazards of RFR (electromagnetic) to personnel, fuels, and ordnance is available in reference (f). HERP and HERF can be found in volume I of reference (f). HERO can be found in volume II of reference (f).

(2) COMNAVSEASYSCOM Code SEA 05H is the lead agent for coordinating electro-magnetic safety programs for naval ships.

(3) Commands must determine RF levels for all areas in which personnel could receive exposures in excess of the exposure limits. Commands must use proper RF measurement techniques and application of the RF exposure limits to avoid imposing unnecessary restrictions on operations or establishing overly restrictive protective boundaries.

(4) A comprehensive RF hazard evaluation for major platforms, such as warships or communication stations, where multiple RF emitters exist in close proximity to each other, requires considerable technical familiarity with electromagnetic fields. Such surveys may involve determination of boundary locations for protective enclosures, or specifying operational conditions or restrictions necessary for protection of personnel. Paragraph 5 lists activities that perform these evaluations.

(5) Following a survey and implementation of the recommended control measure provided in the HERP survey report of reference (d), COMNAVSEASYSCOM Code SEA 05H will issue a RADHAZ certification naval message (see subparagraph 2a(1)(b)).

(6) The Navy does not authorize RF-shielded protective clothing for routine use as a means of protecting personnel. This does not preclude use of other protective equipment, such as electrically insulated gloves and shoes for protection against electrical shock or RF burn, or for insulation from the ground plane.

(7) Electric and magnetic fields exist around power lines, electrical devices and appliances. The intensity of these fields decreases rapidly with distance. While questions have been raised about the possibility of health effects from exposure to electric and magnetic fields at levels that are commonly encountered in homes and most work places, findings issued by various scientific review panels have not confirmed that such fields pose a risk to health.

b. Lasers

(1) Commands wishing to dispose of lasers must obtain approval from COMNAVSEASYSCOM following guidance in references (e) and (g).

(2) Large deck ships that have medical lasers may require a medical LSSO. Requirements for lasers in MTFs and the medical LSSO are contained in reference (h).

(3) Broadband optical sources such as germicidal lamps, phototherapy, sun lamps, backlights, arc lights, projector lamps, high intensity discharge lamps and infrared arrays are also used in many medical and industrial applications. These types of light sources require exclusionary zones or boundaries (i.e., non-ionizing RADHAZ area) implemented when working with such sources or lasers, to prevent possible acute effects such as skin burns, photo keratitis, cataracts or retinal burns. Exposure guidance can be found in reference (i). Obtain assistance in the evaluation of broadband optical sources, where personnel are considered to be at ocular risk, from an industrial hygienist or radiation health officer.

5. Points of Contact

a. Non-ionizing radiation RF and microwaves from radar, communication equipment (transmitters), and RF heat sealers.

(1) For measurement surveys and technical assistance for shipboard RF emitting systems: RADHAZ Environment Characterization Group, HERP and HERF RADHAZ Certifications E3 Assessment and Evaluation Branch, Naval Surface Warfare Center, Dahlgren/Code B52, 5493 Marple Rd, Suite 156, Dahlgren, VA 22448-5100, Commercial: (540) 653-1419, Defense Switched Network (DSN): 249-1419.

(2) For RF bio-effects and medical research issues, or assistance in evaluating personnel overexposure incidents: Naval Medical Research Unit San Antonio, 3650 Chambers Pass, Fort Sam Houston, TX 78234-6315, DSN 389-8918, Commercial: (210) 539-8918 or U.S. Air Force School of Aerospace Medicine Environmental, Safety, and Occupational Health (USAFSAM ESOH) Service Center, 5135 Pearson Road, Building 10, Wright-Patterson Air Force Base (AFB), OH 45433, Commercial: (888) 232-3764 or DSN: 798-3764.

(3) For RF health hazards, personnel exposures and exposure incidents from industrial and medical RF emitting sources: Naval Medical Research Unit San Antonio, 3650 Chambers Pass, Fort Sam Houston, TX 78234-6315, Commercial: (210) 539-8918, DSN: 389-8918, or USAFSAM ESOH Service Center, 5135 Pearson Road, Building 10, Wright-Patterson AFB, OH 45433, Commercial: (888) 232-3764 or DSN: 798-3764. Ensure reporting requirements are met per paragraph 8 (Non-Ionizing Radiation Incidents).

(4) For guidance on RF exposure limits and health issues: BUMED, Non-Ionizing Radiation Health Branch (Code M95, Fleet Programs), 7700 Arlington Boulevard, Suite 5129, Falls Church, VA 22042-5129.

b. Laser

(1) For medical and industrial laser operations: BUMED, Non-Ionizing Radiation Branch (Code M95, Fleet Programs), 7700 Arlington Boulevard, Suite 5129, Falls Church, VA 22042-5129.

(2) For all laser hazard evaluations, laser operations (other than medical, military exemption of lasers, laser safety officer certification training, and certification surveys of outdoor laser firing ranges). Funding for services must be provided by the requesting command. LaserR system hazard evaluations and range surveys: Lead Naval Technical Laboratory for Laser Safety, Commercial: (540) 653-2442, DSN: 249-2442, E-mail: DLGR_lasersafety.fct@navy.mil. Combat Direction Systems Activity, Dam Neck R44, 6078 Norc Avenue Suite 309, Dalhgren, VA 22448. http://www.navsea.navy.mil/Home/WarfareCenters/NSWCDahlgren/WhatWeDo/NavalLaserSafety.aspx.

(3) For laser range surveys: Naval Surface Warfare Center Corona Division (Code SE-41), 2300 Fifth St, Norco, CA 92860; mailing address: P.O. Box 5000 Corona, CA 92878-5000.

(4) For DON LSRB review of new laser systems or changes to fielded laser systems, schedule meetings, obtain guidance and direction on the various aspects of managing a local laser hazards control program: points of contact, such as the current LSRB chair, vice chair, and secretary, can located at the DON LSRB's Joint Knowledge Online Web site, https://intelshare.intelink.gov/sites/jko/NavyLaserSafety/SitePages/Home.aspx.

(5) For laser bio-effects and medical research issues, or assistance in evaluating laser-induced injuries: Naval Medical Research Unit San Antonio, 3650 Chambers Pass, Fort Sam Houston, TX 78234-6315, DSN 389-8918, Commercial: (210) 539-8918 and USAFSAM ESOH Service Center, 5135 Pearson Road, Building 10, Wright-Patterson AFB, OH 45433, Commercial: (888) 232-3764 or DSN: 798-3764.

(6) For guidance on laser exposure limits and health issues: BUMED, Non-Ionizing Radiation Branch (Code M95, Fleet Programs), Commercial: (703) 681-9276, DSN: 761-9276, 7700 Arlington Blvd, Suite 5129, Falls Church, VA 22042-5129. If calling after business hours or in an emergency, contact the TriService Laser Injury Hotline at Commercial: (888)-232-3764 or DSN: 798-3764

6. Non-Ionizing RADHAZ Areas. RFR hazard areas. RFR hazard warning signs are required at all access points to areas where the RFR levels may exceed the MPE. Obtain NAVSEASYSCOM-approved warning signs and labels through the standard stock system see reference (f). When military operational considerations prevent the posting of such signs, a waiver must be obtained from the supporting SOH professionals depending upon the RFR source. Where the RFR levels may exceed 10 times the MPE limit, additional warning devices and controls such as flashing lights, audible signals, barriers, and interlocks may be required, depending on the potential risk for exposure. These areas will be noted in the ship's RADHAZ survey reports.

a. Radar and Communications. The ship's RADHAZ report provides detailed posting and deck marking information for these RFR hazard areas per reference (f).

b. Heat Sealers and Other RFR Sources. Posting requirements for other RFR hazard areas are contained in reference (f).

c. Lasers. Per DoD Instruction 6055.15 of 4 May 2007, areas where laser exposures are above MPE must be establish and control maintained. Exclusionary zones or boundaries must be implemented and maintained for laser hazard areas, especially during the advent of laser weapons being deployed on ships.

7. Medical Surveillance. References (j) and (k) contain information on the laser medical surveillance program.

8. Non-Ionizing Radiation Incidents

a. RFR

(1) Commands must investigate and document all suspected RF incidents or mishaps involving personnel exposure to excessive RF levels, per references (j) and (l) such as:

(a) personnel injury has been sustained or physical symptoms are experienced by the individual(s) that are believed to be associated with RF exposure;

(b) Personnel exposure has been determined to have exceeded the appropriate MPE limit in terms of power density by a factor of five or more (for exposure determinations, provisions for time averaging and spatial averaging can be used in conjunction with transmitter duty factors and antenna rotation or scanning rates to establish maximum likely exposure levels);

(c) inadvertent exposure occurred to members of the general public or to other non-involved personnel as a result of naval operations that have exceeded the appropriate MPE limit; and

(d) exposure circumstances or the severity of the incident or mishap are such that inquiries from news media are anticipated, or are deemed to be of interest to the chain of command.

(2) Investigation of incidents involving alleged or actual RFR exposures that are 5 times the MPE or greater must include, as a minimum:

(a) a listing of all involved personnel,

(b) measurements of RFR exposure levels,

(c) results of appropriate medical examinations,

(d) a detailed description of the circumstances surrounding the incident,

(e) recommendations for more detailed medical follow-up (if necessary), and

(f) recommendations to prevent future recurrence of the incident.

(3) The command exercising operational control of the RF source has the primary lead for conducting the RF exposure investigation and for ensuring the appropriate report is filed.

(4) Commands must refer personnel reporting physical symptoms, or suspected of having been exposed to levels in excess of 5 times the MPE limit, for a medical evaluation or follow-up. Since medical evaluations following RF exposures have been infrequently required and physical signs of injury are usually not manifested, medical personnel should be advised to refer to reference (l), for information on RF biological effects.

(5) Commands must make initial notification for the occurrence of an RF incident to the DoD Electromagnetic Field Injury Hotline ((888) 232-3764, DSN: 798-3764, https://hpws.afrl.af.mil/dhp/OE/ESOHSC/pages/index.cfm?id=335) to provide timely expert

medical advice in the event of an injury or suspected injury from electromagnetic field devices. Commands will follow-up via phone, fax, message, or e-mail to NAVSAFECEN with a copy to BUMED, Non-Ionizing Radiation Branch (Code M95). Discussions following this initial notification can determine whether a more extensive investigation will be necessary and whether a site visit should be scheduled to assist in making RF measurements or an exposure evaluation. Central to the command's investigation will be a determination of the degree of RF exposure incurred since such incidents often involve emotional or health concerns which cannot be easily addressed when measurement data is not available. Performing RF measurement assessments are often beyond the technical capabilities of the local command or the nearby medical facility.

(6) If an exposure incident meets the reporting criteria in reference (l), then a mishap report must be submitted.

b. Laser Radiation

(1) If eye damage from laser exposure is suspected or observed the supporting activity must ensure the individual receives a medical examination as required by reference (j) as soon as possible.

(2) Commands must make initial notification for the occurrence of a laser incident to the Triservice Laser Injury Hotline at Commercial: (888) 232-3764, DSN: 798-3764, https://hpws.afrl.af.mil/dhp/OE/ESOHSC/pages/index.cfm?id=336) to provide timely expert medical advice in the event of an injury or suspected injury from laser radiation. Commands will follow-up via phone, fax, message, or e-mail to NAVSAFECEN with a copy to BUMED, Non-Ionizing Radiation Branch (Code M95).

(3) If a laser exposure meets the reporting criteria in reference (l), then a mishap report must be submitted.

SECTION B

CHAPTER 10

LEAD CONTROL

Ref: (a) NMCPHC TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix
(b) DoD 6055.05-M, Occupational Medical Examinations and Surveillance Manual, 2 May 2007
(c) 29 CFR 1910.1025, Lead

1. Discussion

a. The Navy has established strict controls to limit both occupational and environmental exposures to shipboard personnel. Lead may adversely affect the peripheral and central nervous systems, as well as the red blood cells, kidneys, reproductive and endocrine systems. The standards and controls discussed in this chapter are provided to prevent lead intoxication and related injuries during the use, handling, removal and melting of materials containing lead.

b. In this chapter, “lead” means metallic lead, all inorganic lead compounds, and organic lead soaps. Lead's low melting point, high molecular weight, high density and malleability make it a useful structural material. When added to resins, grease, or rubber, lead compounds act as antioxidants. Common uses for lead and lead compounds include ballast, radiation shielding, rubber and pipe joints, small arms ammunition, batteries, weights and paint. The Navy has made a significant effort to reduce the amount of lead found in paint so as to reduce the potential for lead exposures. While not an absolute or all inclusive indicator, red, forest green, chrome yellow, and "school bus" yellow color paints typically contain lead compounds. All painted surfaces, that cannot be identified as lead-free through laboratory analysis or by documentation that only lead-free paints have been used, must be handled as though containing lead.

2. Responsibilities

a. Commanding Officers

(1) Only authorize paint removal to protect the ship from corrosion, when incidental to hot work, and when bare metal is required for an inspection, not for cosmetic reasons.

(2) Ensure sufficient funds are available for protective clothing and equipment to protect ship personnel during lead work.

b. Safety Officer

(1) Verify that the proper clothing and equipment is onboard to protect personnel during lead work.

(2) If specified in the baseline or periodic IH survey, ensure a written compliance plan to comply with lead control requirements is available, implemented and updated as required by paragraph 6.

(3) Ensure lead hazard training is conducted per paragraph 7 for all personnel identified in the baseline or periodic IH survey as potentially exposed to lead at or above the action level (AL). Refer to the latest periodic IH survey for information on employee exposure to lead hazards. "Action level" means employee exposure, without regard to the use of respirators, to an airborne concentration of lead of 30 micrograms per cubic meter (30 ug/m^3) of air averaged over an 8-hour period.

(4) Request IH assistance to have suspected lead containing material (i.e., paint) tested prior to work being done to see if the material contains lead.

(5) Ensure that the lead safety program is evaluated at least annually if applicable. Chapter A3 contains information on conducting self-assessment evaluations.

c. Division Officers

(1) Ensure that personnel required to perform work involving lead exposure are provided with proper clothing and equipment.

(2) Ensure that personnel who work with lead or who work in areas where the potential exists for lead exposure at or above the AL as identified in the IH survey are trained per paragraph 7.

(3) Identify to the MDR, personnel who work with lead or who work in areas where the potential exists for lead exposure at or above the AL.

d. MDR

(1) Assist the safety officer with conducting lead hazard training upon request.

(2) Implement a medical surveillance program, if required, as outlined in paragraph 5.

(3) Schedule personnel for blood lead analysis and physical examinations at shore medical activities as required for medical surveillance in reference (a).

(4) Within 5 working days after the receipt of exposure monitoring results, the MDR must notify affected personnel in writing of results that represent their exposure. Whenever the results indicate that the individual was exposed above the PEL, without regard to respirator use, the written statement must include that fact and a description of the corrective action(s) taken to reduce the individual's exposure.

e. All Hands

(1) Attend training per paragraph 7 for personnel informed by their division officer as having the potential for being exposed to lead at or above the AL.

(2) Wear the appropriate protective equipment and use safe work practices if performing work that has been identified in the IH survey as being at or exceeding the AL for lead.

(3) Report for medical surveillance tests and examinations when scheduled.

3. IH Survey

a. An IH must evaluate all workplaces in which lead is used. This evaluation must be accomplished during the baseline and periodic IH surveys specified per chapter A3. Where a potential for exposure from inhalation of airborne lead particulate or personnel contamination is found, the IH must establish an exposure monitoring plan to characterize personnel exposures. When a written lead hazard compliance plan is required, provide the exposure assessment data to the safety officer per paragraph 6.

(1) PEL. The PEL for an 8-hour TWA exposure to airborne lead is 50 ug/m^3 of air (without regard to respirator use).

(2) AL. The AL for an 8-hour TWA exposure to airborne lead is 30 ug/m^3 (without regard to respirator use).

(3) Biological Monitoring and Medical Surveillance. Must be initiated when an employee's exposure exceeds the AL for more than 30 days per year.

b. If the safety officer or any supervisor has a question regarding the potential lead hazards and appropriate controls involving an operation which includes or potentially includes lead, the safety officer must request IH officer assistance from a tender, CVN, staff or local MTF or NAVENPVNTMEDU.

4. Control of Lead in the Workplace Environment

a. There are seven basic principles to be used when working with lead or materials that contain lead.

(1) General Workplace Control Practices

(a) Use non-lead paint.

(b) Keep mechanical grinding and sanding to the absolute minimum with primary reliance on impact tools and authorized chemical strippers for paint removal. Mechanical tools equipped with HEPA filtered exhaust for removal and reclamation of lead dust are preferred.

(c) When feasible, minimize the heating of lead and leaded materials by using thermostatically-controlled heating (below 600 degrees Fahrenheit) or removing the lead-containing surface coatings or contaminants prior to heating.

(d) Establish procedures to maintain work surfaces as free of lead dust as is practical. Clean up lead dust with a HEPA filtered vacuum cleaner. Wet sweeping, wet brushing, and wiping down with wet rags may be effective in removing lead dust. Rags used for wiping down must be disposed of as lead waste.

(e) Lead-containing waste, scrap, debris, containers, equipment and clothing consigned for disposal must be collected, sealed, and labeled in impermeable containers. Transportation must be conducted in a manner that does not release airborne dust or pollute surrounding waterways. Dispose of lead waste per the procedures of chapter B3.

(f) To minimize exposure potential, isolate hot work on lead and abrasive lead removal operations from other operations.

(2) Ventilation

(a) If deemed necessary by the cognizant IH, provide fixed local exhaust ventilation connected to high efficiency particulate air filters at the point of particulate generation.

(b) Do not exhaust emissions to another workspace (see chapter A4, subparagraph 3b(2) note).

(3) Personal Protective Clothing and Related Control Facilities

(a) Personnel engaged in the handling of lead or in situations where the concentration of airborne particulate lead is likely to exceed the PEL, or where the possibility of skin or eye irritation exists must remove uniform clothing and wear protective clothing. Consult the command's IH officer, IH survey, or contact the local BUMED IH for specific clothing requirements. Clothing must be waterproof when wet lead is handled.

(b) Personnel must remove protective clothing before leaving the work area.

(c) Provide change rooms as close as practical to the lead work area(s) for personnel who work where the airborne lead exposure is above the PEL (without regard to the use of respirators). When possible, locate shower facilities between the "clean" and "dirty" change rooms. Consult the command's IH officer, IH survey, or contact the local BUMED IH for specific decontamination facility requirements.

(d) Launder lead-contaminated clothing to prevent release of lead dust in excess of the AL. Transport lead-contaminated clothing in a sealed container with the standard "caution label" affixed (see subparagraph 4a(5)(b)). Notify persons who clean or launder protective clothing or equipment in writing of the potentially harmful effects of exposure to lead and monitor these persons for exposure to lead as required by paragraph 3.

(4) Respiratory Protection

(a) Respirators are required where the concentration of airborne, particulate lead is likely to exceed the PEL.

(b) Consult the command's RPPM, IH survey, or contact the local BUMED IH for specific respirator requirements.

(5) Warning Signs and Caution Labels

(a) Warning signs must be provided and displayed at each location where airborne lead concentrations may exceed the PEL. Signs must state, as a minimum, the following:

WARNING

LEAD WORK AREA
POISON
NO SMOKING, EATING OR DRINKING

(b) Caution labels must be affixed to containers of lead-contaminated clothing and equipment, raw materials, waste, debris, or other products containing lead. These caution labels must state:

CAUTION

CLOTHING CONTAMINATED WITH LEAD
DO NOT REMOVE DUST BY BLOWING OR SHAKING
DISPOSE OF LEAD CONTAMINATED MATERIAL ACCORDING TO
APPLICABLE LOCAL, STATE OR FEDERAL REGULATIONS

(6) Housekeeping

(a) Where lead containing materials are routinely melted, ground or cut, maintain all surfaces as free as practical of lead accumulation. Clean surfaces at least once per shift to prevent accumulation of lead dust.

(b) All cleaning must use methods such as vacuuming with HEPA filtered vacuum cleaners or washing down where feasible, observing water pollution regulations as they pertain to lead-contaminated wastewater. Only use wet sweeping, shoveling, or brushing when other methods have been tried and found to be ineffective or infeasible.

(c) Do not use compressed air to clean work surfaces.

(7) Personal Hygiene

(a) Prohibit eating, drinking, smoking, chewing of tobacco products or gum, the application of makeup, and storage of food and tobacco products in lead work areas.

(b) Personnel working with lead must wash their hands and faces prior to eating, drinking, smoking or applying cosmetics.

(c) There are two basic principles to be followed when disposing of lead waste.

(1) Lead-containing waste materials are classified as HAZMAT and must be handled per chapter B3. Bag hazardous lead waste in heavy-duty plastic bags or other impermeable containers. Label bags with caution labels described in subparagraph 6a(5)(b).

(2) Label containers such as bags and trash cans "LEAD WASTE ONLY." Care must be exercised in order to prevent bags and other containers from rupturing when being moved.

5. Medical Surveillance

a. Medical surveillance consists of: pre-placement medical evaluation, whole blood lead and zinc protoporphyrin (ZPP) monitoring every 6 months, and follow-up medical evaluation based on the results of blood lead analysis, worker complaint, and physician opinion. The lead medical surveillance examination and forms can be found in the medical matrix of reference (a) as examination #161. Personnel are included in this program when IH surveillance indicates that they perform work or are likely to be in the vicinity of an operation which generates airborne lead concentrations at or above the AL more than 30 days per year. Inclusion in this program is based on measured airborne concentrations without regard to respirator use, and therefore does not indicate that an individual is overexposed to lead.

b. Within 5 days of receipt of blood lead monitoring results, the MDR must notify affected personnel in writing of his or her blood lead level per reference (b), if their blood lead level is at or above 30 micrograms per deciliter (ug/dl), per reference (b). Notification should include the criteria for removal from lead work and, if appropriate, notification that the person is being temporarily removed from lead exposure per reference (c). If an individual is pregnant, pregnant, lactating, or trying to become pregnant, counsel her on the possible adverse effects to the pregnancy or fetus. A decision regarding any follow-on action to be taken will be made by the physician on a case-by-case basis.

c. All records of examinations, possible lead-related conditions, related laboratory results and all forms and correspondence related to the person's medical history will become a permanent part of the health record and be retained for the period of naval service plus 20 years, or 40 years after the date of the last entry, whichever is longer.

6. Written Compliance Plan. A written compliance plan is required for processes that produce exposures in excess of the PEL as specified in reference (b). The compliance plan must be reviewed every year by the safety officer and the supporting IH and updated to reflect current status. The compliance plan consists of the following three parts.

a. Exposure assessment data provided in the IH survey.

(1) A description of each operation in which lead is emitted; (e.g., machinery used, material processed, controls in place, crew size, employee job responsibilities, operating procedures and maintenance practices).

(2) A description of the specific means that will be employed to achieve compliance, including engineering plans and studies used to determine methods selected for controlling exposure to lead.

(3) A report of the technology considered in meeting the PEL.

(4) Air monitoring data that documents the source of lead emission.

b. A work practice program and administrative control schedule created by the safety officer in consultation and coordination with the supporting industrial hygienist as required by reference (b).

c. A detailed schedule for implementation of the program, including documentation such as copies of purchase orders for equipment, construction contracts, etc. maintained by the safety officer.

7. Training. All personnel who are potentially exposed to lead at or above the AL, and their supervisors must receive initial training prior to such assignment and at least annually thereafter. This training must, at a minimum, include the following in subparagraphs 7a through 7g.

a. The specific nature of operations during which exposure is possible.

b. The purpose, proper selection, fit testing, use and limitations of respirators.

c. The adverse health effects of lead with particular attention to the reproductive effects upon both males and females, including the possible adverse effects on pregnancy and the fetus.

d. The purpose and description of the medical surveillance program.

e. The engineering controls and work practices to be applied and used in the work, including PPE and personal hygiene measures. Emphasis should be on removal using hand methods such as chipping, scraping, sanding, and needle gunning to reduce potential lead exposure.

f. The contents of any compliance plan in effect.

g. The command must inform personnel that additional information on lead can be found in reference (b).

SECTION B

CHAPTER 11

TAG-OUT

Ref: (a) NAVSEA S0400-AD-URM-010, Tag-Out User's Manual (TUM)

1. Discussion

a. A tag-out procedure is necessary because of the complexity of modern ships and the cost, delays, and hazards to personnel which could result from improper operation of equipment or the inadvertent release of stored energy. In order to prevent injury to personnel and damage to equipment, the tag-out program is mandatory for all-shipboard equipment, components, and systems. The program is designed to notify personnel that tagged out equipment or systems are not in a normal operating condition. Each tag contains information necessary to avoid a possible mishap. Standard tag-out procedures are to be used for shipboard work performed by any activity. Tag-out procedures must be enforced at all times. The use of tags or labels is not a substitute for other safety measures such as chaining or locking valves, removing fuses, or racking out circuit breakers. If any system, portion of a system, component, equipment, or instrument has more than one type of tag or sticker, the danger (red) tag, when present, must take precedence over all other tags or stickers.

b. Reference (a) is the primary document for detailed program and technical guidance regarding the tag-out.

2. Responsibilities

a. Commanding Officer. Establish a comprehensive tag-out program and ensure that all personnel comply with the program requirements in reference (a).

b. Safety Officer. Ensure that the tag-out program is evaluated at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

SECTION B

CHAPTER 12

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Ref: (a) NSTM 077
(b) The Naval Safety Center's Shipboard Safety Equipment Shopping Guide, Jan 2012
(c) Navy Chemical Protective Glove Selection Matrix, Mar 2012
(d) NSTM 555, Volume 1
(e) MCO 1020.34H, Marine Corps Uniform Regulations

1. Discussion

a. This chapter provides procedures for provision and use of PPE. Chapters B1, B3, B4, B5, B6, B7, B8, B9, and B10 contain more detailed instructions for approval, use, and maintenance of certain specialized equipment. See reference (a) for additional information on PPE. Reference (b) contains stock number information for ordering PPE. Organizations should check the naval supply system for most current stock and ordering information.

b. PPE establishes a "last line of defense" against exposure to workplace hazards, and in some cases, may be the only means of protection. Any PPE breakdown, failure, or misuse immediately exposes the wearer to the hazard. For this reason, proper equipment selection and maintenance, personnel training (including equipment limitations), and enforcement of protective equipment maintenance, configuration, and use are key elements to an effective personal protective effort.

Note: Preparation for any availability should include careful assessment of PPE needs over the entire period to ensure an adequate supply.

2. Responsibilities

a. Commanding Officer. Ensure that there is sufficient PPE aboard to meet the needs of his or her command. The commanding officer must ensure that adequate funding is provided to obtain or replace missing or worn out PPE.

b. Safety Officer. Ensure that the use of PPE is monitored for required work or in required spaces, as well as being worn in a proper and effective manner. PPE selection must be based on the workplace evaluation and recommendations contained in the applicable sections of the baseline or periodic IH survey, NSTM, HMUG, and MRCs.

c. Division Officers. Budget for, procure, and stock personal protective clothing and equipment and provide it to personnel as needed. Division officers must review relative allowance parts lists, AELs, and coordinated shipboard and shore-based allowance lists to ensure they accurately reflect PPE requirements, and where deficiencies, inaccuracies, or surpluses are identified, coordinate with the supply officer to submit recommended changes. Division officers must ensure that PPE is properly maintained and must monitor and enforce proper wearing and use. Additionally, division officers must ensure that assigned personnel are adequately trained per paragraph 4.

d. Supervisors. Monitor and enforce the proper use and wearing of protective equipment.

e. All Hands. Ensure that they wear or use the required PPE to perform assigned work in a proper manner. If the required PPE is not available to do the assigned work, or if instruction is needed on how to wear or use the equipment, the affected person must notify his or her supervisor immediately.

3. Protective Equipment

a. Head Protection. Helmets or hard hats protect crew members from the impact of falling and flying objects, from impact with low overheads, and on a limited basis, from electric shock and burn.

(1) Metal hard hats are not authorized for shipboard use.

(2) Stow helmets or hard hats in a manner so that cracks will not develop in hat material. Do not stow heavy materials on top of hard hats.

(3) Do not wear hard hats if cracked, if the hat material has a hole other than one caused by the manufacturer, if missing the suspension harness, or if painted. Such hard hats must be turned in and replaced.

(4) Do not drill any holes in hard hats or modify them in any way. Such action will greatly reduce the protective capability of the headwear. Affixing decals on protective headwear is permitted.

(5) Protective headwear for cold weather (watch caps, stocking caps, ball caps, etc.) may be worn with the hard hat if it does not interfere with correct fit.

b. Foot Protection. Shipboard environments such as flight decks, hangar decks, machine shops, pipe shops, heavy supply parts stowage areas, replenishment areas, and rigging sponsons expose personnel in some degree to foot hazards. Only shipboard approved Navy footwear will be worn.

(1) Leather steel toed shoes are required for all personnel aboard ship for normal daily wear. CORFAM® (poromeric or equivalent) shoes or those made with plastic or vinyl outer material may only be worn when immediately departing or returning to the ship or when specifically authorized by the commanding officer for ceremonial or other special occasions. Do not wear CORFAM® (or equivalent) shoes or those made with plastic or vinyl outer material in main machinery spaces, or in hot work areas.

(2) Standard stock safety shoes, with built-in steel box toe protection are intended primarily to provide protection from falling and rolling objects. Enlisted personnel are issued safety shoes at recruit training commands. Officers must be provided standard stock safety shoes when required by their work. Safety shoes should be periodically examined for worn soles and heels that would reduce the non-skid features of the shoe. Safety shoes must be replaced when the upper leather is worn or develops cracks exposing the toe protection or the foot. When safety shoes exhibit wear such that safety protection is no longer afforded, the command must provide standard stock safety shoes as organizational clothing (similar to coveralls or foul weather gear). Any safety footwear may be compromised after a severe impact or compression of the toe cap. Safety shoes must be replaced if the toe cap is compromised or when the upper leather is worn or develops cracks exposing the toe cap or the foot.

(3) Special safety shoes.

(a) Semi-conductive safety shoes are used to dissipate static electricity.

(b) Safety shoes or boots with rubber or synthetic material are used for protection against acids, caustics and other liquid chemical hazards. They may or may not have toe protection.

(c) Molders boots (slip on), with toe protection, should be provided to welders to provide easy removal in case hot slag or metal drops in or on the boot.

(d) Protective shoes must be stowed in a dry atmosphere. Where practical, they must be stowed upright, allowing the insides to dry out.

c. Hand Protection. Hand hazardous operations include handling sharp or abrasive objects, working with chemicals, power tools or electrical equipment, working in the vicinity of hot or cold objects or liquids, and hot work. Guidance is provided in the following subparagraphs 3c(1) through 3c(10).

(1) When handling sharp materials, such as sheet metal, wear leather gloves. Also wear leather gloves over electrical grade rubber gloves whenever the rubber gloves could be subjected to cutting by sharp or abrasive objects.

(2) Whenever it is necessary to work with portable electric tools or equipment in damp locations or when it is necessary to work on live electrical circuits or equipment, wear electrical grade insulating rubber gloves rated for the voltage. Leather protectors must be worn over rubber insulating gloves.

(3) Stow rubber electrical insulating gloves in the original box or equivalent container. Perform the appropriate planned maintenance on the gloves prior to stowage. Stow all rubber electrical safety protection equipment in a clean, dry, oil-free location. Care should be taken not to fold rubber insulating equipment as this will frequently result in cracks that will greatly reduce the insulating capability of the material.

(4) Do not use electrical insulating gloves or leather protectors for non-electrical work such as: mechanical work, general cleaning with cleansers, work involving solvents, work with petroleum based products such as oil and grease, work involving alkali material, or work involving acids. Cleaning products, petroleum based products, acids and alkalis will degrade the insulating properties of the gloves making them unsafe for electrical work.

(5) Wear only gloves approved to handle acids, corrosives, solvents, and other industrial chemicals when required. The safety officer or HAZMAT coordinator must assist supervisors in the selection of gloves to protect against chemical hazards. Surgical, clear plastic, latex, or food-handler type gloves are not approved for use with HAZMATs.

(6) When it is necessary to handle hot items or perform hot work, even if tongs or other gripping and clamping tools are available, wear non-asbestos, insulated gloves.

(7) Wear Kevlar® or boning gloves when handling knives in food service situations.

(8) Do not wear gloves when operating machinery with rotating or moving parts or line handling when the gloves could be caught in the bite.

(9) Deck personnel must be provided with leather gloves to protect against hand injury when handling sharp objects including wire rope or banding material.

(10) Reference (c) provides information on proper glove selection.

d. Safety Clothing. Special clothing may consist of flame resistant coveralls, disposable coveralls, impervious chemical spill coveralls, welding leathers, arc-rated clothing and chemical aprons. These items may be specified as required by technical manuals or standard work practices. Non-flame resistant fabrics (e.g., service khaki, navy service uniform, etc.) are not authorized for wear on surface ships while underway, except as noted in subparagraphs 3d(1) through 3d(3). Leather clothing, such as welding leathers, should be stored in a clean, dry atmosphere. Additional information on firefighting clothing is contained in references (b) and (d).

(1) Flame Retardant Coveralls

(a) The flame resistant variant (FRV) coverall is a flame retardant treated 100 percent cotton fabric. Currently, the FRV coverall will be issued to all shipboard personnel as organizational clothing. The FRV is required to be worn by all surface ship and carrier personnel while underway (i.e., from stationing and securing sea and anchor detail and maneuvering watch when leaving and entering port, respectively) except as noted in subparagraphs 3d(1)(b) and 3d(1)(c).

(b) Submarine personnel must wear Navy FRV coveralls. In nuclear propulsion spaces, sleeves must be rolled down when on watch or when performing maintenance in machinery spaces where steam is circulating in piping systems or a diesel engine is in operation.

(c) U.S. Marine Corps personnel that are part of ship's company are not required to wear FRV coveralls. Additional guidance for U.S. Marine Corps personnel is contained in reference (e).

(d) Personnel (riders) getting underway but not part of ship's company (e.g., inspectors, training personnel, civilian technical representatives, other Government civilian personnel) are not required to wear FRV coveralls.

(2) Navy Working Uniform

(a) Underway, the Navy working uniform is only authorized for wear during special events such as manning the rails, change of command, or receptions held at anchor.

(b) In port, the Navy working uniform is the main working uniform but it is not flame resistant and cannot be worn when fighting a fire. However, the urgency for immediate response demanded by a shipboard fire requires that a sailor wearing the Navy working uniform be prepared to attack a newly discovered fire in order to extinguish the fire or prevent fire spread. In other words, the initial response can be in the Navy working uniform, as the intent for initial response is to immediately take action to extinguish the fire or set boundaries and contain the fire until relieved by a properly equipped fire party.

(3) Physical Training Uniform

(a) The physical training uniform is designed primarily for group and unit physical training activities and the semi-annual physical fitness assessment; however, it can be worn underway for fitness and leisure, unless determined otherwise by the commanding officer.

(b) The physical training uniform is not flame retardant or resistant and cannot be worn when fighting a fire.

e. Personal Flotation Devices. Whenever personnel, other than aircrew members and flight deck personnel, are required to wear life preservers in open sea operations, the life preservers must be inherently buoyant. Those jacket-type life preservers are used by personnel in exposed battle stations, when working over the side, topside in heavy weather, during replenishment at sea, in small boats (including lowing and raising) and other evolutions when personnel can be carried over the side. Thoroughly dry life preservers prior to stowage. Following drying, stow them in designated clean and dry locations.

4. Training. Personnel who use PPE must be trained on the proper use, maintenance, and storage of PPE required for their jobs.

SECTION B

CHAPTER 13

FALL PROTECTION

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) Department of the Navy Fall Protection Guide, May 2015,
(c) OPNAVINST 5102.1D/MCO P5102.1B, Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual
(d) NSTM, Chapter 600, Volume 3, Hull Outfitting Equipment
(e) NAVSUP 538, Management of Materials Handling Equipment (MHE) and Shipboard Mobile Support Equipment (SMSE)
(f) NSTM, Chapter 077, Personal Protective Equipment

1. Discussion

a. This chapter provides requirements to establish and manage a comprehensive fall protection program for afloat Navy activities, which have personnel exposed to falls from heights. The goal of the fall protection program is to prevent injuries and fatalities when personnel working at heights are exposed to fall hazards on Navy vessels. A managed fall protection program must be in writing and approved by the TYCOMs, ISICs, or unit level, depending on the scope, resources and expertise required as determined by the TYCOMs. Program development, management and implementation will require supporting resources from sponsors, NAVSAFECEN, and fleet commanders to include training.

b. There is no safe distance from an unprotected side or edge of a deck or platform. There is no minimum time duration that allows exclusion of fall protection requirements (e.g., if a 2-minute job requires 15 minutes to establish fall protection). Fall-related mishaps are generally complex events frequently involving many factors. Consequently, the requirements for risk management for fall protection must be incorporated into:

(1) planning, reviews, and execution of work operations and procedures;

(2) job hazard analyses;

(3) SOPs;

(4) equipment selection and maintenance; and

(5) training.

c. Commands at all levels have a duty to anticipate the need for personnel to work at heights and plan work accordingly. This means effective mishap prevention and rescue procedures must be incorporated into all job planning process. All commands must identify fall hazards by performing a fall hazard survey and assessment on each work process and utilize risk management principles to identify hazards, determine the level of risk they present to personnel or equipment, and to develop controls to minimize those risks. A thorough risk management assessment must include an evaluation of potential fall hazards per reference (a). Implementing activities may use reference (b) as a supplement to its comprehensive fall protection program.

2. Responsibilities

a. Implementing activities must delineate duties and assign responsibilities in the implementation of a managed fall protection program. The activities must ensure that ship's company personnel, in company with TYCOM and other resources, have the necessary skills, knowledge, training, and expertise to manage, administer, implement and monitor the fall protection program. Depending upon the activity size and mission, the personnel who manage, administer, implement and monitor the fall protection program may either be assigned full-time or part-time (i.e., collateral duty). TYCOMs may also assign personnel to manage and implement the program across multiple units or ISICs. Personnel assigned to the fall protection program must have the following qualifications and responsibilities:

(1) The Fall Protection Program Manager (FPPM). An FPPM is a person designated in writing by the command who is responsible for the development and implementation of the program. The FPPM must ensure that shipboard personnel exposed to fall hazards, and other personnel involved in managing the program, receive adequate training as outlined in this chapter.

Note: The FPPM position need not be an exclusive title designation. With adequate education, training, and experience, the same person may also function as a competent person.

(2) Competent Person for Fall Protection. A person, who through training knowledge and expertise, is capable of identifying hazardous or dangerous conditions in personal fall arrest systems or components, and in using the right equipment, and who has the authority to take prompt corrective measures to eliminate or control the hazards of falling. This person must be designated in writing by the command to be responsible for immediate supervision, implementation, and monitoring of the fall protection program. The competent person will identify, evaluate, and address existing and potential fall hazards; and are knowledgeable in the application and use of personal fall protection and rescue systems and equipment. The competent person is the frontline when it comes to delivering the training and refresher training, and monitoring how end-users are using fall protection equipment.

(3) Qualified Person for Fall Protection. A person with a recognized engineering degree or professional certificate and with extensive knowledge, training, and experience in the field of fall protection who is capable of designing, analyzing, evaluating, and specifying fall protection systems and rescue systems and equipment. This person may serve as the expert for multiple units or types of units as determined by the TYCOM.

(4) End-User of Fall Protection (Authorized Person). A person who has been trained in the use of assigned fall protection equipment in a typical fall hazard situation, including hands-on training and practical demonstration and using personal fall protection equipment (including fall arrest, fall restraint, or fall positioning) while performing work assignments at heights. A competent person at the unit, level who has the knowledge, expertise, and education to deliver the training must train end-users.

b. The Commander or Commanding Officer of Embarked Personnel for Inspections, Certifications, Assessments, and Visits (ICAV)

(1) Establish and implement a fall protection program, which includes the following in subparagraphs 2b(1)(a) through 2b(1)(h).

(a) Assigning responsibilities.

(b) Surveying and assessing fall hazards.

(c) Providing prevention and control measures including the development of site specific fall protection and prevention plan. The ICAV competent person can adopt the requirements of the ships site specific fall protection plan if the area where their personnel are working at heights has been included in the ships specific fall protection plan.

Note: The site specific fall protection plan should be developed by the competent person associated with whoever is making a visit to the ship. The ICAV competent person can utilize the ships site specific fall protection if they are going to be working at heights in an area that is already covered under that plan (i.e. going aloft on the mast). However, if the entity making the visit to the ship is working at heights in an area that has not been included in the ships specific fall protection plan they are obligated to evaluate the area to be worked and develop that plan.

(d) Training of personnel.

(e) Inspecting equipment.

(f) Auditing and evaluation.

(g) Proper installation and use of fall protection systems and equipment.

(h) Availability of rescue equipment with accompanying rescue procedures.

(2) Designate in writing an FPPM, E-7 or above, who is responsible for administering the fall protection program.

c. Commanding Officer of a Naval Vessel

(1) Establish and implement a fall protection program, which includes the below in subparagraphs 2c(1)(a) through 2c(1)(h).

(a) Assigning responsibilities.

(b) Surveying and assessing fall hazards.

(c) Providing prevention and control measures.

(d) Training.

(e) Inspecting equipment.

(f) Auditing and evaluation.

(g) Proper installation and use of fall protection systems.

(h) Availability of rescue equipment with accompanying rescue procedures.

(2) With the exception of shipyard personnel during an availability, provide fall protection to embarked Navy civilians and military personnel exposed to fall hazards on any elevated walking working surface with unprotected sides, edges, or floor openings, from which there is a possibility of falling 5 feet or more to a lower level; or, where there is a possibility of a fall from any height onto dangerous equipment, into a hazardous environment, or onto an impalement hazard. Ensure contractors do not use Government-owned fall protection equipment unless it is stated in the contract and ensure that Navy civilian and military personnel will not use contractor-owned fall protection equipment.

(3) Designate in writing an FPPM, E-7 or above, who is responsible for administering the fall protection program.

(4) Waive, in writing, fall protection requirements if, in his or her assessment, the required use of fall arrest equipment places the end-user in a potentially unsafe situation. This waiver will only be granted under the strictest of circumstances and after conducting and documenting a thorough risk assessment utilizing risk management principles of the work operation.

d. FPPM

(1) Develop, implement, and manage the fall protection program per requirements of this chapter.

(2) Maintain a fall protection program instruction that addresses additional supplementary requirements that are beyond the fall protection policy detailed in this manual, and include personal fall protection equipment issue points and other special conditions.

(3) Ensure a site-specific shipboard rescue plan, as an appendix to the instruction, is in place for any locations that may require rescue (see paragraph 5). The fall protection instruction must address working over the side, working aloft, and interior and deck areas of a ship (e.g., enclosed masts, hanger bays, well decks, vehicle storage decks, ramps, vertical trunks, elevator trunks, dumbwaiter trunks, package conveyor trunks, void spaces, and ballast tanks) with unprotected sides, edges, and openings from which there is a possibility of:

(a) a fall from 5 feet or more to a lower level, or

(b) a fall from any height onto dangerous equipment, into a hazardous environment, or onto an impalement hazard.

(4) Ensure FPPM training is completed per paragraph 7.

(5) Ensure that the safety officer, competent person, fall protection safety observers, supervisors of end-users, and end-users of fall protection receive training per paragraph 7.

(6) Use risk management principles to assess fall hazards and take prompt corrective measures to eliminate or control the hazards.

(7) Ensure that all personal fall protection equipment impacted by a fall is immediately removed from service and held for mishap or near mishap investigation per reference (c). Personal fall protection equipment refers to fall arrest restraint and positioning equipment.

(8) Ensure that only NAVSEASYSCOM-authorized personal fall protection equipment is onboard, and that it is inspected, stowed, maintained, and issued per paragraph 4.

(9) Conduct a self-assessment evaluation of the fall protection program at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

(10) Ensure that when an end-user of fall protection equipment is working over the side or working aloft that a fall protection safety observer is assigned to oversee the evolution.

(11) Ensure that all fall protection equipment logs, working aloft and over the side chits, audits, etc. are maintained for 5 years and audited annually per reference (b).

(12) Ensure that only approved anchor points are used when tied off. For ships without approved anchor points, a competent person must designate tie-off points.

e. Division Officers. Ensure that personnel exposed to fall hazards are qualified in the use of and provided with proper PPE as specified by the competent person.

f. Safety Officer

(1) Complete training requirements as required by paragraph 7.

(2) Ensure that all injuries from falls and near misses are reported per reference (c).

(3) Assist the FPPM in identifying fall hazards and taking prompt corrective measures to eliminate or control the hazards.

(4) Ensure that the FPPM conducts a self-assessment of the fall protection program at least annually. Chapter A3 contains information on conducting self-assessment evaluations.

g. Fall Protection Safety Observers

(1) Complete training requirements, as required by paragraph 7.

(2) Have no other duties assigned in the work operation.

(3) Keep unnecessary personnel from decks above the work area, over the side, or beneath the work area being done afloat.

(4) Keep in visual contact with all personnel working aloft, or over the side, in the respective area or zone assigned.

(5) Ensure that any fall injury and any near miss is reported to both the FPPM and the safety officer.

(6) Ensure that the OOD is immediately notified in the event of any fall injury or near miss.

(7) Wear the same personal fall protection equipment as the personnel working aloft or over the side, including a hard hat.

h. Supervisors of End-users

(1) Ensure that end-users are permitted to attend and participate in fall protection training, as required.

(2) Complete training requirements, as required by paragraph 7.

i. End-users of Fall Protection

(1) Complete training requirements before using the equipment, as required by paragraph 7.

(2) Use only NAVSEASYSCOM-authorized personal fall arrest or fall restraint, fall positioning equipment or systems when exposed to fall hazards in performance of their duties.

(3) Ensure that all injuries from falls and near misses are reported to both the FPPM and the safety officer.

3. Fall-Hazard Identification, Prevention, and Control Measures

a. "Fall hazard" must be defined as the exposure of a person to a fall from 5 feet or more to a lower level; or, where there is a possibility of a fall from any height onto dangerous equipment, or onto an impalement hazard.

b. All commands must maintain a fall hazard survey and assessment and prepare survey report that identifies potential fall hazards and utilizes risk management principles to determine the level of risk they present to personnel or equipment.

c. All commands must develop additional controls where required to minimize the risks of fall hazards.

d. Since many areas on the exterior of a ship are inaccessible to personnel from the deck or built-in work platforms, it becomes necessary to work at heights, or "over the side," to reach these areas.

(1) For submarines, this must be defined as either work on, or within, the sail, not to include the bridge or bridge trunk.

(2) "Over the side" must be defined as anywhere outboard of the lifeline system, to include inside flooded well decks. If the hazard of a fall over water exists, a personal floatation device is required. For submarines, it also includes: aft of aft-most safety stanchion; forward of

the foremost safety stanchion; or outboard a plane that runs parallel to the stanchion boundary, if safety lines are removed for other reasons. Procedures for working over the side are contained in chapter C8.

e. The use of NAVSEASYSCOM-approved personal fall protection equipment is required for ship personnel exposed to fall hazards in the following conditions per subparagraphs 3e(1) through 3e(5).

(1) On any interior or exterior walking or working surface with unprotected sides, edges, or openings that is elevated 5 feet or more.

(2) In any embarked vessels or atop embarked equipment.

(3) When the risk of falling over the side, including working in the vicinity of an unprotected deck edge, exists. "Vicinity of deck edge" is considered to be within 3 feet of the deck edge when guardlines, lifelines, or liferails are removed; or, if personnel are elevated near the deck edge such as using a step ladder where personnel climb higher than the middle lifeline or liferail. If the hazard of a fall over water exists, a personal flotation device is required.

(4) When working outside the boundaries of the installed guardlines, lifelines, or liferails.

(5) When the ship is in drydock. Personal flotation devices are not required to be worn over the side in dry docks with no water. Personnel working over the side in a dry dock will normally be in a man basket and tied off using a full-body harness and energy absorbing lanyard (safety lanyard) attached to an anchorage. Drydock procedures are contained in chapter C8.

f. Fall protection systems. Only NAVSEASYSCOM-authorized fall protection equipment (to include fall arrest, restraint, and positioning) must be used by uniformed personnel.

(1) Fall Arrest System. A system used to arrest a person in a fall, preventing them from contacting a lower level or object. Fall arrest system consists of an anchorage system, connecting means (i.e., energy absorbing lanyard (safety lanyard), self-retracting device, or fall arrestor) and a full-body harness.

(2) Restraint System. A combination of devices designed to restrain an end-user from reaching an exposed fall hazard. The system consists of a full-body harness that can be secured around a worker and attached by a lanyard to a load-bearing anchorage in order to restrict travel and limit fall hazards.

(3) Positioning System. A combination of equipment, including a full-body harness rigged to allow the end-user to work with both hands free while being supported on an elevated

vertical or inclined work surface. Positioning system consists of a full body harness attached to and anchorage using a short lanyard.

g. Prevention and passive fall protection systems

(1) Lifelines, Liferails, and Guardlines

(a) Lifelines and liferails must be installed parallel to the deck in the locations specified in the following subparagraphs 3g(1)(a)1 through3 g(1)(a)4.

1. Along deck edges and walkways.

2. Around open hatches and elevator openings.

3. In flight decks and on antenna platforms at a height required by reference (c).

4. Along other boundaries wherever there is danger of personnel falling overboard, falling to lower levels in the ship, or falling on hazardous operating machinery or equipment. Additional information concerning lifelines, liferails, and guardlines is contained in references (b) and (d).

(b) Lifelines are removable safety barriers rigged along deck edges and deck openings and in areas from which all obstructions must be readily removable for action, exercises, or operations. Lifelines must be made and tested in compliance with NAVSEASYSCOM drawings 804-5184155 and 804-5959308.

(c) Liferails are a rigid barrier, usually permanently fixed, but can be hinged or portable, and are installed along deck edges or platforms. Liferail systems must be made in compliance with NAVSEASYSCOM drawing 804-5184155.

(d) Guard and access lines are rope or chain systems for ready access openings through lifelines or liferails. Access openings in such locations as accommodation ladders, hatch openings, and other deck openings used for egress and ingress must be fitted with short lengths of guard line assemblies. The number and courses of rope or chain must be the same in number and height from the deck as the adjacent courses of liferails or lifelines.

(2) Safety Net Systems. Safety nets are used at the deck edge, or when working over the side, to prevent falling to a lower level. Information concerning flight deck and access trunk safety nets is found in chapter C8 and reference (d).

(3) Submarine Safety Track and Safety Line System. A system designed to restrain a person from the hazards of a fall from the deck of a submarine.

(4) Submarine Float Lines. Float lines are rigged around a moored submarine's waterline in such a manner as to ensure that a conscious person falling overboard who is not incapacitated (e.g., injury, stroke, or heart attack), can grasp the floating line and stay afloat. Information concerning float lines is found in COMSUBLANT/COMSUBPACINST 5400.49, The Submarine Organization and Regulations Manual (SORM).

(5) Fixed Rail Ladder Climbing Systems (formally climber safety rail). A device or climbing sleeve connected to the front D-ring on the climber's full-body harness that slides up or down on the fixed rail ladder climbing device. If a fall occurs, the device is designed to lock by inertia or cam action to arrest the fall. Fixed rail ladder climbing devices must permit the individual to ascend or descend without continually having to hold, push, or pull any part of the device, leaving both hands free for climbing. The fixed rail ladder climbing systems is used at selected permanently installed topside fixed vertical ladders where a fall hazard exists such as the mast, kingpost, and other topside structures providing access to a fall-hazardous location where a full-body harness is to be worn. The fixed rail ladder climbing systems must be installed in compliance with NAVSEASYSCOM drawing 804-4563125. The extension rail for the fixed rail ladder climbing systems attaches to the top of the rail so the worker can reach the deck without disconnecting. It also permits the worker to rotate 360 degrees to a safe area. Fixed rail ladder climbing device and sleeves must be inspected, cleaned, and lubricated in compliance with applicable MRCs. See reference (d) for additional requirements on fixed rail ladder climbing systems requirements.

(6) Accommodation Ladders, Brows, Inclined Ladders, Pilot's Ladders, Jacob's Ladders, Side Ladders, and Embarkation Ladders. Requirements for maintenance, inspection, testing, and repair for all equipment is covered in reference (d). Ensure that pilot and accommodation ladders are rigged per NAVSEASYSCOM and ship's drawings. Additional guidance is contained in reference (d).

(7) Firefighter Ladder Safety System (LSS) (On DDGs, CGs, LPD 17s, LHDs, and LSDs)

(a) The firefighter LSS provides continuous fall protection for firefighters when climbing or descending machinery space access trunk ladders during vertical entry firefighting, or during training exercises. The equipment components are installed on existing ladder rungs in main and auxiliary machinery space access trunks.

(b) The firefighter LSS consists of a rigid rail bolted to the trunk ladder; and a carrier sleeve which slides along the rail, connects the user to the rail, and grips the rail if the user slips. A waist belt is worn by the user which connects to the carrier sleeve and a removable rail extension for closure of access trunk hatches (see AEL 2-930095002). The firefighter LSS complies with both OSHA and American National Standards Institute standards for an LSS.

(8) Self-Retracting Lanyard and Lifeline (On LPD 17s). A device that contains a drum-wound line that automatically locks at the onset of a fall to arrest the user; but that pays out from, and automatically retracts into, the drum during normal movement of the person to whom the line is attached. Self-retracting lifelines must only be used in vertical applications where the anchorage is located above the dorsal D-ring of the full body harness. See reference (e) for maintenance requirements.

(9) Temporary Covers. Covers for deck openings must be secured in place and capable of supporting loads at least twice the weight of people, equipment, and materials combined. When a cover is removed, the opening must be protected by use of either a temporary grate placed over the deck opening or guardrails, or guard chains erected around it.

(10) Temporary Platforms. Temporary platforms (e.g., paint float, scaffolding systems) may be positioned or erected alongside elevated work areas to prevent falls. When working from these elevated work platforms, 5 feet or higher, the work platforms must be equipped with a guardrail system or other fall protection systems. Information on scaffolds can be found in appendix B13-A.

(11) Additional situations that may require the use of personal fall protection equipment listed in subparagraph 3d include:

(a) elevators, conveyors, and dumbwaiters; and

(b) ladders. Information on ladders can be found in appendix B13-B.

4. Inspection, Maintenance, Issue, and Storage of Personal Fall Protection Equipment. All personal fall protection equipment must be inspected, maintained, and issued in per the appropriate MIP and MRC per reference (e).

5. Assisted Rescue and Self Rescue Procedures

a. When personal fall protection systems are used, the command must ensure that the person can either self-rescue or can be rescued promptly. Ships must have onboard an assisted rescue system. The ship's fall protection program instruction must contain a rescue plan that includes emergency procedures, local fire department notification when pier side, methods of self-rescue, assisted rescue, equipment requirements, ship-specific anchor points, and specialized training requirements for rescue personnel.

b. At least one aloft, site-specific, assisted rescue drill must be exercised pier side, annually. The drill will be documented in writing and retained onboard for 3 years.

6. Fall from Heights Mishap Reporting Procedures. Any fall from heights, and any noted fall hazards, must be reported to both the FPPM and the ship's safety officer. The safety officer

must submit either a mishap or hazard report, and make a hazard abatement log entry, as applicable. When personnel experience a fall that is arrested by fall arrest equipment, it isconsidered a mishap or near miss for reporting purposes and must be reported to both the FPPM and the ship's safety officer. Fall arrest equipment involved in a fall mishap must be returned to the FPPM per subparagraph 2b(6). Falls resulting in injuries or near misses must be reported per reference (c).

7. Training

a. All Navy and Marine Corps personnel working at heights greater than 5 feet, who are exposed to fall hazards or otherwise involved in the Fall Protection program, must be trained to recognize the hazards of falling in the workplace and how to minimize such hazards. Additionally, end-users of fall protection equipment must be trained in assisted-rescue and self-rescue equipment and procedures.

b. Before using fall protection equipment, personnel must be trained on the safe use of fall protection equipment. All personnel working at heights greater than 5 feet must receive a minimum of 16 hours, or, as appropriate, fall protection training that includes hands-on training and practical demonstrations with practice climbing in a controlled situation in the presence of a competent person per reference (b).

c. The end-user must be trained by a competent person who has the knowledge, expertise, qualification, and education to deliver the training.

d. Refresher training for all end-users of fall protection equipment will be provided every 2 years. Additional retraining for end users will be provided as necessary for personnel to maintain proficiency.

e. Written certification of initial and refresher training is required and must be maintained for every individual certified to utilize fall protection equipment by the FPPM. For those personnel visiting from another Navy activity, they must provide documentation that certifies that they are qualified to utilize fall protection equipment. The documentation or certificate must identify the name of the employee trained, date of training, and the signature(s) of the trainer(s). Additionally, a determination will be made as to whether the training has resulted in personnel acquiring the required skills and knowledge.

f. FPPMs must be trained and qualified on the use of various types of personal fall protection equipment. Training must include the following:

(1) Fall protection program development, management and implementation.

(2) Record keeping (e.g., training, mishap reporting, and hazard reporting).

(3) Inspection of equipment and systems (PMS).

(4) Fall hazard recognition.

(5) Ship applicable SOPs job qualification requirements (JQRs).

(6) above training requirements are met by completion of the NAVSAFENVTRACEN afloat fall protection program manager course or an equivalent course as approved by fleet commanders.

g. Competent person for fall protection must:

(1) be trained and qualified on the use of various personal fall protection equipment and systems through formal classroom and practical demonstration training;

(2) be trained on identifying, evaluating, and addressing existing and potential fall hazards;

(3) acquire knowledge and expertise in the application and use of personal fall protection and rescue systems, or any component thereof; and

(4) be familiar with, and able to train on, the:

(a) ship-specific fall-protection equipment;

(b) safety observer and end-user fall protection responsibilities; and

(c) calculating free-fall, total fall distance, and clearance requirements.

(5) above training requirements are met by completion of the NAVSAFENVTRACEN afloat fall protection competent person course or an equivalent course as approved by fleet commanders.

h. The safety officer, safety observers, supervisors of end-users, and end-users of fall protection must receive training on the topics detailed in subparagraph 7a from the competent person prior to using any personal fall protection equipment, and every 2 years thereafter. Training records must be maintained for 2 years by the FPPM.

i. All hands must be trained to recognize fall hazards and the work operations when personal fall protection equipment is required. This training is to be accomplished during shipboard indoctrination and annually thereafter.

APPENDIX B13-A
SCAFFOLDING

1. Scaffolding becomes a significant factor during either maintenance evolutions, or dry docking periods. All scaffolding must be equipped with planks, guardrails, toeboards, access and cross bracing (see figure B13-A-1). Otherwise, wear a full-body harness with energy absorbing lanyard (safety lanyard) attached to an anchorage. The harness will be inspected per the established PMS prior to use.

2. Scaffolding will be erected by qualified contractor or shipyard personnel following OSHA standards. Ship's force must not erect scaffolding. Once scaffolding is erected, it will be inspected by the contractor or shipyard. If ship's force will be using the scaffolding, the competent person, FPPM, and safety officer will receive a tour of the scaffolding by the contractor or shipyard personnel. Figure B13-A-1 provides an example of a properly erected scaffold.

3. Daily inspections of scaffolding must be conducted by a qualified contractor or shipyard person. If ship's force is to use the scaffolding, then a ship representative must accompany the qualified contractor or shipyard personnel on the daily inspection prior to use.

4. The following subparagraphs 4a through 4h provide general guidelines.

a. A qualified individual, usually a contractor or shipyard representative, must supervise the erection of scaffolding.

b. Scaffolds, and their components, must be capable of supporting at least 4 times the maximum intended load. The sides of scaffolds usually have maximum load markings.

c. Damaged or weakened scaffolds must not be used until repairs have been completed.

d. Guardrails, mid-rails, and toe-boards must be installed on all open sides and ends of platforms more than 5 feet above the deck.

e. A tag indicating that the scaffold is safe for use must be hung on the scaffold and issued by a qualified individual prior to use.

f. Hardhats must be worn by personnel working on or underneath scaffolding per reference (f).

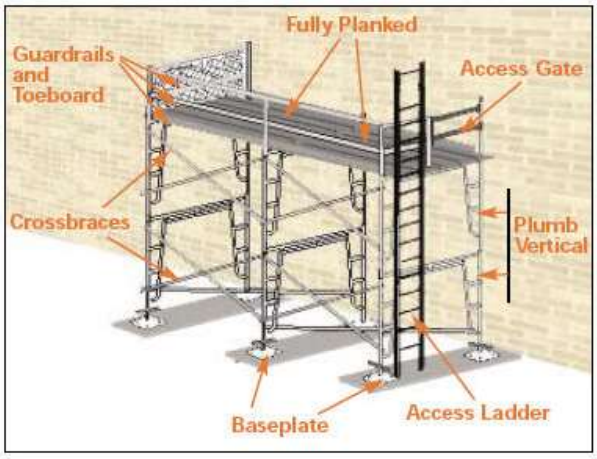

Figure B13-A-1

g. Access must be provided to all work platforms. If it is not available from the structure, access ladders, frames with built-in ladders, or stairways must be provided.

h. A full-body harness is not required to be worn by personnel working on scaffolds where installed guardrails protect all edges and prevent a fall hazard.

APPENDIX B13-B
LADDERS

1. Fixed Ladders

a. Personnel must not perform work from a fixed ladder greater than 5 feet high, unless wearing fall protection equipment such as a full-body harness attached with a short connection to a ladder climbing device, a self-retracting lifeline, or "Y" lanyard; which in turn, is attached to a properly designed and installed anchorage. If the total length of the climb on a fixed ladder (with the exception of vertical trunks) equals or exceeds 20 feet, then the fixed ladder must be equipped with one of the following in subparagraphs 1a(1) and 1a(2).

(1) Ladder climbing device.

(2) Self-retracting lanyard (lifeline) and rest platforms at intervals not to exceed 15 feet.

b. In a ladder system with multiple ladder sections, each ladder section must not exceed 50 feet in length. These ladder sections must be offset from adjacent sections, and landing platforms must be provided at maximum intervals of 50 feet.

c. Fixed ladders are provided with ladder climbing devices or self-retracting lanyards (lifelines) where the length of climb is less than 20 feet, but the top of the ladder is at a distance greater than 20 feet above lower levels (i.e., if the fall from that ladder can exceed 20 feet to the lower level, but the ladder itself is less than 20 feet in length, such as observed with a 6-foot section of a fixed ladder located 25 feet above a lower level). The step-across distance between the center of the steps and rungs of fixed ladders, and the nearest edge of a landing area, must be no less than 2-1/2 inches and no more than 12 inches.

d. All ladder climbing devices must permit the worker to ascend or descend without continually having to hold, push, or pull any part of the device; whereby, leaving both hands free for climbing. These ladder climbing devices must be activated within 2 feet after a fall occurs. Ladder climbing devices must be attached to a frontal-centered D-ring or other specifically-designed centered frontal attachment point on a full-body harness.

e. The side rails of through-ladder or side-step ladder extensions must extend 42 inches above the top level or landing platform served by the ladder.

2. Portable and Extension Ladders (Non-Self-Supporting)

a. Personnel must visually inspect that non-self-supporting portable and extension ladders have structural integrity, can operate as designed, and are free from slippery materials prior to each use.

b. A non-self-supporting portable and extension ladder should be set, where possible, at a 4:1 ratio for the proper angle to deck or platform (see figure B13-B-1).

c. A non-self-supporting portable and extension ladder must be placed to prevent slipping, or it must be lashed, or it must be held in position.

d. Spreaders should be used to stabilize non-self-supporting portable and extension ladders, when possible.

e. Do not stand or work from the top 2 rungs of a non-self-supporting portable or extension ladder.

f. When non-self-supporting portable and extension ladders are placed for access to an upper landing surface, the side rails must extend at least 3 feet above the upper landing surface. When such an extension is not possible, the ladders must be tied off to the upper landing surface.

g. Ladders which have developed defects, will be withdrawn from service for repair as directed by the ladder manufacturer, or for destruction, and tagged or marked as "Dangerous, Do Not Use."

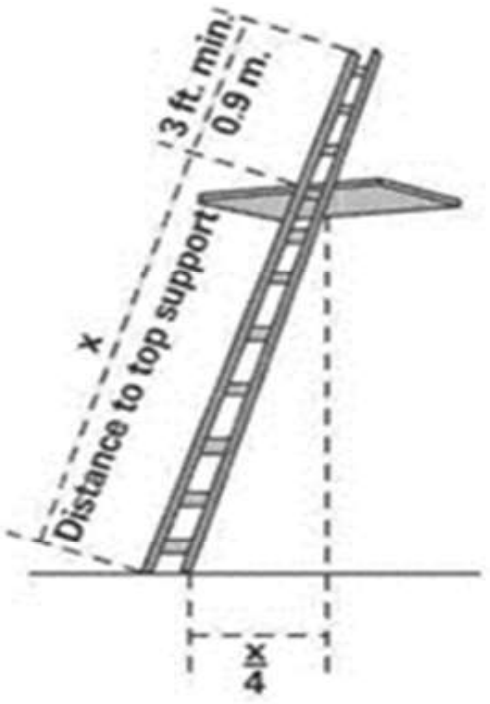

Figure B13-B-1

3. Portable Step Ladders (Self-Supporting)

a. Personnel will visually inspect that portable ladders have structural integrity and can operate as designed prior to each use.

b. Do not stand or work from the top two rungs.

c. Do not use a closed, self-supporting stepladder because it may slip out.

d. Self-supporting stepladders must not exceed 20 feet in length.

e. The steps of a self-supporting stepladder must be corrugated, knurled, dimpled, coated with skid-resistant material, or treated to minimize slipping.

f. Metal self-supporting ladders must not be used when performing electrical work. Only ladders approved for electrical work must be used.

g. Ladders which have developed defects will be withdrawn from service for repair as directed by the ladder manufacturer, or for destruction, and tagged or marked as "Dangerous, Do Not Use."

SECTION C. SURFACE SHIP SAFETY STANDARDS

CHAPTER 1

BASIC SAFETY

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion

a. Shipboard life is one of the more hazardous working and living environments that exist. The existence of HAZMATs and equipment, in addition to the fact that a ship is a constantly moving platform subject to conditions such as weather, collision, and grounding contribute to a potentially hazardous environment. Any chain of mishaps could lead to a major catastrophe. It is for this reason, practical safety must be followed and the prescribed safety regulations strictly followed to prevent personal injury and illness.

b. As a risk control measure, and a consideration when using ORM to plan an evolution, consider assigning a safety observer whose only responsibility is safety during any evolution that could injure personnel or damage equipment. This safety observer should be knowledgeable in the proper performance of the evolution and have the ability to identify safety related concerns or procedural violations. Reference (a) contains additional guidance on ORM.

c. The general safety standards in the following paragraph 2 are applicable to all shipboard operations and spaces. These standards have been adopted from requirements from the NAVSEASYSCOM, OSHA, USCG, SOLAS, ANSI, and previous OPNAV directives. The standards provided in this chapter may not be all inclusive for every possible evolution on board ship, and the lack of a specific standard does not imply that a practice is safe just because it is not mentioned. Use ORM to determine the safety requirements for unique evolutions and operations.

2. General Safety Standards

a. Ladders and Egress

(1) Be familiar with all exits and egress routes from working and living spaces.

(2) Always move up or down a ladder with one hand on the railing. Never slide down inclined ladder rails. Do not carry loads up or down ladders that obstruct movement or sight (use additional personnel to support the load and a spotter when required).

(3) Always ensure exits are not locked or blocked with equipment or any other type of interference.

(4) Do not run onboard except for designated exercise locations.

(5) Always be cautious when nearing a "blind" corner or when opening doors.

(6) Never lock escape scuttles or other accesses so they cannot be opened from the inside.

(7) Never dismantle or remove any inclined or vertical ladder without permission of the commanding officer. Secure such areas with temporary lifelines and post with a warning sign on every deck affected.

(8) After opening and prior to passing through a watertight hatch, scuttle, or manhole cover, ensure hatch brace pins, safety pawls, scuttle and manhole covers are positively locked. Properly secure watertight door, hatch, scuttle, or manhole cover when access is complete.

(9) Provide temporary barriers using guardrails, line, or chains, suitably supported by stanchions or pads, when opening accesses in bulkheads or decks that are normally closed.

(10) Ensure that low overheads above inclined ladders (less than 72 inches in height), ladder grab bars, passageways (less than 75 inches in height) and obstructions in passageways (less than 72 inches in height), are padded or protected to prevent head injury if struck.

b. Non-Skid Decking Material. Ensure non-skid decking material, non-skid paint or 3 adhesive non-skid strips (no space in between strips) are installed at the locations listed in subparagraphs 2b(1) through 2b(6).

(1) At the top and bottom of each ladder.

(2) On both sides of doors and arches with sills or coaming higher than 4 inches.

(3) On both sides of doors to mess room, galley, and sanitary spaces (may be on exit side only if non-skid tiles are installed in messing spaces).

(4) Outside of refrigerated stores spaces.

(5) On the passage side of doors from spaces which may have wet decks such as CHT rooms.

(6) In the machinery operators' work areas.

c. Damage Control

(1) Know the location and operation of life preservers, EEBDs, and other emergency equipment in or near working and living spaces.

(2) Know the location of all fire stations and other firefighting equipment in or near the living and working spaces frequented.

(3) If passing through a watertight door, hatch, or scuttle designated to be closed during normal operations, be certain to properly close and dog it.

(4) Never tamper with any damage control fittings or equipment.

(5) Never open a tank or void without permission of the gas free engineer. When working in a tank or void ensure a gas free certificate is properly posted. Personnel entering the tank or void must wear a harness with attached safety line, wear proper protective equipment, and have a second person tending the safety line outside the tank or void.

d. Stowage and HAZMATs

(1) Make sure that all movable objects in spaces are secured for sea using appropriate materials. Whenever feasible, provide permanent secure-for-sea mountings with metal bands, bolts, or other securing devices.

(2) Ensure all HAZMATs, including cleaners and paints, are properly labeled, safely used, and returned after use; see chapter B3.

e. Machinery

(1) Wear short sleeves or roll up sleeves when operating rotating industrial machinery. See chapter B12 for specific protective clothing requirements.

(2) Know the emergency shutdown procedures for all equipment used.

(3) Do not wear rings, watches, key rings, bracelets, cell phones, pagers, and other items that may become entangled or caught on projections, or may be a shock hazard when working with electrical or electronic equipment.

(4) Always wear approved safety shoes when required.

(5) Do not operate machinery and tools without proper training and authorization.

(6) Keep decks free of obstacles and materials causing slippery conditions, particularly in work areas. Post warning signs in areas that are slippery.

(7) Never operate machinery or equipment with defective or missing safety devices.

(8) Ensure hazard boundaries around machinery are established and marked with appropriate deck markings

(9) Never tamper with or render ineffective any safety device, interlock, ground strap or similar device intended to protect operators or the equipment without specific approval of the commanding officer.

(10) Only open or close electrical switches, breakers, and pipe valves when authorized to do so.

f. Ventilation. Always ensure ventilation ducts are free of blockage. Never alter ducts or diffusers without permission. Know where ventilation controllers are located for work and living areas.

g. General Space Safety

(1) Keep constantly familiar with the whereabouts of crewmembers in the space where one is working, especially if they are working in tanks, voids or other restricted movement areas.

(2) Observe and enforce all PPE requirements.

(3) Promptly report all unsafe conditions discovered.

(4) Never straddle or step over lines, wire, and chains under tension.

(5) Never hesitate to stop a shipmate from doing something that may be hazardous or unsafe, and never leave a worksite in an unsafe condition.

(6) Use of personal earphones and headphones is not authorized except in the berthing spaces, in recreation and study areas, or in other authorized ship spaces.

(7) Ensure spaces containing flammable liquids are marked with red danger signs to warn personnel.

h. Topside

(1) Appropriate sunglasses may be worn when topside. Sunglasses will not be worn as a substitute for impact safety glasses, sun and wind goggles, flight deck goggles, or as protective equipment for operations such as fire watch or welding.

(2) Know where all life rings, dye markers, and flares are located for man overboard emergencies.

(3) Do not lean against lifelines. Never dismantle or remove any lifeline, or hang or secure any weight or line to any lifeline except as authorized by the commanding officer. When no lifeline is available, temporary lifelines must be used.

(4) Wear an inherently buoyant life preserver (IBLP) or auto-inflatable utility life preserver topside where the potential exists of falling, slipping, being thrown, or carried into the water.

(5) Never dismantle any permanent lifeline system without permission of the commanding officer and without providing temporary lifelines.

(6) Know the location of all lifeboat and life raft stations. Be familiar with access routes to the stations from the living and working spaces frequented.

3. Safety Color Code and Signs for Marking Physical Hazards

a. Danger. Red is the basic color for the identification of dangerous equipment or situations:

(1) Safety cans or other approved portable containers of flammable liquids. These metal cans must be painted red with some additional clearly visible identification either in the form of a yellow band around the can or the name of the contents conspicuously stenciled or painted on the can in yellow.

(2) Danger signs are red with black and white lettering, to indicate a hazardous situation, equipment, area, or condition, which has a high probability of death or severe injury.

(3) Emergency stop bars on hazardous machines, such as rubber mills, wire blocks, or flat work ironers. Stop buttons or electrical switches, on which letters or other markings appear and are used for emergency stopping of machinery, must be red.

(4) Guards or barriers enclosing rotating shafts, belts, pinch points or moving parts on machinery or elevators which could cause death or severe injury, if removed.

(5) Red danger tape is used to indicate an immediate hazard or area and excludes any unauthorized personnel from entering the area.

b. Caution. Yellow is the basic color to denote caution.

(1) Yellow is the basic color for designating caution and for marking physical hazards such as: striking against, stumbling, falling, tripping, and "caught in between." Solid yellow, yellow and black stripes with suitable contrasting color should be used interchangeably, choosing the combination which will attract the most attention in a given environment. Overhead obstructions (less than 72 inches in height), monorails and turntables are painted solid yellow.

(2) Yellow and black are the colors of caution signs used to indicate a hazardous situation, which may result in minor or moderate injury. Caution signs are yellow with black lettering, and are used for eye hazard and noise hazard signs.

(3) Use yellow and black striping or checkerboard designs, painted or tape, to indicate industrial eye hazardous areas, trip hazard areas, or other areas where caution should be exercised.

(4) Yellow caution tape is used to indicate a potential hazard or area and only authorized personnel with knowledge of the hazard may be allowed to work in the area.

c. Safety Information. Green is the color of general safety information and instructional signs, such as the location of emergency eye wash stations and safety precaution placards.

d. Workshop Deck Markings. Deck markings are used around permanently installed workshop machinery to alert personnel nearby of potential hazards. Markings may be applied using commercially available safety tape or painted onto surfaces. Markings are to be applied around each machine. Avoid marking an entire space as hazardous by applying deck markings only at a doorway or entrance. Operator and eye hazard areas may overlap if machines are installed close together.

(1) Operator Work Areas. The area at the machine where the operator normally stands while using the machine is marked to alert personnel not to enter that operator area. The operator should be provided enough room to safely operate the equipment without being bumped by transiting personnel. An operator area is marked by painting the entire operator area as a solid yellow block. The operator area must also have non-skid decking to prevent slipping on oily decks and falling into the machines. The non-skid may be non-skid paint or adhesive non-skid strips with no spaces between the strips. Non-skid should not be painted yellow. The operator area around the non-skid strips must be painted yellow or for non-skid painted areas a boarder outlining the operator area must be painted yellow.

(2) Eye Hazardous Areas. Any area around a machine determined to pose an eye hazard must have those boundaries outlined in black and yellow strips or checkerboard paint or tape. To determine the extent of the eye hazard, note areas where chips or debris are thrown or materials splashed during operation. That area or machine must also be labeled with a "Caution – Eye Hazard" sign in yellow and black (see chapter B5 for details).

(3) Safe Passage and Caution Areas. If space permits, lanes used for normal traffic through a machine shop or around industrial machinery should be outlined using solid white (safe) or yellow (caution) lines.

SECTION C

CHAPTER 2

DRY CARGO OPERATIONS, STORES HANDLING, AND RIGGING

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) NSTM 589, Cranes
(c) NSTM 077, Personnel Protection Equipment
(d) NAVSUP MHE538, Management of Materials Handling Equipment and Shipboard Mobile Support Equipment
(e) NAVSEA SW023-AH-WHM-010, Handling of Ammunition and Explosives with Industrial Material Handling Equipment
(f) NWP 4-01-4, Replenishment Underway
(g) NSTM 572, Shipboard Stores and Provision Handling

1. Discussion

a. Dry cargo and stores are any material that are carried in their own containers and are not in bulk form, such as fuel. Examples of dry cargo are stores, equipment and machinery that are carried in a ship for its own or another vessel's use.

b. This chapter does not discuss underway replenishment (UNREP) operations or refueling at sea operations except fuel used in drums or other approved containers. UNREP and refueling at sea operations are covered in other chapters.

c. Dry cargo and stores handling evolutions are extremely dangerous, even though they appear routine. Cargo and stores being handled can fall or shift, causing injury to personnel and damage to the ship. Additionally, damaged HAZMAT cargo may cause illness or death from resulting spills in extreme conditions. Cargo and stores handling gear can fail, causing not only cargo damage, but additionally the failed cargo handling gear can itself maim and even kill, as well as cause physical damage. It is for these reasons that extreme care must be used during cargo and stores handling operations.

d. Working parties and personnel moving stores throughout a ship result in numerous injuries. Handlers may need hand and foot protection, back injury prevention training, and supervision to prevent injuries.

e. Complete an ORM review, per reference (a), before the evolution and mitigate risks as feasible.

2. Precautions – Working Parties Moving Stores. The precautions below in subparagraphs 2a through 2g are for personnel assigned to temporarily assembled or routine working parties, and their supervisors, when handling and moving stores through a ship.

a. Ensure the path throughout the ship where stores will be moved is clear of obstructions and traffic through those areas restricted during stores movement.

b. Wear hand protection (when handling wire rope or banded material), and steel-toed safety shoes.

c. Ensure there are sufficient personnel assigned to allow passing of boxes or material and that all members are fit to handle the anticipated weight.

d. Arrange sufficient numbers of personnel in the working party to minimize twisting or exertion while passing the material. Never toss or throw boxes, cases, or materials from one person to the next.

e. Prior to each handling evolution, review proper handling techniques to avoid back injury (lift with legs, do not bend at waist to lift, get help with heavier loads, get a firm grip before releasing to next person, and stop and report any strains immediately).

f. Ensure slides at inclined ladders are firmly in place and do not have sharp edges or protrusions.

g. Review spill response procedures if handling HAZMATs.

3. Precautions - Cargo Handling for Supervisors. The precautions in the following subparagraphs 3a through 3x are for cargo handling supervisors. Supervisors must initiate these precautions as well as those in reference (b) before beginning any cargo handling operations.

a. Ensure open hatches in use are cleared of adjacent loose equipment that might fall into the hold and injure personnel below.

b. Restrict traffic about hatches to the side away from where cargo is being worked. Rope off areas to traffic over which loads are traveling.

c. Secure or remove hatch beams or other structures in the way of hatches where cargo is being worked. Personnel engaged in moving hatch beams must wear a safety harness with associated safety lines, which must be tended at all times.

d. Ensure that all personnel handling cargo gear are familiar with the use of their equipment and limitations on load capacity and outreach and are PQS qualified.

e. Ensure that trained and qualified signalmen are designated and posted during crane or boom operations. The following crane crew personnel will be qualified, per reference (b), tagline handler, rigger, signalman, crane operator, crane safety observer, and crane maintenance technician. Where applicable, NAVEDTRA PQSs are available and should be used to supplement the reference (b) qualification requirements.

f. Verify that all designated cargo handlers are wearing the required PPE, including hand protection (when handling wire rope or banded material), head protection (hard hats), and steel-toed safety shoes. Ensure all other personnel immediately involved in the cargo handling operations (e.g., safety observer, rig captain, signalmen, winch operator, and winch checker), including personnel observing for training, wear head protection (a hard hat) with the chin strap in place under the chin.

g. Ensure that all cargo holds to be used are open and hatch covers properly stowed. Ensure all hinged or folding cargo hatches, normally stowed in an upright position are secured with hatch securing pawls and safety preventer chains engaged.

h. Visually verify that all pallets and containers are of the correct type and safe for the intended use. If a pallet appears unsafe, discard or repair it prior to use.

i. Inspect the cargo handling area and ensure that dunnage is properly stowed clear of all proposed cargo handling activity.

j. Visually check and ensure that all required cargo handling warning signs are properly posted near personnel transit areas.

k. Ensure that all required trim and stability calculations have been completed before the cargo is loaded or off-loaded.

l. Visually check and verify that all cargo boom preventer guys, straps, and whips are rigged correctly.

m. If handling ordnance, ensure that all applicable safety standards are followed and enforced. Chapter C14 provides additional guidance.

n. Use caution when using dock or mobile cranes. Rotary cranes, booms and structures can strike and damage the ship's superstructure.

o. Ensure that all suspected unsafe cargo handling gear is tagged out of commission, removed, and repaired or replaced, and tested prior to re-issue.

p. Ensure that all holds and levels being utilized have the required safety barriers (e.g., rope, chains, and nets) installed.

q. Verify that all required cargo (save-all) nets are in place.

r. Ensure there are no oily or slick decks where cargo is to be handled.

s. Ensure adequate lighting is provided at the boom heads, cargo holds, and draft areas when conducting nighttime cargo operations.

t. Do not operate any cargo handling system with inoperative safety devices or guards without the specific approval of the commanding officer.

u. Rig suspended baskets and buckets per reference (b). Personnel in the basket or bucket must wear a safety harness with safety line attached. Leave the safety lanyard disconnected when the basket or bucket is positioned over water. When conducting work that will suspend personnel over water, personnel must wear approved life preservers in conjunction with fall protection per reference (c).

v. Use correct and well-maintained blocks and sheaves for safe load handling operations.

w. Conduct an informal safety brief for all participants prior to the start of cargo.

x. Ensure that safety observers are not involved in any other aspects of cargo handling operations except observing safe procedures.

4. Precautions During Cargo Operations. All personnel handling cargo should follow the precautions listed below is subparagraphs 4a through 4ae during cargo handling operations.

a. Always know where the cargo is during a transfer.

b. Wear a hard hat with chinstrap in place under chin, gloves (when handling wire rope or banded material), and steel-toed safety shoes.

c. When transiting a cargo operations area, walk only in the designated transit areas that are located on the side of the ship opposite the cargo handling operations.

d. Never look into a hold when cargo is being handled or cargo gear is in use unless controlling the movement of the cargo.

e. Never walk under suspended cargo or tensioned highline.

f. Do not ride on pallets, containers, or hooks. Do not ride on conveyors.

g. Know the firefighting and safety equipment locations.

h. Do not walk backward.

i. Always listen to equipment. Abnormal sounds usually mean trouble.

j. Never allow cargo to swing or remain suspended for a period longer than necessary.

k. When cargo is being lowered, keep feet and hands clear. Never put hands under cargo during transfer.

l. Never allow unsecured cargo gear or equipment to go unattended.

m. Never throw anything down a hold or onto a dock.

n. Never step into bights of line.

o. Never grab or hold onto cargo lines.

p. Know the location of all exits from holds.

q. Know the location and use of emergency cut-off switches.

r. Do not oil or lubricate equipment while it is in use.

s. Check cargo-handling equipment for damage and proper operation if struck by cargo being handled.

t. Ensure cargo never exceeds cargo handling equipment's listed safe working load limit at the outreach being used.

u. Avoid making side pulls.

v. Never climb up or down exposed ladders when cargo is being handled within the immediate area.

w. Do not smoke.

x. Inform supervisors of unsafe or damaged equipment or conditions.

y. Do not use personnel-only elevators for cargo.

z. Always lift loads evenly.

aa. When suspending a load, only do so over the deck, not the hatch.

ab. Wear eye, face and hand protection when removing steel strapping. Stand to one side and out of the path of the strapping as strapping will recoil when cut.

ac. Do not overload hand and fork trucks. Ensure trucks are below handlers when going up or down an incline.

ad. Remove, repair, or replace defective or broken strapping on cargo.

ae. Provide tag lines to loads requiring continuous manual guidance while in motion.

5. Precautions – Material Handling Equipment (MHE) During Cargo Operations. All MHE operators should the precautions listed in the following subparagraphs 5a through 5h during cargo handling operations.

a. Be trained and licensed, where appropriate, and follow the requirements in references (d) and (e).

b. Use a ground guide in congested areas and areas with limit clearance and vision.

c. Operate MHE at a speed that will permit it to be brought to a stop in a safe manner.

d. Ascend or descend grades slowly. On all grades, the forks must be tilted back and raised only as far as necessary to clear the floor, deck or road surface. Do not turn on an incline. When traveling up or down a grade in excess of 5 percent (3 degrees) with a loaded forklift truck, keep the load upgrade to maintain control.

e. Do not travel two MHE abreast unless approved by the commanding officer.

f. Maintain a safe distance from the edge of elevators, ramps, platforms, and safety nets. Be aware of "tail swing" motion on rear-steering MHE to avoid driving off the edge of elevators, ramps, and platforms.

g. Sound the horn at intersections, congested areas and other locations where vision is obstructed. Also, sound the horn before proceeding around corners or into elevators when the view is obstructed. Operators must sound the horn before moving rearward if the MHE does not have an audible backing warning system.

h. Wear seatbelts at all times.

6. Stowage Precautions

a. Before handling vehicles as cargo, inspect and ensure that all fuel has been emptied from the vehicle's tanks with the exception of combat loaded military vehicles.

b. Stow vehicles fore and aft, chock wheels, use approved or installed tie downs or wire rope lashings.

c. Always brace, shore, and lash cargo that may shift.

d. Always pre-plan the location of material to be stowed so that heavier items are stowed below lighter ones.

e. Use dunnage only when necessary.

f. For specific tie down information, see the appropriate transportability guidance technical manual.

7. Nets

a. Use cargo nets when loading or unloading packages, bundled and bagged materials, or other objects that might roll or shift, creating an unsafe condition if lifted on a sling.

b. When cargo nets are used to discharge cargo onto trucks, land the load slowly to prevent damage to the truck and possible injury to personnel. Carefully disconnect the net from the sling and leave the net in the truck with its load.

c. Inspect nets prior to and during use for wear and damage. Remove worn or damaged nets from service until repaired or replaced.

d. Refer to reference (f) for additional precautions associated with vertical replenishment (VERTREP).

8. Pallets

a. Palletizing speeds up the handling of cargo, prevents damage to easily crushed items, and increases the amount of cargo that can be stacked in a pile. For these reasons, pallets are used extensively in cargo handling operations.

b. When loading a pallet, stack the cargo so that no possibility of cargo spilling exists, and the pallet will be stable and level when lifted. When loading a pallet with cases of uneven size, place the highest and strongest cases at each end of the pallet with the smaller and more fragile cases in the center. In this manner, when piling one pallet on top of another, a stronger and more

level surface is offered. This will result in safer stowage of the pallets. Do not lift pallets on which items are loose or broken and which cannot be properly reloaded in cargo nets.

c. Palletize round commodities, such as cylinders, by using specially constructed chocks, made up and spaced to fit the particular cargo. For safe handling, tie the chocks together by 2 narrow strips that lie in the space between the chocks and are flush with the top of the pallet's platform. Lay the second tier in the cantlines of the first.

d. Use pallet bridles and bars whenever possible and especially when loading or unloading pallets containing even-sized cases or cartons.

e. Do not lift a load on damaged pallets. A damaged, palletized load may be lifted if a sound pallet is placed under the damaged pallet or if the load is placed into a cargo net. Otherwise, repalletize the load.

f. Refer to reference (f) for additional precautions associated with VERTREP.

9. Conveyors

a. When using a power conveyor, run the device slowly enough that personnel at the end of the conveyor can handle the packages without rushing.

b. Do not ride a moving conveyor. Signs must be posted on all conveyors to this effect. Do not walk on idle conveyors, except as required for maintenance.

c. Never leave a powered conveyor unattended while it is in operation. When operating a dual-control conveyor from one control station, use the station affording the best view of the entire conveying operation. For elevated conveyors, this usually means the elevated end. Control stations must be placarded with operating instructions and precautions.

d. Do not convey materials having an unstable load distribution.

e. Examine all conveyors frequently for sharp edges, dents, worn liners, or any other conditions that could cause injury to personnel or damage to conveyed materials. Inspect power conveyors for loose or broken parts.

f. Do not lubricate, adjust, or repair any part of the conveyor while the machine is in operation. Tag-out and remove conveyor from service before performing maintenance, inspection, or adjustments.

g. Wear steel-toed safety shoes when loading or unloading conveyors. Wear hand protection if the materials have metal bands or sharp edges.

h To avoid personnel injury from falling cargo, do not go underneath the conveyor or inside the specified safe distance from its sides and ends.

i. Always use the two-man rule when operating conveyors per reference (g).

j. Always maintain positive communication between the control stations at each level of operation.

k. Ensure there is adequate lighting and firm footing (including non-slip) for personnel loading conveyors.

l. Ensure all platform-locking bars, interlocks, and audible alarms are working prior to using the conveyor.

m. Ensure that all conveyor operators and maintenance personnel are PQS qualified.

10. Chainfalls and Come-A-Longs

a. Do not exceed weight for which the equipment was designed.

b. Never kink, twist, or knot chains or slings, as these are among the greatest causes of failures.

c. Never splice or shorten chains by bolting, wiring, or knotting.

d. Clearly mark chain falls and come-a-longs to show the capacity. Do not exceed marked capacity.

e. Do not use chain, whether new, repaired, or to which hooks or rings have been added, without thoroughly inspecting or weight testing, if required. Tag defective chains or slings or immediately cut up and properly dispose of them.

f. Do not subject chains to sudden shock while in use. Jerky movements put severe strains on the chain.

g. Keep chains free from grit and dirt. Do not drag chains or drop them on hard materials.

h. Use attachments or fittings for chains of the type, grade, and size suitable for service with the size of chain used.

i. Keep brakes free from grease, oil, and rust. Adjust for wear as required.

j. Do not operate unless the ratchet and pawl mechanism is engaged.

k. Keep the equipment dry and rust-free. Lubricate only the load chain.

SECTION C

CHAPTER 3

UNDERWAY REPLENISHMENT (UNREP)

Ref: (a) NWP 4-01-4, Underway Replenishment
(b) OPNAVINST 3500.39D, Operational Risk Management
(c) NSTM 077, Personnel Protection Equipment

1. Discussion

a. All precautions listed for handling cargo in chapter C2 must be followed during UNREP operations. However, several operations involved with UNREP are unique and require special attention and safety. VERTREP operations are covered in chapter C7, Helicopter Safety. Reference (a) contains additional procedures, requirements, safety precautions, and warnings associated with UNREP planning, ship handling, personnel, rigs, and transfer operations.

b. Fueling at sea and replenishment at sea involve the transfer of cargo, personnel, and fuel between two or more ships while underway. This involves not only the dangers normally found with cargo transfers but also adds the problem of heavy weather, motion, streaming operations, and the possibility of collisions. For these extra threats, special precautions and practices must exist.

c. Complete an ORM assessment before the evolution. Reference (b) provides additional guidance on ORM. Mitigate risks as feasible.

2. Precautions to Be Observed Prior to UNREP Operations. The senior personnel in charge of UNREP operations must take the precautions in the following subparagraphs 2a through 2v.

a. Ensure all UNREP equipment and breakaway equipment is in place and operational.

b. Ensure all assigned crew members know their duties, are qualified where applicable, and are aware of their responsibilities.

c. Test and ensure that proper communications equipment is being used and is operational.

d. Ensure that communications (including back-up systems) are established with the UNREP vessel.

e. Ensure UNREP stations have non-slip deck treads or non-skid paint.

f. Ensure all permanent lifelines and temporary lifelines are in place.

g. Ensure that all UNREP personnel have removed all watches, bracelets, etc., and are wearing life preservers, head protection (hard hats) with chin straps, hand protection (when handling wire rope or banded material), steel-toed safety shoes and non-vented safety goggles. Ensure that personnel assigned to work stations are carrying an appropriate knife for routine or emergency use.

h. When fueling, ensure all firefighting stations are properly equipped to combat a casualty.

i. Ensure life rings, buoys, and markers are within easy access for UNREP team members, and station lookouts on the fantail for each engaged side.

j. Ensure that all UNREP team members are thoroughly familiar with emergency breakaway procedures. Station-to-station phone talkers and rig captains should discuss emergency breakaway procedures as soon as sound powered phone communications are established. Phone talkers should never fasten the phone strap around their necks. Emergency breakaway procedures must be issued by the delivery ship, but can be initiated by either ship.

k. Ensure that all cargo handling equipment, including padeyes, are not overloaded.

l. Post UNREP warnings at designated personnel transit areas.

m. Only allow essential personnel at UNREP stations.

n. Ensure that all UNREP personnel wear snug fitting clothes.

o. In cold climates, make sure all ice and snow is removed from UNREP station and the UNREP area deck is properly sanded.

p. During night UNREP operations, ensure that all lights are operating.

q. During personnel transfers:

(1) make sure transferring personnel wear head protection (hard hats) with chin straps and authorized life preservers per reference (c) and are equipped with whistles and personal marker lights;

(2) ensure that transferring personnel know how to get out of the transfer chair in an emergency;

(3) inspect transfer rig before using. In particular, inspect the manila or synthetic highline, as applicable, for evidence of rot, broken strands, cuts, or other signs of weakened condition.

(4) use only manila or synthetic highlines and messenger lines. Hand tend messenger lines and personnel highlines; and

(5) additional information on personnel transfers can be found in chapter 8, paragraph 8.6, of reference (a).

r. Ensure that a ready lifeboat is manned and ready in case of an emergency.

s. Clear area of dunnage.

t. Ensure padding is in place for ordnance.

u. Assign a PQS qualified safety observer to every UNREP station during all UNREP evolutions. Ensure that the safety observer's only function is to watch for hazardous conditions. The safety observer should know the locations of all nearby eye wash stations and be familiar with emergency measures in the event of accidental eye splashing.

v. Ensure a safety brief is held for all participants prior to all UNREP evolutions using the principles of ORM.

3. Precautions During UNREP Operations. All personnel must comply with the following in subparagraphs 3a through 3aa.

a. Wear head protection (hard hat) with chin straps, hand protection (when handling wire rope or banding material), life preserver, and steel toed safety shoes.

b. Wear snug fitting clothing appropriate for the weather conditions. Remove rings, watches, key rings, cell phone, pager, and other personal gear, which may become entangled in loads or lines.

c. Know the location of lifesaving equipment and firefighting stations.

d. Be aware and exercise caution when line throwing gun or bolo are in use.

e. Stand clear of the bights of lines.

f. Transit the UNREP station area in the designated transit area on the side opposite the UNREP operations station.

g. Never turn away on incoming cargo or rigs.

h. Stand clear of suspended or incoming cargo.

i. Do not stand between incoming cargo and a fixed object.

j. Secure cargo immediately.

k. Never step on or in cargo nets attached to a cargo hook.

l. Know all emergency procedures, especially emergency breakaway.

m. Do not smoke.

n. Ensure supervisors are immediately informed of all damaged or broken equipment, including the conditions of lines.

o. Ensure station-to-station phone talkers do not fasten phone straps around the neck.

p. When passing lines:

(1) when possible, use a line-throwing gun for initial line transfer, and ensure that a bolo line is available at each transfer station as a backup;

(2) CVNs, LPDs, LHAs, LHDs, and ships configured for multiple air operations must provide the shot line;

(3) send the bolo or shot line across only after being advised that the station on the receiving ship is ready;

(4) do not aim line-throwing guns and bolo lines to areas on the other ship that are under cover or where activities are obscured;

(5) direct all station personnel to take cover before indicating ready to receive the bolo line or the shot line; and

(6) apecified personnel must retrieve the bolo or shot line only upon the order of the petty officer in charge of the station.

q. Neatly fake or coil down all lines to avoid a tripping hazard.

r. Stay clear of all lines, especially bights, unless directly engaged in their handling. Line handlers UNREP personnel should always remain inboard and forward of all rigs, space permitting.

s. Space permitting, keep at least 6 feet from any block or cleat through which lines pass.

t. Use tag lines to control a load during hoisting and lowering.

u. Secure cargo to prevent shifting.

v. Ensure that all transfers of empty hooks are treated as full load transfers with the proper catenary maintained.

w. Keep working areas clear of all dunnage and items that create a tripping hazard.

x. When handling ammunition and guided missiles, use padding on decks, bulkheads, and gun mounts in the vicinity of the station.

y. Raise loads only as high as necessary to clear obstructions.

z. Do not overload hoist rigs.

aa. Keep the bridge informed of any change affecting the readiness of the station to transfer. Before reporting all lines clear, ensure that all lines are clear of the receiving ship. When reporting all lines on deck, ensure that no lines are trailing in the water but are in fact on board and clear of the ship's sides.

SECTION C

CHAPTER 4

SMALL BOAT SAFETY

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) NSTM 077, Personnel Protection Equipment
(c) NSTM 583, Boats and Small Craft

1. Discussion

a. The Navy uses several types of small boats. All can be used for emergency evacuation.

b. Launching and recovery are the most dangerous operations involving small boats. It is during these critical evolutions that human error and mechanical failure of boat davits and launching and retrieval machinery can occur, and when weather and sea state often worsen the effects. Sea state can also have an adverse effect while approaching accommodation ladders, pilot boarding stations or side port doors, and gates and ramps at sea. Therefore, inherently buoyant (kapok type) life preservers will be worn at all at-sea or at-anchor small boat evolutions to include entering and exiting well decks of L class ships by navy operated amphibious crafts (except landing craft air cushion (LCAC) and amphibious vehicles).

c. Unsafe contracted liberty boats (water taxis) have contributed to the death and injury of Navy personnel. To reduce the hazards associated with these operations, contracts for these services must specify a minimum level of safety and seaworthiness. In addition, commanding officers must ensure that a knowledgeable officer inspects water taxis prior to their being placed in service and at least daily thereafter. Paragraph 5 provides guidance on these safety inspections.

d. Complete an ORM assessment before the evolution and mitigate risks as feasible. Reference (a) provides additional guidance on ORM.

2. Precautions for Launching and Retrieval. Observe the precautions in the following subparagraphs 2a through 2r.

a. Never engage a crank when hoisting motor is energized.

b. Inspect all equipment before use, especially the condition of the boat falls, the machinery, and the boat itself.

c. Conduct a safety brief prior to all evolutions. Ensure people riding the boat wear an inherently buoyant (kapok type) life preserver and a safety helmet with the chinstrap fastened under the chin following section 2 of reference (b). Personnel assigned to the boat handling station will dress out the same including wearing a safety helmet with the chinstrap fastened under the chin following section 2 of reference (b).

d. Conduct a boat inspection. Inventory equipment; install bilge plug; remove ropes from bags; and check hoisting hook, rings, slings, and bales.

e. Keep non-essential personnel away from the davit area. Do not stand under the boat during lowering or raising.

f. When preparing davit to raise or lower the boat, post a davit winch watcher to monitor the spooling of the wire rope falls.

g. If the ready life boat is rigged for use, the sea painter connection will be checked during the morning boat report and before any launching evolution.

h. Obtain permission from the bridge; then raise or lower the boat slowly when cleared.

i. Permit only required personnel to be in the boat during lowering or hoisting operations. Personnel must wear IBLPs. The boat crew will be loaded when the boat is alongside the rail and after permission has been granted by the bridge through the petty officer in charge of the evolution. These personnel must hold on to the manropes when provided. Manropes must be positioned to the outboard side of the boat.

j. The small boat’s engine will be engaged prior to the small boat entering the water and disengaged after being recovered out of the water.

k. Release the stern hook first when launching from a double-hoisting wire davit.

l. The safety lines will be released in the following order after the small boat has been launched: aft steadying line, forward steadying line, sea painter. The safety lines will be reattached in the following order when recovering the small boat: sea painter, forward steadying line, aft steadying line.

m. Do not launch a boat when own ship's speed is greater than 5 knots.

n. Do not hoist boats aboard ship or lower with water in the bilge in excess of that which the installed bilge pumps would normally remove.

o. Properly secure lifting hook bails before a boat is raised or lowered.

p. Be alert for any possible malfunctioning and act quickly if it occurs. Do not lower or raise the davit arms into the davit arm stops at full speed. Do not use limit switches as stop switches.

q. When hoisting a rigid inflatable boat or other ship's boat with survivors embarked, only three crewmembers are required to be aboard: bowhook, sternhook, and coxswain. Other crewmembers should disembark by alternate means in deference to survivors prior to hoisting the boat. Although undesirable, when human life is in jeopardy and depending on operating conditions, the rigid inflatable boat or other ship's boat's limit on the number of people may be exceeded. The boat and boat davit safety factors are sufficient to permit hoisting the boat to the rail or deck edge when carrying the full capacity (see reference (c), section 5 for detailed guidance). However, under no circumstances must the boat be swung in or out when carrying more than five people.

r. Before raising or lowering a boat, ensure all slings, bale shackles, and pins are seated and seized.

3. Fueling

a. If possible, fuel a boat in the daytime and while it is in the water with its engine stopped. Fueling a boat at night requires the permission of the OOD.

b. If it is necessary to fuel a boat in its shipboard stowage, provide adequate spill control and firefighting equipment at the scene. Ensure all electrical equipment in use during refueling on or in the immediate are of the boat is approved for hazardous atmospheres.

c. Do not fuel boats with passengers on board.

d. Prior to fueling, make a grounding and bonding connection between the fuel delivery pump and the fuel tank for gasoline propelled boats.

e. Always keep gas cap in place when not fueling.

f. Only personnel specifically authorized by the ship's fueling instruction will fuel small boats.

g. Smoking or use of non-explosion-proof lights are not permitted near small boats during fueling operations.

h. Before starting the engine, inspect compartments and bilges, clean, and ventilate as necessary.

i. Ensure gasoline is stowed only in approved fuel containers, and returned to approved storage location upon completion of the fueling operation.

j. Report to the OOD any fuel or oil spills into navigable waters. Do not rinse, bail, or discharge anything from the small boat into navigable waters without the OOD's permission.

k. Always use non-vented safety goggles when handling fuels.

l. See reference (c) for additional requirements for small boat fueling at the boat stowage location.

4. Operations

a. Know and obey the "Rules of the Road." Especially important to boat coxswains is the "Rule of Good Seamanship," which requires that boats give way to ships and seaplanes. Boats should turn away from ships or seaplanes early and radically or show clearly their intentions so as not to embarrass the larger and less maneuverable vessels.

b. Always post a bow lookout while underway.

c. Do not maneuver close to ships anchored, moored or pass close around the corner of a pier, except when such a procedure cannot be avoided. Coxswains must transit slowly until there is no danger of collision with any boat or vessel that may be obscured.

d. Boat capacity

(1) Be familiar with and never exceed the designated personnel carrying capacity. Be able to calculate the load and regulate the number of personnel accordingly. While carrying stores, the load in pounds, including personnel and stores, must never exceed the maximum allowable cargo load.

(2) Do not carry passengers, stores, or baggage topside on motorboats. If it is necessary to carry stores or baggage, reduce the maximum number of passengers accordingly. Refer to reference (c) for detailed guidance.

(3) Installation of flotation material must not relieve operating personnel from exercising prudence in the loading of boats or providing of life preservers when conditions warrant.

(4) In choppy seas, reduce capacity. The rated capacity designated on the label plate is the maximum capacity under normal weather conditions in calm waters. Always reduce capacity under less than optimum weather conditions or on the open sea.

e. Do not use gasoline to clean the engine or its parts.

f. Keep bilges and sumps dry.

g. Prohibit smoking or open flames.

h. Never start the engine if excessive vapors are present. Check for leaks, damaged piping, and loose connections. Correct deficiencies. If a leak is observed during engine operation, stop the engine and correct the cause of the leak.

i. Use PQS qualified boat officers in foul weather, reduced visibility, long duration transits, first boat transit in foreign or unfamiliar ports, and when returning large liberty parties after sunset.

j. Do not operate the boat with a defective bilge pump.

k. Never open the bow ramp of a landing craft while underway.

l. Ensure boats carry proper fog signaling equipment (refer to reference (c), section 6) and two 18-inch life rings, one forward and one aft. Life rings must be secured in such a manner that they are easily broken out.

m. For precautions on charging small boat batteries, see chapter C9, paragraph 4.

n. Ensure boat crewmembers wear authorized life preservers following section 2 of reference (b), under adverse weather conditions, including reduced visibility.

o. Run boats dead slow when passing other boats that are alongside ships or landings, in narrow or crowded waters, and when passing deeply laden boats.

p. Ensure that authorized life preservers according to section 2 of reference (b), are readily accessible in boats for all members of the crew and all passengers. Never allow the number of personnel in the boat to exceed the number of life preservers available.

q. Do not operate boats with enclosed engine rooms without the engineer being on board and on station, and then only when proper ventilation is assured.

r. Ensure that boat fire extinguishers are in place and charged.

s. Ensure that life preservers are always kept dry while in storage.

t. Inspect the electrical system for loose connections and worn insulation before operating a boat and whenever damage to these systems is suspected. Do not operate the boat until corrective action is completed.

u. Display running lights per the "Rules of the Road" when underway between sunset and sunrise or in reduced visibility. (Refer to section 6 of reference (c) for guidance.)

v. Ensure shackles and pins are used with anchors. Ensure hoisting slings or bales and steering cables are seized and cotter pins are in place.

w. Boat handling system

(1) Be sure winch and davit safety and operating placards, lubrication charts, and test label plates are posted. Ensure winch controls, brake, clutch, and pawl handles are labeled to show function and direction of movement.

(2) Always check the wire rope on the winch drum before operation to ensure the wire is properly spooled on the drum.

(3) Except in an emergency, check limit switches for operability.

(4) Ensure all turnbuckles used on boat gripes are marked to show the limit of tensioning.

x. Ensure that only qualified (class II or above) swimmers are assigned as boat crew members.

5. Contract Liberty Boat Safety

a. Commanding officers must ensure that husbanding agents and contractors provide contract liberty boats that are always manned with a minimum of one operator (coxswain) and two line handlers, operated safely, and secured to the pier or landing with a minimum of two mooring lines during embarkation and debarkation of passengers. Prior to being placed into service, a knowledgeable officer, acting for the commanding officer, must inspect and approve all contract liberty boats (water taxis) for operational safety.

(1) Ensure the navigation lights, lighted compass, distress signals, and a fog signal device are present and in working condition, and that the area charts are available and current.

(2) Ensure that fire extinguishers are present in sufficient number for the size of the boat.

(3) Verify that there is a working radio aboard, with backup battery, capable of bridge-to-bridge communications.

(4) Inspect the anchor, anchor chain, and mooring lines for adequacy given the size of the vessel.

(5) Verify that the weather deck drains are free from obstructions and drain overboard, not into the bilge.

(6) Check engineering spaces and compartments for fire or flooding hazards.

(7) Conduct a visual inspection topside for conditions which may be hazardous to passengers, to:

(a) ensure that the vessel is equipped with a sufficient number of clean and serviceable life preservers for the maximum capacity of the vessel, and ensure the life preservers are stowed in a readily accessible place marked clearly in English;

(b) verify that decks, railings, doors and seats are structurally sound, latched, and tightened as appropriate;

(c) ensure that no bare or exposed electrical wires or connections are located in the passenger area;

(d)Validate that a sufficient number of unobstructed exits are present and marked in English; and

(e) verify that no loose gear, potential projectile hazards, or trip hazards exist.

(8) Ensure the operator understands that the boat must be properly secured to the pier or landing with a minimum of two mooring lines before allowing passengers to embark or debark.

b. It is impractical to establish detailed specifications for every inspection item. Inspectors must use their judgment and experience when advising the commanding officer of the overall safety of the contract water taxi.

c. Any item missing that is critical to safety may be provided by the commanding officer for the duration of the contract boat services. Ensure that the contracted boat crew return any such items prior to the expiration of the contract. In all cases where Government furnished property is provided due to contractor's failure to meet the terms of the contract or the contractor's vessel is unsafe for use, the commanding officer must immediately notify the contracting officer of the circumstances surrounding the deficiency(ies). If the contracting officer is not on site, notification must be by message.

d. Assign boat officers to the contract water taxis during hours of darkness, or low visibility, and heavy weather. Boat officers must be PQS qualified by the ship and responsible for maintaining good order and discipline of personnel onboard.

e. When boat officers are assigned to contract water taxis, they have the authority to not allow boarding when the water taxi's crew performance and navigation are unsatisfactory. Boat officers must ensure boats are securely moored to the pier or landing with a minimum of two mooring lines before allowing passengers to embark or debark. When weather conditions are determined to be unsafe, the boat officer has the authority to refuse to get underway.

SECTION C

CHAPTER 5

WIRE AND FIBER ROPE

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) NSTM 613, Wire and Fiber

1. Discussion

a. Ropes come in a multitude of types, quality, and sizes, each with its own characteristics. In general, there are two types of rope: fiber (natural and synthetic) and wire. When removed from a coil or reel, fiber ropes are generally referred to as lines. Wire is referred to as "wire rope" or "wire," but not "cable." Additionally, there is a fiber and wire hybrid known as "spring lay" rope. Spring lay rope is composed of six main strands laid around a fiber core. Each main strand consists of three preformed wire strands and three fiber strands laid alternatively around a fiber center. Each of these ropes has been developed to satisfy a specific requirement. They can be safely used, but must be properly maintained.

b. Complete an ORM review before any line handling evolution, and mitigate risks as feasible. Reference (a) contains additional guidance on ORM.

2. General Precautions

a. Always inspect wires, ropes, and lines before use. Look for deterioration, broken wires or fibers, visible signs of rot, chafing, and variations in color, crushing, or the other signs of damage. Refer to reference (b) for additional information on use, maintenance, and material requirements for ropes.

b. Wear steel-toed safety shoes with skid-proof soles before handling lines. When handling lines, do not wear rings, watches, cell phones, pagers, key rings, and other items that may become entangled.

c. Check all rollers, capstans, gypsy heads, and windlasses, to ensure they are operating satisfactorily.

d. Avoid getting hands, feet, or clothing caught in bights formed by wires, ropes, or lines.

e. Do not stand directly in line with the point where wires, ropes, or lines change direction (e.g., around a bitt, capstan, or through a block).

f. Do not straddle or stand on chains, wires, ropes, or lines, whether under tension or not. Never step over chains, wires, ropes or lines under tension.

g. Avoid placing wires, ropes, or lines on rough or sharp surfaces that can cause chafing or cutting. Use chafing gear.

h. Do not place objects on wires, ropes, or lines.

i. Ensure all kinks are out of wires, ropes, or lines before use.

j. Check sheaves and blocks being used for proper size and strength. Do not use sheaves or blocks that are too small for the wire, rope, or line used.

k. Listen to wires, ropes, and lines under tension. Any unusual popping or tearing noises may mean that the wire, rope, or line is in danger of parting.

l. Always place hands above lines fairlead into gypsy heads, capstans, or bitts.

m. Do not lubricate lines.

n. Do not apply loads suddenly.

o. Never leave wires, ropes, or lines under strain on gypsy heads or capstans.

p. Do not use sheaves or drums with corrugated grooves.

q. Remove the loose ends of splices.

r. Seize all bitter ends.

s. Use the same type of material for stoppers as the hawser being held (e.g., synthetic stopper for synthetic line). Chain must be used for stoppers on wire rope.

t. Do not use manila, wire, spring-lay rope, or synthetic line together on the same chock, bitt, or reel.

u. Carefully make up lines not in use.

v. Do not permit rat guards and sharp edges to wear mooring lines. Use chafing gear and lash well.

w. Change boat falls, highlines, and mooring lines following PMS procedures. Failure to make such changes can result in serious injury.

x. Make up wires, ropes, and lines not in use and stow clear of walkways and passages.

y. Ensure wires, ropes, lines, and rigging are not subject to overload.

z. Use steadying or frapping lines on boat falls and large lifts to prevent uncontrolled swinging or twisting.

aa. Refer to reference (b) for additional information on use, maintenance, and material requirements for wires, ropes, and lines.

3. Natural Lines. In addition to the precautions stated in paragraph 2, also follow the following precautions in subparagraphs 3a through 3l.

a. Do not use natural lines in sheaves and blocks built for wire rope service.

b. Never use manila lines 5 or more years old.

c. Do not continue to use natural fiber line in which any of the conditions in the following subparagraphs 3c(1) through 3c(7) are present.

(1) Ruptured fibers and powdering between the strands.

(2) Dark red, brown, or black spots between the strands, and a sour, musty or acidic odor.

(3) Thirty percent of the yarns in the cross-section have been worn through.

(4) Long jawed and distorted strand areas.

(5) Salt incrustation and swollen areas.

(6) A harsh, dry, dead feel in manila or sisal lines.

(7) Evidence of gritty material between the strands.

d. Store lines in cool, dry spaces.

e. Fake lines down after use to dry out.

f. Always thaw frozen lines before use.

g. Do not allow lines to come into contact with chemicals, acid, alkalis, paints, soaps, rust, or vegetable oils.

h. Do not drag lines over sand, grit areas, or non-skid decks.

i. Do not let line wear become localized; rotate lines.

j. Use chafing gear if necessary.

k. Only use undamaged lines. Always remove damaged lines from use and repair or discard immediately.

l. Do not use chain or wire stoppers on fiber lines.

4. Synthetic Lines. In addition to the precautions in paragraph 2, the following precautions in the below subparagraphs 4a through 4g must be observed.

a. Do not expose lines unnecessarily to heat, sunlight, excessive cold, or chemicals.

b. Store nylon and polyester lines under cover or tightly wound on reels or on cleats during excessive cold.

c. Always thaw frozen lines before use.

d. Install tattletale lines to gauge how far lines are stretching. Tattletales cannot be used on aramid fiber ropes, due to their low stretch. The load should be carefully controlled on aramid lines to avoid excessive tension of the line. This is best accomplished by having line handlers ″check the line″ frequently until they have a feel for the load. Checking means allowing only enough line to render around the bitts to prevent the line from parting. It is never prudent seamanship to hold a line while a ship has movement. Remember, a parted line serves no useful purpose and is definitely a safety hazard. Regardless of the safety features of aramid lines, they must be treated with the same respect afforded to other lines under tension.

e. Payout lines on cleats, bitts, or capstans slowly. Exercise extreme care when easing out synthetic lines under heavy load. Because of their high extendibility under load, their rapid recovery, and their low coefficient of friction, these ropes may slip suddenly on easing out, thereby causing injury to line handlers. For control in easing out or surging, take two round turns on the bitts and then apply one or two figure eight bends. No more than two figure eight bends will be used. Because these bends tend to lock under surge, use of more than two figure eight bends will cause difficulty in easing out operations.

f. Double up lines under excessive strain.

g. Stand clear of lines under strain. (The videotape, "Synthetic Line Snapback," PIN 82971 ,should be viewed for an appreciation of this phenomenon.)

5. Wire and Spring Lay Rope. In addition to paragraph 2, the precautions listed below in subparagraphs 5a through 5k must be observed.

a. Always wear heavy-duty hand protection when handling wire and spring lay rope.

b. Always wear eye protection while splicing.

c. Seize wire ends to prevent unlaying.

d. Store wire and spring lay rope away from weather, acid, and chemicals.

e. Inspect wire and spring lay rope per PMS procedures.

f. When using U-bolt clamps to form an eye, always put the U-bolt itself over the bitter end. Tighten clamps only after putting line under stress.

g. Only operate winches with more than 2 turns of wire on the drum.

h. Do not use sheaves or blocks designed for use with fiber rope with wire rope.

i. Inspect end fittings, such as sockets, connectors, and wire rope clips prior to use to determine if there is an area of break adjacent to the fitting. Tighten clips after the first hour of running and at PMS specified intervals thereafter. Remove clips after long use and examine rope for broken wires. Remove the damaged part, if broken wires are found, and make a new attachment.

j. Inspect the bitter end of a wire on a drum to ensure it is properly attached.

k. Because spring lay is a combination of wire and fiber, rules for the care of both wire and fiber rope apply.

6. Cable Cleaner and Lubricator. Many ships are now using the pollution prevention cable cleaner and lubricator to clean and grease wire rope. User instructions are provided with the equipment, and the precautions in the following subparagraphs 6a through 6i must be observed.

a. Do not exceed the pressure rating of any of the system components.

b. Check the hoses for damage and ensure connections and fittings are secure prior to operation.

c. Release all system pressure before any service or disassembly of the unit.

d. Ensure chains or slings used are weight-tested or rated to withstand an initial line pull of 600 pounds.

e. Ensure personnel are clear of the exit end of the lubrication collar during the lubrication process.

f. Ensure that all shackles and fittings are tightened prior to operation.

g. Do not run the system unless the airline lubricator has oil in it.

h. Ensure personnel wear steel-toed shoes, eye and hand protection when handling the wire rope during the cleaning and lubricating.

i. Dispose of any greasy rags or debris following the ship's local HAZMAT instructions (e.g., turn in to the ship's HAZMINCEN).

SECTION C

CHAPTER 6

GROUND TACKLE AND TOWING

Ref: (a) SL 740-AA-MAN-010, U.S. Navy Towing Manual (NOTAL)
(b) OPNAVINST 3500.39D, Operational Risk Management
(c) NSTM 581, Anchors and Anchoring

1. Discussion

a. Ground tackle is a general term used to refer to the anchor, anchor chain, the anchor windlass, and auxiliary equipment. Although this chapter discusses the gypsy head, additional information is provided under general line handling precautions in chapter C5.

b. Personnel injury may result if any part of the anchor or its handling system fails when under strain. Precautions must be observed to avoid personnel injury or system damage resulting from excessive strain.

c. Towing is an evolution, which is seldom accomplished except in an emergency or for training. Due to the large inertia associated with the ships involved in the evolution, it can be extremely hazardous, particularly if excessive strain is placed on the towline and its parts. Refer to the ship's towing bill, reference (a), and ORM policy in reference (b).

d. Complete an ORM review before anchor handling or towing evolutions, and mitigate risks as feasible. Reference (b) contains additional guidance on ORM.

2. Ground Tackle Precautions

a. All personnel must wear snug fitting clothing, hand, eye and head protection, and steel toed safety shoes.

b. Check equipment to ensure it is in proper operating condition.

c. Ensure all equipment is lubricated and fluid levels are adequate.

d. Keep hands or feet off moving anchor chains.

e. Beware of oily areas or ice on decks during cold weather. Clean up oil and spread salt or sand or both for ice. Keep decks clear of obstructions that may impede quick escape.

f. Ensure proper communications to the bridge and the machinery spaces have been established prior to any evolution.

g. Only enter the chain locker when no anchor operations are planned and only with OOD permission. Chain lockers should be entered only when the ship is in port. Space must be certified as gas free before entry (see chapter B8).

h. Check that the chain locker is clear and free for running before using the anchor.

i. Allow only the anchor and line detail in the ground tackle area during operations.

j. Set brake on windlass immediately when yellow painted chain link is visible.

k. Never allow the chain to run free without braking. Excessive payout speed can cause loss of the anchor, or injury to personnel.

l. Ensure anchor chain is securely fastened to the padeye in the chain locker when reinstalling the chain after painting.

m. If using chain stoppers, set and clear the immediate area before strain is put on the chain.

n. Always keep the hawser deck bolster pipe cover in place when not hoisting or letting go the anchor.

o. When first red chain link appears on deck and the brake fails to hold, clear the immediate area.

p. House anchor in hawse-pipe shell bolster at the lowest possible speed.

q. Operate windlass at a low speed whenever the chain out exceeds 60 fathoms.

r. If the chain tends around the stem, report the situation to the bridge. The chain must be allowed to run free or the sharp bend may damage links. Detachable links are particularly susceptible.

s. Replace anchor chain if corrosion has reduced the mean diameter to less than the criteria in reference (c).

t. Personnel assigned to work over the side of the ship to hose down the anchor after hoisting must be in proper fall protection equipment; see chapter B13.

u. Windlasses

(1) When at anchor, nothing must interfere with the readiness to run, slip, or heave in the chain, or let go the spare anchor.

(2) When using the gypsy head, observe the following safety precautions:

(a)Never make a line fast to the gypsy head, but only to fittings provided for that purpose, such as cleats or bitts.

(b) Disengage the wildcat shaft locking head and hold the wildcat by the brake.

(3) When using the capstan, observe the following procedures and safety precautions:

(a) Keep capstan heads free of gouges, paint, any and all petroleum based products, and rust.

(b) When using the capstan for heaving, ensure turns are taken in the right direction for heaving.

(c) Never make lines fast to capstans, but only to fittings provided for that purpose, such as cleats or bitts.

(d) When handling lines on the capstan, when possible, position line handlers perpendicular to the line of pull.

(4) Ensure operating, safety, lubrication label placards, and test label plates are posted on or in the vicinity of windlasses or capstans.

(5) Ensure controls, brakes, and clutch levers are labeled properly.

(6) Never place any part of the body into moving machinery.

(7) Do not wear jewelry, neckties, cell phone, pagers, or loose fitting clothing while operating equipment.

(8) Wear proper protective clothing, eye and hearing protection, and equipment suited to the operation being performed.

3. Towing Precautions. Personnel involved in towing operations must be thoroughly trained, disciplined, and equipped not only to perform routine duties, but also to react appropriately to

unusual or non-routine situations. The officers and crew of vessels involved in towing operations routinely should conduct safety indoctrination lectures and exercises aimed at reducing unsafe conditions or practices and at reacting appropriately to unusual circumstances through professional knowledge of their duties and towing procedures. Consult reference (a) for detailed precautions based on the type of towing evolution.

SECTION C

CHAPTER 7

HELICOPTER AND TILTROTOR SAFETY

Ref: (a) NAVAIR 00-80T-122, Helicopter Operating Procedures for Air Capable Ships NATOPS Manual
(b) NTTP 3-50.1, Navy Search and Rescue Manual
(c) OPNAVINST 3500.39D, Operational Risk Management
(d) NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010, Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel, and Other Flammable Material)

1. Discussion

a. Helicopters and tiltrotors are used for various operations at sea, including anti-submarine warfare, VERTREP, and search and rescue. Helicopters create special hazards. Catastrophic mishaps can severely damage the ship, aircraft, and cause injury or death to personnel.

b. Helicopter or tiltrotor mishaps can happen at any time and result in varying degrees of damage, injury, and loss of aircraft and crew. Examples of mishaps include a crash on takeoff or landing, injury to ship's personnel from static electricity discharge during hoisting evolutions, inadvertent external cargo release during VERTREP operations, or injury from debris blowing about by rotor wash.

c. These standards are written for all ships that are air-capable.

d. Consult references (a) and (b) for further details concerning specific procedures and related safety procedures.

e. Complete an ORM review before any flight operations, and mitigate risks as feasible. Reference (c) provides additional guidance on ORM.

2. General Precautions

a. Avoid approaching within 50 feet of a helicopter or tiltrotor when the rotor blades are turning, unless necessary. Whenever required to approach or leave a helicopter or tiltrotor that has its blades rotating, remain in full view of the landing signalman enlisted and pilot and keep in a crouched position. Unless authorized, do not work in the area of the cockpit or cabin rearward while blades are rotating. Do not attempt to leave or approach a helicopter or tiltrotor that is

engaging or disengaging rotors. A crouched position with one side to the helicopter or tiltrotor lowers the risk of being blown down or overboard by rotorwash.

b. Always wear complete flight deck PPE, including cranials with double hearing protection, goggles, and float coats when required during flight quarters. Long sleeve shirts must be worn with sleeves rolled down at all times during flight operations. Personnel involved in flight deck operations including maintenance and refueling must wear steel toed leather safety shoes or boots with non-slip oil and fuel resistant soles.

c. Remove soft hats topside during helicopter or tiltrotor landing or take-off.

d. Know the location and use of firefighting and lifesaving equipment.

e. Prohibit the dumping of trash during helicopter or tiltrotor operations.

f. Prohibit blowing tubes when a helicopter or tiltrotor is on or in close proximity to the flight deck.

g. Conduct a foreign object damage (FOD) walkdown on the weather decks and flight deck prior to flight operations. FOD is defined as any article or object which may be disturbed by the wind across the flight deck or rotor wash and may cause damage to personnel, aircraft, or equipment. FOD prevention is the responsibility of all-hands. Take only necessary tools and material to the flight deck, and account for all tools brought to the flight deck before leaving. Report any missing items immediately.

h. Secure all hatches that open into the helicopter or tiltrotor operating area. Scuttles and hatches that open into the aircraft operating area will be posted with the following notice:

CAUTION

DO NOT OPEN DURING FLIGHT QUARTERS EXCEPT FOR

EMERGENCY EXIT. NOISE HAZARD AREA – HEARING

PROTECTION REQUIRED.

i. During flight operations, permit only authorized personnel on the flight deck or weather areas adjacent to the flight deck. Personnel will not stand in or otherwise block entrances to flight deck weather areas.

j. Utilizing flash producing equipment on the flight deck during launch, recovery, or taxi evolutions, especially at night, requires the approval of the flight deck officer.

k. Night flight operations, from 30 minutes prior to sunset to 30 minutes after sunrise, are always more hazardous for both pilots and flight deck crews. The tempo of night flight operations should be reduced in both volume and intensity when compared to day operations.

l. Flight operations and top side motor gasoline fueling operations must not be conducted within 50 feet.

m. Follow approved HERO emission control procedures per reference (d).

SECTION C

CHAPTER 8

WORKING OVER THE SIDE OR ALOFT; VERTICAL TRUNKS; AERIAL WORK PLATFORMS; DRY DOCK SAFETY

Ref: (a) NAVFAC P-307, Management of Weight Handling Equipment
(b) NSTM S0570-AC-CCM-010/8010, Industrial Ship Safety Manual for Fire Prevention and Response
(c) NSTM 772, Cargo and Weapons Elevators

1. Discussion

a. Since many areas on the exterior of a ship are inaccessible to the crew from decks or built-in work platforms, it becomes necessary to work "over the side" or "aloft" to reach these areas. "Over the side" is defined as anywhere outboard of the lifeline system and above water. The key hazard for working over the side is asphyxiation by drowning. "Aloft" is defined as being located outside the hull or superstructure in an area where specific emission hazards exist such as non-ionizing radiation from radars and antennas, radiation-induced electrical shock, inhalation of stack exhausts, and proximity to operation of a ship's whistle. The term aloft does not include the potential for fall hazards from working at height. Fall hazards, fall protection requirements and equipment utilized while working over the side, aloft, and in vertical trunks are covered in chapter B13.

Note: Access trunks, escape trunks, elevator trunks, dumbwaiter trunks, and vertical pallet and package conveyor trunks are all vertical trunks where the potential for a fall exists, but are not locations where personnel are considered aloft because they are located inside a ship's hull or superstructure.

Note: It is important to understand the mutually exclusive distinctions between the terms "over the side," "aloft," and "at height." A person working outboard of a lifeline system and above a lower deck would not be working over the side. However, that person could be working "at height" if there is a possibility of a fall from 5 feet or more to a lower level; or, where there is a possibility of a fall from any height onto dangerous equipment, or onto an impalement hazard. A person aloft can also be working at height; whereas, a person working at height is not necessarily aloft. It is entirely possible for a person to be working in any combination of over the side, aloft, or at height because of the different hazards associated with each term.

b. When a ship is in dry dock, many of the precautions associated with working over the side or aloft must be followed. This chapter will discuss the hazards and precautions associated with this unique evolution.

c. Personnel suspended in a man basket over the side by a crane are subject to electrical shock and burn hazards from voltage induced in the hoist wire from transmitting antenna and radar. When personnel are suspended over the side by a crane, all precautions listed in this chapter must be taken.

d. As a risk control measure, assign and position a safety observer near the work being performed, whose only responsibility is safety, during any deck or seamanship evolution that could injure personnel or damage equipment. This safety observer must be knowledgeable in the proper performance of the evolution. Examples of deck evolutions include: operation of boat davits, rigging pilot and accommodation ladders, and handling lines.

2. General Precautions

a. An appropriate check sheet must be routed to the OOD or CDO for permission to work either over the side (OPNAV 5100/24 Working Over the Side Check Sheet) or aloft (OPNAV 5100/23 Working Aloft Check Sheet).

b. When exposed to falls of 5 feet or more to a lower level, or, where there is a possibility of a fall from any height onto dangerous equipment, or onto an impalement hazard wear appropriate fall protection equipment per chapter B13.

c. When performing hot work, replace personal safety and staging boatswain (bosun) chair fiber lines with wire rope. Personal safety lines must be corrosion resistant steel wire rope.

d. Attach safety lanyards to all tools, if practicable. Never carry tools up and down ladders. Rig a line and raise or lower tools in a bucket.

e. Stop work when the ship begins to roll in excess of 10 degrees, or the ship begins to pitch in excess of 5 degrees, or wind speed is greater than 30 knots, or in an ice storm or when lightning threatens.

f. Ensure appropriate signal flags are hoisted. (Kilo for personnel working aloft; Kilo One is for personnel working over the side; Kilo Three is for personnel working aloft and over the side.)

g. When underway or when working near stacks or exhausts that are actively discharging gases, the commanding officer's permission is required to work aloft or over the side.

h. An experienced senior person must check the rigging of the bosun chair or staging prior to use. Never rig lines over sharp edges. Inspect lines for damage, rot, and wear.

i. The petty officer in charge must mark off an area and keep unnecessary personnel clear. He or she must also maintain a sharp lookout for anything that would cause an increase in ship's motion or drastic change in direction. Personnel must not work over the side during maneuvers with other ships because of the unpredictable nature of these evolutions.

j. Read and comply with any safety placards (e.g., radio-frequency radiation warning signs) posted in the area prior to commencing work.

k. Cranes used to suspend personnel over the side must be certified, per reference (a), and work platforms or man baskets must be approved by COMNAVSEASYSCOM as safe for manned handling. Comply with the caution plates attached to the inside and outside of the man basket gate. Personnel suspended over the side by a crane are subject to radiation burn hazards from voltage induced in the hoist wire from transmitting antenna and precautions must be taken.

3. Procedures for Working Over the Side. Complete OPNAV 5100/24 prior to commencing work over the side.

a. Personnel working over or near water, where the danger of drowning exists, must wear a NAVSEASYSCOM-approved IBLP.

b. Where water directly abuts the ship and the distance from walking and working surface to the water is 25 feet or more, fall protection is required; IBLPs are not required.

c. Where the distance from the walking or working surface to the water surface is less than 25 feet and the water depth is less than 10 feet, or hazards (machinery, barges, camels, or other structures fastened to and directly abutting ship) are present, fall protection is required. IBLPs are not required.

d. When using both IBLP and fall protection, the harness must be worn under the IBLP.

4. Procedures for Personnel Working Aloft. Complete OPNAV 5100/23 prior to commencing work aloft.

a. Do not go aloft on masts, macks, stacks, or kingposts or be suspended over the side by a crane without first obtaining written permission from the OOD in the form of a working aloft checklist as described in paragraph 2.

b. Wear respiratory protection designated by the RPPM when working near stacks or exhausts that are actively discharging gases.

c. Wear appropriate fall protection equipment per chapter B13, if a fall hazard exists

d. Prior to commencement of work, and every 15 minutes thereafter, pass a verbal warning over the one multi-channel: "Do not rotate antennas, energize, or radiate any electrical or electronic equipment while personnel are working aloft." If personnel aloft are in the vicinity of the stacks add: "Do not blow tubes or lift safety valves while personnel are working aloft."

e. Inform ships in the vicinity that personnel will be working aloft to ensure they take appropriate action on operation of electrical or electronic equipment.

f. Departments concerned must ensure that all radio transmitters and radars that pose RADHAZs are placed in the "STANDBY" position and a sign placed on the equipment that reads:

"SECURED. PERSONNEL ALOFT. DATE_____ TIME_____ INITIALS_____."

g. Position a safety observer on deck near the work being performed. Outfit the safety observer with appropriate fall protection and rescue equipment per chapter B13 to permit rapid emergency assistance, if required. The safety observer must keep the deck area beneath the work aloft free of unnecessary personnel.

5. Dry Dock Safety Precautions

a. Personnel working at heights while in dry dock must comply with the precautions indicated in this chapter. Personnel working at heights in dry dock will normally be in a man basket with full body safety harness and safety lanyard worn. On temporary elevated work areas (e.g., staging, scaffolding, etc.) with properly constructed guard rails, a safety harness is not required.

b. Ensure all temporary elevated work areas (e.g., staging, scaffolding, etc.) are properly constructed and supported per chapter B13.

c. Only enter the dock with a hard hat that meets ANSI/International Safety Equipment Association (ISEA) Z89 standards, steel-toed safety shoes that meets ANSI/ISEA Z41 standards, and eye protection that meets ANSI/ISEA Z87 standards. PPE that meets ANSI/ISEA standards will be labeled, stamped, or embossed with the standard.

d. Shift no weights within the ship while in dry dock without the permission of the docking officer.

e. Ensure the ship is adequately grounded at all times.

f. Drain all lines subject to freezing, in freezing weather. If frequent service is required, maintain a small flow through the line to prevent freezing.

g. Ensure adequate topside lighting is provided by either installed dock lights or by temporary lighting, particularly in areas where normal passage is obstructed or disrupted by service lines or work in progress.

h. Ensure that any equipment that projects through the hull is only operated with the permission of the commanding officer and then with a safety observer outside the hull.

i. Do not throw anything over the side into the dock, including debris from cleaning or preservation.

j. When carrying fuel of any kind in dry dock, do not allow fuel to drain into the dock. Should it be necessary to remove fuel from tanks or receptacles while in dry dock, take precautions that will prevent any of the fuel from reaching the floor of the dock.

k. Gangways

(1) Provide one gangway located at the ship's quarterdeck.

(2) Per reference (b), provide one additional gangway for ships less than 600 feet in length. Provide two additional gangways for ships 600 feet or over in length. The additional gangways are required to provide a separate means of egress; therefore, additional gangways are not allowed to be placed in the same fire zone as the quarterdeck gangway without concurrence from the cognizant shore safety office and fire department. Gangways and landing platforms must be a minimum of 3 feet in width and be designed and constructed to support a minimum load of 75 pounds per square foot. The entire length of gangways and adjacent areas must be illuminated with weather-tight lights, and shielded to prevent temporary blinding of personnel. Safety nets must be installed under gangways and platforms that are not fitted with both side rails having a vertical height of 42 inches nominal and metallic meshing or similar material with small openings (approximately 2-1/2 inch) between the top of the rail and the gangway platform deck. Safety nets, when used, must extend 6 feet beyond each side of gangways and platforms. Gangways must be maintained free of debris, ice, snow, and foreign matter.

(3) Do not permit horseplay, leaning on lifelines, or other negligent practices leading to falling over the side.

6. Operating Aerial Work Platforms

a. Aerial work platforms include aerial lift equipment (i.e., vehicle-mounted rotating and elevating aerial devices, or boom-supported elevating work platforms), scissor lifts, and mobile scaffolds.

b. Before an aerial work platform operation begins, the operator must:

(1) be qualified and licensed according to local instructions;

(2) read and understand the operating instructions and safety rules for the equipment being used;

(3) understand all decals, warnings, and instructions displayed on the work platform;

(4) send the OOD and commanding officer the OPNAV 5100/23 and the OPNAV 5100/24 to request permission to work either over the side or aloft;

(5) inspect the equipment for defects that would affect its safe operation, and be alert for cracked welds or other structural defects, leaks in the hydraulics, damaged control cables, loose wires, and bad tires; and

(6) test the operating controls to make sure they work; and check the operating condition of the brakes, lights and other automotive-operating accessories, such as the horn and warning devices. Test all limit switches.

c. Equipment operators must observe these rules when working on, around, or over water.

(1) Wear a NAVSEASYSCOM-approved IBLP over the full-body safety harness. Attach the safety lanyard to a staple or pad-eye designated for fall arrest inside the man basket. Do not attach safety harnesses or lanyards to the aerial work platform railing. Do not attach lanyards while over water.

(2) Ensure a paint punt is in the water near the aerial work platform operations (for rescue purposes).

(3) When using an aerial work platform on a barge, secure it to the barge with wire or tie-down so that it cannot move.

(4) Do not alter or disable safety devices or interlocks.

(5) Make sure a supervisor watches aerial work platform operations from the pier.

(6) When personnel are working on a ship's sides, the supervisor must ensure the deck above the aerial work platform is free from hazards, especially falling objects.

(7) Wear hard hats with chin straps.

d. Before each elevation, the aerial work platform operator must:

(1) check for overhead obstructions and high-voltage conductors;

(2) elevate the work platform on only a firm, level surface;

(3) make sure the load and its distribution on the platform follows the manufacturer's rated capacity, and never exceed the manufacturer's rated workload;

(4) use the outriggers or stabilizers, if required, following the manufacturer's instruction;

(5) make sure guardrails on the platform are installed correctly and the gates or openings are closed; and

(6) check all occupants' safety harnesses and lanyards, making sure they are attached properly to a staple or pad eye inside the man basket; do not attach lanyards to objects outside the basket.

e. Before and while driving with the aerial work platform elevated, the operator must:

(1) look in the direction of, and keep a clear view of the path of travel, and make sure the path is firm and level;

(2) maintain a safe distance from obstacles (ahead, behind, below, and above), debris, drop-offs, holes, depressions, ramps, and other hazards; and

(3) set the brakes and chock the wheels once stopped.

f. While using the aerial work platform, the operator must not:

(1) use ladders or makeshift devices on the platform to obtain greater height; such practices are prohibited;

(2) climb up or down extendible arms;

(3) sit on or climb on the edge of the basket;

(4) delay reporting any defects or malfunctions to the supervisor; and

(5) engage in stunt driving or horseplay.

7. Procedures for Working in Vertical Trunks. Complete OPNAV 5100/25 Working in Vertical Trunk Check Sheet, prior to commencing work in an elevator, dumbwaiter, or conveyor trunk.

a. Personnel working in vertical trunks must comply with the precautions indicated in this chapter with the exception that life preservers are not required. On scaffolding with guardrails a safety harness is not required.

b. Ensure all staging is correctly constructed and supported chapter B13.

c. When replacing access trunk safety nets and staging has not been installed, work from below the net.

d. Where elevator or dumbwaiter guardrails are not installed or available, safety lanyards must be attached to the platform tie down fitting farthest away from the side of the trunk where work is being performed.

e. Per reference (c), personnel are prohibited from riding on the platform of cargo and weapons elevators in motion unless permission is obtained from the commanding officer, or his or her designee. If movement of an elevator platform cannot be avoided during maintenance, the precautions in the following subparagraphs 7e(1) through 7e(4) must be taken.

(1) Establish effective communication between all personnel before any platform movement.

(2) The preferred method of moving the platform is with the hoist motor de-energized and tagged out, manually releasing the brake.

(3) If releasing the brake will not allow proper positioning of the platform, jogging the platform in only the down direction is the next preferred alternative.

(4) If jogging down will not permit proper positioning of the platform, only as a last resort, the platform may be jogged in the up direction. This movement puts personnel at the greatest risk and should be avoided if at all possible.

SECTION C

CHAPTER 9

ELECTRICAL SAFETY, ELECTRONIC SAFETY, AND TAG-OUT PRECAUTIONS

Ref: (a) NSTM 300, Rev 9, Electrical Plant – General
(b) NAVSEA S0400-AD-URM-010, Tag-Out Users' Manual (TUM)
(c) NAVSEA S9310-AQ-SAF-010, Technical Manual for Batteries, Navy Lithium Battery Safety Program Responsibilities and Procedures
(d) OPNAVINST 5090.1D, Environmental Readiness Program
(e) NSTM 555, Volume 1, Surface Ship Firefighting
(f) NAVSEA SE 000-00-EIM-100, Electronics Installation and Maintenance Book (EIMB), General Handbook
(g) NSTM 634, Deck Coverings

1. Discussion

a. Practically every piece of equipment on board ship requires electrical power. Radars, communication equipment, as well as lighting, portable tools, and personal equipment all use power from the ship.

b. The fact that electrical equipment and tools are so commonplace means that hazards involved with electricity are often taken for granted. This occurs despite the fact that the hazards of electrical shock are commonplace ashore where the extra shipboard hazards of high-powered equipment, unstable work spaces, and saltwater are usually non-existent. Compared to other environments, the potential for electrical shock aboard ship is far greater. Because ships' electrical and electronic systems are ungrounded, personnel and equipment may easily become a path to ground in cases of faulty wiring, resulting in injury, death or damage to equipment.

c. Reference (a) is the primary technical reference for shipboard electrical safety.

2. Definitions

a. "Electrical equipment" includes generators, electrically powered machinery and mechanisms, power cables, controllers, transformers, and associated equipment.

b. "Electronic equipment" includes radars, sonars, radios, power amplifiers, antennas, electronic warfare equipment, computers, and associated controls and peripherals.

3. Electrical Precautions

a. Portable electrical equipment is any device that is hand-held, may be plugged into the ship's electrical power, and is generally used in a variety of different locations throughout the ship (drills, grinders, vacuums, etc.). All personnel using portable electrical tools will:

(1) wear electrical safety gloves when using electric portable tools in hazardous conditions, such as wet decks or bilge areas;

(2) wear leather gloves over electrical safety gloves when the work being done could damage the rubber gloves;

(3) conduct the required PMS on electrical safety gloves before issue and use, inspect electrical safety gloves prior to storage and store them so they are protected from damage, and not use electrical safety gloves for cleaning, painting, or any purpose other than electrical work;

(4) wear required eye protection when working where particles may strike the eyes;

(5) wear hearing protection (earplugs or circumaural muffs or both) when working with noise hazardous tools or in the area where such work is being conducted;

(6) not use spliced cables on tool cords or extension cords;

(7) not use any portable equipment that has a frayed cord or broken or damaged plug;

(8) make sure that the on and off switch is in the "off" position prior to inserting or removing the plug from the energized receptacle;

(9) always connect the cord of portable electrical equipment into the extension cord before the extension cord is inserted into an energized receptacle;

(10) always unplug the extension cord from an energized receptacle before the cord of the portable electrical equipment is unplugged from the extension cord;

(11) arrange the cords so that they will not create a trip hazard;

(12) never pick up the tool by the electrical cord;

(13) when drilling or cutting through bulkheads, check the opposite side for cables and pipes;

(14) only use electric equipment in explosive atmospheres including gasoline hazard areas if the equipment is approved for such use (explosion proof or intrinsically safe);

(15) not allow cords to run through hatches, chemicals, scuttles, or watertight doors or over sharp objects or hot surfaces;

(16) not join more than two 25-foot extension cords together;

(17) protect the cord to guard against accidental closing of the door or hatch when it is necessary to run electrical leads through doors or hatches, and install chafing gear;

(18) return portable electrical power tools, drop cords, and extension cords to the proper location at the end of the operation or workday to prevent damage to the equipment unless permission is granted to retain overnight;

(19) visually inspect portable cables for any signs of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles, and cables must be of the proper length and cross-sectional area; and

(20) only use COMNAVSEASYSCOM-authorized extension or trouble lights for shipboard use to eliminate or drastically reduce the many hazards associated with the use of unauthorized commercial grade lights. These lights are intended for temporary use and should not be mounted in any manner. The approved lights most frequently used aboard ships are:

(a) a caged, 100-watt incandescent bulb equipped with 50-foot, three conductor cable for use as a general multi-purpose extension light, NSN 9G 6230-00-701-2947; and

(b) a small 4-watt fluorescent tube for servicing electronic equipment. This light is of all plastic construction with no outside conductive surfaces. It is intended for use in open electronic equipment areas only. It is not explosion-proof and is not acceptable for use in hazardous atmospheres.

b. Do not touch a conductor until it is properly tagged out of service and tested, to be sure it is de-energized or discharged.

c. Obey all warning signs; read equipment warning labels before use.

d. Never work on live (energized) electrical equipment unless in strict adherence with reference (a).

e. Always de-energize and "tag-out" installed electrical equipment before starting any maintenance or repair unless directed by higher authority (Engineering Operational Sequencing System (EOSS), PMS, technical manuals, etc.). Test for energized circuits prior to performing work per reference (a).

f. Do not energize any electrical equipment that is tagged-out. Clear the tag first following reference (b). If a caution tag is installed, ensure compliance with amplifying instructions prior to energizing equipment.

g. Only use authorized equipment to perform maintenance on electrical equipment. Ground all metal-cased electrical equipment, except power tools verified to be double-insulated on the label and by electrical safety check.

h. Close all fuse boxes, junction boxes, switch boxes, and wiring accessories.

i. Use the one-hand rule when turning on electrical equipment. Never operate a switch with the other hand on a metal surface, which would provide a path to ground through the body.

j. Never use outlets that appear to be burnt or damaged. Do not use equipment with worn or damaged cords, or crushed or damaged plugs. They are not to be patched with electrical tape. Turn in such items immediately to electrical tool issue, informing them of the problem.

k. Ensure that "dead-man" switches work properly when installed.

l. Use an authorized voltage indicator to test whether equipment or circuits are energized.

m. Never remove overload relays except for corrective or preventive maintenance.

n. Follow all safety precautions in reference (a) when working on energized circuits or equipment.

o. Never remove overload relays except for corrective or preventive maintenance.

p. Visually inspect portable cables, such as shore power "pigtails," for any sign of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles. Cables must be of the proper length and cross-sectional area. Do not use spliced portable cables except in emergency conditions, as outlined in reference (a).

q. Only install fuses of the rating specified on a fuse box or panel. Do not over-fuse.

r. Do not use aluminum or metal portable ladders when working on electrical equipment.

s. Use only Navy-approved power strips for computer equipment, printers, and peripherals per reference (a). Never use power strips in series (connected one to another and “daisy-chained”).

t. Wear skin and eye protection when changing out battle lantern batteries.

4. Wet Cell Batteries

a. The charging of wet cell batteries will produce hydrogen gas that may be ignited causing fire and explosion. Verify that wet cell battery compartments, which have been sealed, are first opened and well ventilated before entering, turning on any lights, making or breaking any electrical connections, or doing any work in the compartment. Verify that the ventilating apparatus of a wet cell battery compartment is running properly before starting to charge wet cell batteries, and that the exhaust ventilation interlock with the charger is operable. Keep the wet cell battery storage area or compartment well-ventilated during charging. Ensure that battery charging circuit ventilation fans are interlocked so that if power is lost to the fans, the battery charger turns off.

b. While wet cell battery charging is in progress, post a warning placard at the access to the wet cell battery storage area or compartment that reads:

CAUTION

WET CELL BATTERY CHARGING IN PROGRESS

c. Prohibit smoking in the charging area.

d. Prevent open flames, sparks, or electric arcs in wet cell battery charging areas.

e. Keep uninsulated tools and other metallic objects away from the top of uncovered wet cell batteries. When using tools around a wet cell battery, do not allow tools to bridge the wet cell battery terminals or short circuit any part of the wet cell battery. Only tools with insulated handles will be used on the wet cell battery.

f. During normal use, keep cell service openings closed except when they must be opened to take readings or add water. When charging wet cell batteries, completely unscrew the wet cell battery cap, but leave the cap in place on top of the service opening. This will allow hydrogen gas, which is formed during the charging process, to escape but will minimize the release of acid or alkaline mist into the shop atmosphere. Note: This is not applicable to maintenance-free, sealed batteries.

g. Keep cell tops clean.

h. Never stow loose gear in the wet cell battery compartment. Gear such as cleaning rags, hydrometer boxes, pieces of wire, and tools must be removed immediately after use.

i. Charge a wet cell battery only at the rate stated on its nameplate. Never charge a wet cell battery at a higher finishing rate than that stated on its nameplate.

j. When charging several wet cell batteries at once, ensure the voltage of the charging line exceeds the total voltage of all the wet cell batteries being charged, but that the charging rate in amperes does not exceed the maximum charging rate of the wet cell battery in the line having the lowest ampere-hour capacity.

k. Do not operate wet cell batteries above 52 degrees Celsius (126 degree Fahrenheit). When charging wet cell batteries, lower the charging rate immediately if wet cell battery reaches 52 degrees Celsius (126 degrees Fahrenheit) or emits gas.

l. When charging wet cell batteries, keep compartment temperature below 36 degrees Celsius (97 degrees Fahrenheit), if possible.

m. While current is flowing in the charging line, do not attempt to repair the connections of any wet cell battery or connect or disconnect wet cell batteries from the line. Turn current off before attempting any of these procedures.

n. For lead acid batteries (not applicable to maintenance-free or sealed batteries):

(1) Do not add acid of specific gravity greater than 1.350 to a wet cell battery.

(2) Water added to a wet cell battery must be pure distilled water. Never add salt water to a wet cell battery or use salt water to wash out wet cell battery components. Salt water added to a wet cell battery will evolve extremely toxic chlorine gas.

(3) Do not pour water into concentrated sulfuric acid. The heat generated will cause a violent reaction. Sulfuric acid is highly corrosive. Wash up spillage with water and sodium bicarbonate. When handling acid or electrolyte, always wear PPE consisting of a rubber apron, rubber boots, rubber gloves, chemical splash goggles, and a face shield. Store and dispose of battery acid following local hazardous material (HAZMAT) procedures.

o. Do not connect or disconnect batteries in compartments that may contain gasoline vapors. In any use of wet cell batteries, verify that all connections are tight to prevent loose connections that may cause sparks.

p. When wet cell batteries are used with one terminal grounded, always disconnect the grounded terminal first when replacing wet cell battery.

5. Lithium and Mercury Batteries

a. Lithium batteries will not be used aboard ship without specific approval of COMNAVSEASYSCOM, and following reference (c).

b. Primary batteries, especially mercury and lithium batteries, must never be punctured, incinerated or recharged.

c. Dispose of mercury and lithium batteries per reference (d) and local HAZMAT disposal procedures.

d. Turn the battery switch off when battery-driven equipment is not in use or battery charge becomes insufficient to operate equipment. Remove batteries from any equipment that is to be stored or shipped. Cover removed battery terminals with insulating material to prevent short circuits. In the case of equipment powered by dry batteries, remove batteries if equipment is to remain idle for 2 weeks or more. These batteries should be scrapped or stored.

e. Store batteries in an adequately ventilated and cool fireproof area.

f. Ensure alkaline batteries and equipment are segregated from lead acid batteries and equipment.

g. The B section of the Navy type 19026 battery can deliver an extremely serious or fatal shock. Avoid contacting the terminals of this high voltage battery.

6. Electrical Fires

a. For electrical firefighting procedures, see reference (e).

b. Battery fires

(1) A battery fire is nearly always preceded by an explosion. Great care is required fighting such a fire to avoid creating another explosion.

(2) The safest and most effective method for fighting a battery compartment fire is through oxygen starvation. Secure the compartment and stop all ventilation within, including agitation air, to deprive flames of oxygen.

WARNING

Never attempt to extinguish a battery fire by pouring water on the battery. The hydrogen and oxygen generated by electrolysis could produce a violent explosion.

c. Electrical fire prevention

(1) Keep electric motors and generators clean.

(2) Ensure proper maintenance is performed on electrical equipment (e.g., motors, generators, bearings, and filters).

(3) Report overheating or arcing electrical equipment.

(4) Keep air filters clean.

(5) Do not overfuse.

7. First Aid for Electrical Shock

a. Fundamentally, electrical current rather than voltage is the criterion of shock intensity. The passage of even a very small current through a vital part of the human body can cause death. The voltage necessary to produce the fatal current is dependent upon the resistance of the body, contact conditions, the path through the body, etc.

b. It is imperative to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from 115 volts or even lower voltage; fatalities from as low as 30 volts have been recorded. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms and possibly as low as 100 ohms from temple to temple if the skin is broken.

(1) Electrical Shock Symptoms. In the event of severe electrical shock, the victim could become very pale or "bluish." His or her pulse is extremely weak or entirely absent, unconsciousness, and burns are usually present. The victim's body may become rigid or stiff within a few minutes. This condition can be caused by muscular reaction to shock, and it should not be considered as rigor mortis. Therefore, artificial respiration must be administered immediately, regardless of body stiffness, as recovery from such a state has been reported. Consequently, the appearance of rigor mortis will not be accepted as a positive sign of death.

(2) Victim Rescue. The rescue of electrical shock victims is dependent upon prompt administration of first aid.

CAUTION

Do not attempt to administer first aid or come in physical contact with an electrical shock victim before the power is shut off, or, if the power cannot be shut off immediately, before the victim has been removed from the live conductor.

(3) First Aid. When attempting to administer first aid to an electrical shock victim, first proceed as per subparagraphs 7b(3)(a) and 7b(3)(b), then proceed to subparagraphs 7b(3)(c) and 7b(3)(d).

(a) Shut off the power.

(b) If the power cannot be deactivated, per step (a), remove the victim immediately, observing the following precautions.

1. Protect oneself with dry insulating material.

2. Use a dry board, belt, dry clothing, or other available non-conductive material to free the victim (by pulling, pushing, or rolling) from the power-carrying object. Do not touch the victim.

(c) Immediately after removal of the victim from the power-carrying object call for emergency medical assistance team and automated external defibrillator and administer CPR.

(d) When providing first aid measures, take into account any possible spinal injuries or fractures.

8. Electronic Precautions

a. Definitions

(1) Repair. The removal or replacement, by any method, of any component, subassembly, module, circuit card, or conductor to bring malfunctioning equipment back to an operational status.

(2) Corrective Maintenance. The alignment, adjustment, tuning, or trouble shooting of malfunctioning equipment per published maintenance or technical manual procedure.

(3) Preventive Maintenance. The alignment, adjustment, tuning, or testing of operational equipment to ensure performance within published MRC or technical manual procedures.

b. Repair of electronic equipment is normally accomplished with the circuit de-energized. Every effort should be made to avoid making repairs to energized equipment. Do not repair energized electronic equipment unless using approved procedures from technical manuals or the commanding officer has granted permission to perform such repair. In such an emergency, trained personnel must accomplish the repair of energized circuits and an experienced technician or officer must supervise. Electronic repair personnel should observe the safety precautions in references (a) and (f).

c. Corrective maintenance on energized electronic equipment is authorized when done according to published maintenance or technical manual procedures. Freelance corrective maintenance (e.g., without a published procedure) on energized electronic equipment must be

performed only with the specific permission of the commanding officer. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

d. Preventive maintenance on energized electronic equipment is authorized when it follows a published MRC or technical manual procedures. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

e. Perform preventive or corrective maintenance on energized electronic equipment only when authorized by higher authority and trained on that type of equipment. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

f. Whenever work on energized electronic equipment exposes the technician to 30 volts or greater, adhere to the precautions in the following subparagraphs 8f(1) through 8f (11).

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Research into or enter energized electronic equipment enclosure for the purpose of servicing or adjusting only when prescribed by applicable technical manuals, MRC, or other approved documentation.

(3) Obtain the commanding officer's permission whenever work on energized electronic equipment deviates from published corrective or preventive maintenance procedures.

(4) Station a safety observer capable of securing power and rendering adequate aid in the event of an emergency.

(5) Provide warning signs and suitable guards to prevent personnel from coming in accidental contact with dangerous voltage.

(6) Obey all warning signs and heed all equipment warning labels.

(7) Insulate the work from ground with approved electrical grade rubber matting. Installation requirements for electrical grade matting are contained in reference (g).

(8) Remove or snugly secure any loose clothing. Remove all jewelry.

(9) Insulate all metal tools.

(10) Use only one hand, if practical, in accomplishing the work.

(11) Wear electrical safety gloves on both hands, if possible. If the nature of the work is too cumbersome to wear gloves on both hands, then a glove must be worn on the non-working hand.

g. Reaching into de-energized equipment also requires special care and precaution.

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Ensure familiarity with all circuits that must be de-energized and all voltage storing and high voltage components.

(3) Discharge all voltage storing components with an approved shorting probe and applicable PPE.

(4) Do not touch a conductor or electronic component unless it has been proven to be de-energized by using a known good voltage tester.

h. Removal of a unit or part from the normal location within an assembly and the energizing of the unit or part, while it is outside the normal enclosure, removes the protective features such as interlocks, grounded, and enclosures. These safety features may then no longer function as designed. Ground the chassis and frame of all units removed for servicing and ground all circuits normally grounded in operation whenever power is applied to the unit.

i. Do not energize any equipment that is tagged-out. Clear the tag-out first. If a caution tag is installed, ensure compliance with the amplifying instructions prior to energizing equipment.

j. Never defeat an interlock or built-in safety device. Modify such safeguard circuits only as authorized by the cognizant system command.

k. Refer to references (a) and (f) for additional precautions regarding electric systems.

9. Electrically and Electronically Safe Work Benches. Electrical and electronic work benches must be constructed and maintained per appendix H of reference (a).

10. Tag-Out. Tagging-out of electrical or electronic energy sources must be conducted per reference (b).

SECTION C

CHAPTER 10

SHIPBOARD FUELS

Ref: (a) NSTM 541, Ship Fuel and Fuel Systems
(b) NSTM 542, Gasoline and JP-5 Fuel Systems
(c) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion

a. Fuels are used to power the ship, emergency auxiliary equipment, aircraft, vehicles, small boats, and a multitude of smaller pieces of machinery. There are several types of fuels in use, each with its own characteristics and traits. It is impossible to cover all the scenarios that can occur with shipboard fuels; however, this chapter will cover the main points. See references (a) and (b) for additional information concerning fuels.

b. The biggest hazard with shipboard fuels is explosion and fire. Fuels can cause asphyxiation, body burns, eye and respiratory difficulties, and environmental contamination. Due to the incredible impact a shipboard explosion and fire would have, the possibility that a catastrophe could occur should constantly be in the minds of all personnel, especially those involved in fuel storage and transfer operations.

c. Complete an ORM review before refueling operations and mitigate risks, as feasible. Reference (c) contains additional guidance on ORM.

2. Definitions

a. Hazardous areas are locations where hazardous vapors (whether physical or health hazard) could accumulate.

b. Gasoline hazard areas are those areas where gasoline vapors may be present in quantities sufficient to produce explosive or ignitable mixtures. This includes gasoline stowage, handling, and transfer areas, gasoline pump rooms, spaces connected to gasoline hazard area by common ventilation, and up to 15 feet away horizontally from an open gasoline hazard area.

c. Class I flammable liquids are fuels and other liquids with a flashpoint of 100 degrees Fahrenheit (38 degrees Celsius). Class I flammable liquids in contact with air will release flammable vapors under most typical shipboard conditions.

3. General Precautions

a. Never smoke in fuel storage or transfer areas, during maintenance, fueling, or venting operations.

b. Prohibit any open flames, hot work, or the use of non-explosion-proof fixtures or equipment near fuel storage or transfer areas. Fluorescent fixtures are permitted in areas in which JP-5 or F-76 fuel is handled.

c. When working in motor gasoline tanks, the following are prohibited: shoes with steel clips, metal key chains, metal belt buckles, pagers, cell phones, buttons made out of spark producing material, or clothes made of static generating material such as wool, silk, nylon, or Nomex®.

d. Always ventilate fuel tanks (see chapter A4, subparagraph 3b(2) note) and obtain gas free engineer's certification before entering. Ship's gas free engineer may certify only for ship's force entry.

e. Never enter a tank to aid an unconscious crewmember without proper emergency breathing apparatus, such as an SCBA, and a back-up person standing by. The back-up person must also be equipped with the proper emergency breathing apparatus.

f. Detect leaks and make immediate repairs in all fuel systems. Report and clean up pools of leaked or spilled fuel immediately using appropriate HAZMAT or oil spill cleanup equipment and procedures. Dispose of fuel contaminated rags and materials as directed by the HAZMAT coordinator.

g. Inspect tanks, piping, cargo hoses, pumps, and communication equipment before transferring fuel. Ensure a drip pan is under all transfer hose connections and that gaskets are in place in hose joints and couplings.

h. Store oily wastes and rags in an approved container and empty it daily following local HAZMAT procedures.

i. Do not discharge fuel or oily wastes over the side. Do not allow spilled fuel or oily wastes to go over the side. Use rags or absorbent materials to stop fuel from running over the side and report the spill immediately to the supervisor.

j. Avoid physical contact with fuel(s). Remove fuel soaked clothing and thoroughly wash exposed skin after incidental contact. Personnel who suspect that they have ingested or inhaled fuel, or are having a skin reaction to fuel contact, should immediately seek medical attention.

k. Wear eye protection and use respiratory protection if required by the RPPM.

l. When in canisters or drums, flammable fuels must be placed on the weather deck if no flammable storeroom is provided. Gasoline storage must be in remotely jettisonable racks on the weather decks. Do not store near heat sources or near ventilation intakes.

m. Close hatches, doors, and ports in vicinity of tank vents while transferring fuel.

n. During refueling, close and secure all portholes on the engaged side of the ship. Place oil or fuel absorbent materials at deck edge openings and scuppers to prevent spills from running over the side.

o. Ensure exhaust ventilation and gas detection systems are operational in enclosed spaces used for storage, use or handling of low flashpoint liquids prior to entering. Any work in these spaces must include a dedicated fire watch equipped with a charged potassium bicarbonate dry powder portable fire extinguisher or equivalent.

p. Ignition sources are prohibited in hazardous areas containing class I flammable liquids and flammable gases. This includes smoking, open flames, spark producing tools, hot work, electrostatic discharges, and non-approved (i.e., explosion-proof or intrinsically safe) electrical equipment and components.

SECTION C

CHAPTER 11

WELDING, CUTTING, BRAZING, AND HOT WORK

Ref: (a) NSTM 074 (Volume 1), S09086-CH-STM-010, Welding and Allied Processes
(b) NAVSEA OP-4, Ammunition and Explosives Safety Afloat
(c) NSTM 555 (Volume 1), S9086-S3-STM-010/CH-555, Surface Ship Firefighting
(d) OPNAVINST 8020.14A, Department of the Navy Explosive Safety Management Policy

1. Discussion

a. The convenience of metal arc and gas welding and cutting lies largely in the fact that the equipment can be taken to the job. This convenience leads to the performance of construction or repair jobs in locations that have not been designed for such concentrated heat, or mixtures of toxic or explosive gases. The failure to take proper precautions, during welding or cutting operations in such spaces, presents a serious fire, explosion, electric shock, and health hazard.

b. Health hazards common to welding, cutting, and brazing are numerous. In addition to electric shock, burns to the eyes and skin can be caused by sparks, molten metal, and ultraviolet and infrared radiation. Fumes and gases generated by welding can produce ozone and oxides of nitrogen which are poisonous. Lead, zinc, chromium, and cadmium in alloys (strips or wire in coils or rods) produce toxic fumes. Paints and coatings may produce toxic gases when heated by the flames of the welding torch. Additionally, some metal fumes are capable of producing metal-fume fever. Local exhaust ventilation is a must to remove excessive concentrations of air contaminants. Welding in closed, unventilated spaces can result in respiratory irritation or poisoning of personnel. Follow chapter A4, subparagraph 3b note, when using portable exhaust ventilation inside the ship.

c. Hot work includes:

(1) flame heating, welding, torch cutting, brazing, or carbon arc gouging; and

(2) any operation which produces temperatures of 400 degrees Fahrenheit or higher.

Note: Operations not producing hot sparks or flames such as spark-producing or arc producing tools or equipment, static discharge, friction, open flames or embers, impact, and non-explosion-proof equipment such as lights, fixtures, or motors are not considered hot work unless occurring in the presence of flammable liquids or in a flammable atmosphere.

d. Hot work is divided into two classes where only class alpha materials, such as ordinary combustibles (wood, cloth, paper, rubber, and many plastics) are exposed. These classes are as per the following subparagraphs 1d(1) and 1d(2).

(1) Class I. These processes produce either high energy sparks or slag that can be thrown or dropped at the work site or produce heat that can be transferred through the deck, overhead, bulkhead, or structure to a location not visible to the hot work operator. This class includes:

(a) flame cutting,

(b) welding,

(c) plasma cutting,

(d) arcing and gouging,

(e) electric arc welding,

(f) thermal spraying, and

(g) other hot spark or flame producing process not included in class II.

(2) Class II. These processes produce flames or minimal energy sparks or slag that is generally localized to the immediate work area. This class includes:

(a) stud welding with an electric stud gun,

(b) gas-tungsten-arc welding,

(c) torch brazing, and

(d) ferrous metal grinding with abrasive disks.

2. General Precautions

a. Clothing and Protective Equipment

(1) Use the appropriately shaded welder's goggles, welding face shield, or welder's helmet as required by reference (a) and the IH survey. A respirator may be required if indicated by the RPPM.

(2) Remove lighters from pockets during hot work.

(3) Do not wear synthetic-fiber clothing.

(4) Do not roll up sleeves, cuffs, or have open pockets.

(5) Always wear a welder's jacket or sleeves, apron or leggings, and flameproof boots while welding. Helmets and face shields must be fitted with the proper filter and cover lenses.

(6) Always wear electrical safety gloves with leather outer gloves when removing or replacing electrodes, or handling energized holders, layout tables, or equipment. The gloves must be dry and in good condition.

(7) Consult with the RPPM for specific guidance regarding respirator needs or selection. Cartridge respirators, when properly selected, will protect against metal fumes generated during welding. They do not provide oxygen, which may be necessary when working in a confined space. Metal inert gas and tungsten inert gas welding generate hazardous gases and require adequate ventilation or the use of a supplied air respirator. Follow chapter A4, subparagraph 3b(2) note, when using portable exhaust ventilation inside the ship.

(8) To protect passers-by from ultraviolet arc flash and combustible materials from sparks, use NAVSEASYSCOM-approved welding curtains or panels, as specified in reference (a).

b. Space Precautions

(1) Observe the precautions in the below subparagraphs 2(1)(a) through 2(1)(k) during the performance of hot work.

(a) Do not perform hot work when flammable liquids or flammable atmospheres are present without specific instructions of the gas free engineer.

(b) Inspect the other side of the bulkhead, deck, overhead, or other structure to ensure that hot work will not damage materials or equipment that may be on the other side of the hot work operation.

(c) Remove explosive materials and flammable liquids or vapors and take suitable precautions against the re-accumulation of such materials. For welding in magazines or adjacent to magazines, refer to reference (b).

(d) Where practicable, relocate all combustibles at least 35 feet from the work site. Where relocation is impracticable, protect combustibles with metal guards or curtains constructed of MIL-C-24576 material. Tighten edges of covers at the deck to prevent sparks from going underneath the covers. This precaution is also important at overlaps where several covers are used to protect a large pile of combustibles.

(e) Protect intricate and vulnerable machinery and equipment from falling sparks or other potential sources of fire with metal guards or curtains constructed of MIL-C-24576 material. Secure the protection in-place before commencing hot work.

(f) For hot work processes that generate slag, weld splatter, or sparks, cover openings in decks, bulkheads, or overheads within 35 feet which can be a path to prevent ignition sources from passing into adjacent compartments, spaces, or decks below. A complete containment system as described in reference (a), section 10 meets this requirement. If openings cannot be covered, post a fire watch on the far side.

(g) Blank off ducts and conveyor systems that might carry sparks to distant combustibles or otherwise suitably protect.

(h) When hot work is done near decks, bulkheads, partitions, or overheads of combustible construction, take precautions to prevent ignition.

(i) Do not undertake hot work on pipes or other metal in contact with insulation or combustible decks, bulkheads, partitions, or overheads if the work is close enough to cause ignition by heat conduction.

(j) Do not start hot work in areas other than those specifically designated for hot work, such as welding shops, without approval of the commanding officer or his or her designated representative. Abrasive disk grinding with a small wheel (typically 3-inch diameter or less) does not require notification or approval.

(k) De-energize electrical equipment exposed to the hot work.

(2) Ensure that a gas free engineer's survey has been completed before working in tanks, voids, or other confined spaces, including adjacent spaces (especially if those tanks contained flammable liquids or vapors) if these spaces are identified as a confined space per reference (a).

(3) Notify the DCA or fire marshal before starting hot work.

(4) Conduct hot work in or on fuel tanks, in spaces in which fuel tank vents terminate, or in other confined spaces known to contain flammable fuel, only with the commanding officer's approval.

(5) Set fire watches as per the following subparagraphs 2b(5)(a) through 2b(5)(i).

(a) In confined or enclosed spaces, machinery rooms, catapult rooms, bilges, and other locations proximate to flammable atmospheres (e.g., near fuel tank vents and sounding tubes), post fire watches at the worksite when hot work is undertaken. After completion of the

hot work operation, fire watches must remain on station for a minimum of 30 minutes, ensure the area is cool to the touch, and no smoldering embers remain.

(b) For class I hot work, post fire watches when hot work is undertaken. The fire watches must stand watch for fire for 30 minutes after hot work is completed, or until hot work area is cool to the touch.

(c) For class II hot work, the DCA, fire marshal, or individual designated in writing by the DCA will determine the need for a fire watch in addition to the hot worker based on his or her assessment of the worksite prior to undertaking hot work. When posted, the fire watch(s) must stand watch for 30 minutes after hot work is completed, or until hot work area is cool to the touch.

Note: Abrasive disk grinding on a ferrous material with a large wheel (larger than 3 inches in diameter) typically throws large sparks long distances. A fire watch is recommended for large wheel grinding when class alpha materials (ordinary combustibles) are exposed. The DCA or fire marshal will determine the need for a fire watch.

(d) When a fire watch is not required for class II hot work, the hot worker must have the appropriate fire extinguishing equipment available. The hot worker may leave the site after hot work is completed and after he or she has conducted a thorough survey of the area to check for smoldering fires. When grinding a ferrous material with a large abrasive disk wheel (larger than 3 inches in diameter), the hot worker must stand watch for 30 minutes after the hot work ends, or until hot work area is cool to the touch.

(e) When any type of hot work is being performed on bulkheads, decks, or overheads where sparks or heat transfer may ignite combustibles on the opposite, accessible side, set a fire watch on the far side.

(f) The hot worker and the hot worker's supervisor are responsible for ensuring fire watches are in place prior to starting work.

(g) Train fire watches per reference (c), section 10.

(h) Equip fire watches with PPE as required for the operation being conducted and anticipated hazards.

(i) When more than one fire watch is required, establish a communication means between fire watches.

(6) Ensure fire extinguishing equipment is available in immediate area. The types of fire extinguishing equipment fire watches must use are specified in reference (c), section 10.

(7) Provide ventilation (see chapter A4, subparagraph 3b(2) note) as specified in reference (a), IH survey, gas free chit, or hot work chit.

(8) Personnel in areas adjacent to welding areas exposed to arc-produced ultraviolet radiation must be protected by providing screens, appropriate eye protection or other approved means.

(9) Never weld near a source of halocarbons, such as chlorinated solvents (e.g., trichloroethane) or refrigerant gases. Phosgene gas can be produced when halocarbons are exposed to high temperatures.

(10) Do not perform hot work during fueling or ammunition transfer operations. Submarine tenders are exempted from this requirement, but must comply with the requirements of reference (d) while performing hot work or ammunition handling.

c. Practices

(1) Never use oxygen to operate pneumatic tools, on oil preheating burners, start internal combustion engines, blow out pipe lines, blow dust from clothing or work areas, create pressure, or for ventilation purposes.

(2) Do not carry oxygen, acetylene, or other fuel gas cylinders into confined spaces. Use leads of an appropriate length to reach the work area while properly securing gas cylinders away from the confined space point of entry.

(3) Always return cylinders to the storage racks when work is completed and ensure cylinders are secured in place by metal retaining collars.

(4) Ground and bond all electrical welding equipment before use.

(5) Stand on a dry surface or insulating material if surface is not completely dry to avoid electric shock.

(6) Never permit the metal part of the electrode or the electrode holder to touch the bare skin or any damp clothing, which the operator may be wearing. Do not loop the welding cable over a shoulder or other parts of the body. Operators have been dragged off staging or scaffolds when the welding cables were fouled by other workmen or moving equipment.

(7) When stopping work for a significant time (lunch or overnight), remove the electrode from the electrode holder, de-energize the equipment and disconnect the welding supply cable from the welding machine.

(8) When using portable machines, ensure the primary supply cables are separately laid out and do not become entangled with welding supply cables.

(9) Inspect work and electrode lead cables regularly for wear and damage. Replace cables with damaged insulation or exposed conductors. Use connecting devices specifically intended for the purpose when joining lengths of supply and electrode cables. Adequately insulate the connecting devices for the proposed service conditions.

(10) Keep welding cables dry and free from grease and oil, wherever practical, to prevent premature breakdown of the insulation which could cause serious short circuits.

(11) Suitably support cables overhead when necessary to run them some distance from the welding machine. If this cannot be done, and cables are laid on deck, protect them in such a manner that they will not be damaged or interfere with safe passage of personnel. Take special care to see that welding supply cables are not close to power supply cables, lighting circuits, or any equipment that utilizes magnetic tapes or depends upon a magnetic principle for operation. Block hatches and doors to prevent damage to welding cables.

(12) Protect welding equipment used in the open from weather conditions (e.g., rain, sleet, snow, spray, etc.) to prevent short circuiting.

(13) Do not smoke cigarettes or use other forms of tobacco while welding or brazing.

d. Cylinder Safety

(1) Store individual cylinders securely fastened in the upright position (valve end up) by metal collars, with each cylinder independently fastened, and ensure that the cylinder valve protection caps are in place.

(2) Store flammable and explosive gases securely on the weather decks protected from direct exposure to the sun or in flammable compressed gas cylinder storerooms.

(3) Never store flammable gases with oxidizing gases. Typical oxidizing gases are oxygen and chlorine. Compressed gases such as helium, CO_2, nitrogen, and argon can be stored with all gases except acetylene, oxidizing or flammable gases. Ensure inert gases are segregated and readily identifiable.

(4) Do not lift cylinders by valve-protection caps. Bars must not be used under valves or valve-protection caps to pry cylinders loose when frozen in place or otherwise fixed. Use warm (not boiling) water to defrost.

(5) Close valves of empty cylinders.

(6) Place cylinders a safe distance away from the actual welding or cutting operation so that sparks, hot slag, or flame will not reach them. Use fire-resistant shields.

(7) Do not place cylinders where they might become part of an electric circuit. Contact with energized equipment must be avoided. Cylinders must be kept away from radiators, piping systems, or layout tables that may be used for grounding electric circuits, such as for arc welding machines. Any practice, such as the tapping of an electrode against a cylinder to strike an arc, is prohibited.

(8) Never use cylinders as rollers or supports, whether full or empty.

(9) Do not change or alter the numbers and markings stamped into cylinders.

(10) Never attempt to mix gases in a cylinder. Unauthorized personnel should never refill a cylinder.

(11) Unless connected to a manifold, do not use oxygen from a cylinder without first attaching an oxygen regulator to the cylinder valve. Before connecting the regulator to the cylinder valve, open the valve slightly for an instant and then close valve. Always stand away and to one side of the outlet when opening the cylinder valve.

(12) Do not use hammers or wrenches to open cylinder valves. If valves cannot be opened by hand, the cylinder should be returned to supply.

(13) Do not tamper with, or attempt to repair, cylinder valves. If trouble is experienced, remove from service, tag as defective, and notify the supplier, indicating the character of the trouble and the cylinder's serial number. Follow supplier's instructions as to its disposition.

(14) Do not remove the stem from a diaphragm-type cylinder valve.

(15) Always place the fuel-gas cylinders with valve end up. Store and ship liquefied gases with the valve end up. Prior to use, store acetylene cylinders in a vertical position for a minimum of 2 hours to stabilize the gas.

(16) Handle cylinders carefully. Rough handling, knocks, or falls are liable to damage the cylinder, valve, or safety devices and cause leakage.

(17) Close the cylinder valve and release the gas from the regulator before the regulator is removed from a cylinder valve.

(18) Do not place anything on top of an acetylene cylinder which may damage the safety device or interfere with the quick closing of the valve.

(19) Never use fuel gas from cylinders through torches or other devices equipped with shutoff valves without reducing the pressure through a regulator attached to the cylinder valve or manifold.

(20) Do not use copper tubing with acetylene gas cylinders due to the potential of an explosive chemical reaction to take place.

3. Extra Precautions for Work in Restricted Access Spaces

a. For the purpose of this paragraph, a restricted space is defined as:

(1) a space with only one exit, and

(2) a space where equipment or structural barriers prevent easy exit or entrance.

b. Ensure proper ventilation (see chapter A4, subparagraph 3b(2) note) is available to permit work in restricted access spaces. When sufficient ventilation cannot be obtained without blocking the means of access, personnel in the confined space must be protected by supplied air respirators. Ensure space has been certified gas free, if the space is unmanned and ventilation is non-existent or the space is used to store HAZMAT.

c. Leave gas cylinders and heavy welding or cutting equipment outside the restricted access space.

d. Station an attendant outside with instructions to observe the welding operator at all times, and in case of emergency, immediately shut off the gas or welding machine and render such help as the occasion warrants.

e. If entering a restricted access space through a manhole or other small opening, provide means for quick personnel removal in case of an emergency. When safety belts and lifelines are used for this purpose, they must be so attached to the body that the body cannot be jammed in a small exit opening.

f. If the access fitting to a restricted access space is remotely controlled, ensure measures are taken to secure and danger tag-out remote-control equipment to avoid accidental closing of doors.

g. If work in a restricted access space is suspended for any substantial period of time, remove electrodes from the holders of arc welding equipment. One of the three precautions in the following subparagraphs 3g(1) through 3g(3) must be taken.

(1) Remove all arc welding equipment from the restricted access spaces.

(2) Disconnect all such equipment from the source of power. This must always be done if the equipment is to be left overnight.

(3) Positively insulate all such equipment, including the electrode holder, so that no accidental contacts can be made even if the equipment is moved during this period.

h. In the case of gas welding equipment, always close the torch valves and the gas supply to the torch, when not actually in use, to eliminate the possibility of gas escaping through leaks or improperly closed valves. The gas supply to the torch must be able to be positively secured from outside the space. Torches must remain in restricted-access spaces only for the period necessary to perform the required hot work. Overnight and at the change of shifts, the torch and hose must be immediately removed from confined spaces when they are disconnected from the torch or other gas consuming device.

SECTION C

CHAPTER 12

SHIPBOARD AIRCRAFT SAFETY

Ref: (a) NSTM, Chapter 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables
(b) NAVSEA OP 3565/NAVAIR 16-1-529/NAVELEX 0967-LP-624-6010, Electromagnetic Radiation Hazards (Hazards to Personnel, Fuel, and other Flammable Material)

1. Discussion

a. This chapter applies to fixed-wing and rotary wing operations on ships that have full flight and hangar decks (CVNs, LHAs, LHDs, LPD 17 class, CGs, DDGs, and LCS).

b. Flight decks are hazardous and the danger to personnel goes beyond the possibility of crashes. Air intakes on jet engines can actually suck personnel off the deck and into the engine. Jet engine exhaust can propel personnel into other objects or over the side of the ship. Propellers and rotor blades can maim or kill. Aircraft carry ordnance and fuel that can cause fires and explosions. Moving aircraft can hit personnel. The ship itself is pitching and rolling. For these reasons, personnel whose job requires them to work on the flight deck must be constantly alert to many hazards to avoid injury or death.

2. General Fire Precautions

a. Smoking

(1) Do not smoke or permit open flames on flight decks, hangar decks, sponsons, and weather decks.

(2) Only smoke in designated smoking areas.

b. Open Flames and Ignition Sources

(1) Do not permit open flames or any other ignition source in the vicinity of flammable liquids, gases, or explosive ordnance.

(2) Provide continuous fresh air or properly designed exhaust systems where flammable vapors are present.

c. Heating Units

(1) Use caution when using approved element space heaters in any part of a hangar deck or in any ship space where a fire hazard exists.

(2) In no case permit such heaters in locations where ignitable concentrations of flammable gases or vapors are likely to exist, or where flammable or explosive substances in the form of gas, vapor, mist, dust or fibers are present.

d. Shoes. Personnel must wear non-sparking, protective steel toed leather safety shoes with non-slip oil and fuel resistant soles in the vicinity of flammable gases and vapors.

e. Stowage of Combustible Rags. Correctly labeled, metal receptacles with metal covers will be provided for the holding of oily rags, solvent soaked waste, and other combustible waste materials for disposal. Receptacles will be emptied daily per local HAZMAT turn-in procedures.

f. Stowage of Combustibles. Approved flammable storage lockers are required for storing combustible materials. See chapter B3 and reference (a) for details.

3. Housekeeping

a. Clean work areas and keep them clean, during and after maintenance evolutions.

b. Keep decks free from oil, grease, and FOD.

c. Properly store compressed air tanks, tools, and equipment after use.

d. Spills

(1) Immediately clean up oil, grease, fuels, and other flammable liquids or slippery substances to prevent injury or fire.

(2) Use drip pans in the hangar during maintenance evolutions to prevent drips and leaks from becoming fire or slip hazards, particularly under aircraft engines.

e. Place hoses, power cords, and similar equipment in their designed stowage areas to alleviate trip hazards. This will also reduce excessive wear and damage to the cords and hoses from traffic and deck abrasion.

4. FOD

a. Prohibit dumping of trash and garbage during launch or recovery operations. Only dump trash from the fantail or designated sponsons.

b. Only use approved flight deck uniforms, cranial headgear and sound attenuators per appropriate Naval Air Training Operating Procedures Standardization during flight operations. Do not wear ball caps, white hats, watch caps, garrison hats, bridge caps, or hard hats on the flight deck, catwalks, or gallery decks during flight operations.

c. Remove any loose objects and jewelry from person prior to entering the flight deck area.

d. Be careful, aircraft jet engines suck up loose objects from the deck or the area immediately adjacent to the intake, including in some cases, personnel who venture too close. Ingestion of articles into engines can cause costly damage, loss of the engine, and injury and death to personnel. Aircraft Naval Air Training Operating Procedures Standardization manuals depict intake and exhaust danger zones.

5. Liquid Oxygen (LOX)

a. LOX. LOX is a pale blue fluid which flows like water. It boils into gaseous oxygen at minus 297 degrees Fahrenheit (-183 degrees Celsius); therefore, it is capable of immediately freezing any object that comes in contact with it. When warmed to ambient temperature, LOX expands as a gas to about 860 times its liquid volume. Therefore, if a volume of the liquid were confined and allowed to warm, it would exert extremely high pressure (up to 12,000 psi). Because of these properties, extra safety precautions must be observed when working with LOX.

b. Fire Protection

(1) Keep the work area and equipment free of oil, grease, or any readily combustible material.

(2) Keep tools and clothing free of oil and grease.

(3) Ensure that the aircraft or the LOX converter when removed from the aircraft and the LOX servicing trailer are grounded and bonded. The grounding conductor must be connected to the frame of the trailer and all metal parts must be bonded together.

(4) Prohibit smoking, open flames, or sparks within 50 feet of liquid or gaseous oxygen servicing trailers that are transferring or storing oxygen. Any combustion in an oxygen-rich atmosphere may be violent.

(5) Mark oxygen generation and storage spaces with a sign reading:

OXYGEN - NO SMOKING - NO OPEN FLAMES -DO NOT BLOCK LOX JETTISON RAMPS, or an equivalent.

(6) Ensure that adequate ventilation is present or supplemental ventilation (see chapterA4, subparagraph 3b(2) note) is provided when transferring LOX to avoid an oxygen-rich atmosphere.

(7) Do not spill LOX on deck areas. In case of accidental spillage, the area should be thoroughly ventilated and all unnecessary personnel must evacuate the area.

(8) Ensure that a fully operational fire extinguisher is immediately available in the LOX handling space.

(9) Ensure that only approved non-sparking tools are used when working on LOX equipment.

c. Freezing Precautions

(1) The extreme cold of LOX will instantly produce burns if LOX comes into direct contact with the skin.

(2) Frostbite or freezing will occur if the skin comes into contact with surfaces that have been cooled by LOX.

d. Protective Clothing. The possibility of exposure from accidental spillage of LOX exists; therefore, wear the following protective clothing listed in subparagraphs 5d(1) through 5d(4).

(1) Face and eye protection.

(2) White cuff-less coveralls.

(3) Hand protection made of leather.

(4) Molder's (style, slip on) safety shoes.

Note: Ensure that all protective clothing worn is clean and free of oil, grease, and FOD.

e. Handling Precautions

(1) Wear clean, dry leather gloves offering insulation to cold, when handling parts of equipment that have been cooled by LOX. In the event rubber or neoprene gloves are used, wear a covering glove or an interlining glove in conjunction with the molded glove.

(2) Only handle the tubing or fittings through which the LOX is flowing when necessary, wearing insulated gloves or other devices for protection against freezing.

(3) Do not permit LOX to flow onto any part of the body, clothes, pockets, or cuffs where it might be trapped.

(4) In the event the LOX is spilled on clothing, remove the clothing immediately and thoroughly air to allow dilution of the oxygen concentration.

(5) When an un-insulated container of LOX is touched, or when there is any reason to suspect some part of the body has been frozen or chilled through contact with LOX, thoroughly wash the area with clean water and immediately seek medical treatment.

(6) Ensure that at least two persons conduct LOX operations.

(7) Protect LOX storage containers, piping, valves, regulating equipment and other accessories against physical damage and tampering.

6. Arresting Gear and Barricades

a. Unauthorized personnel must remain clear of the walkways, arresting gear machinery, spaces, and equipment.

b. During arresting gear maintenance evolutions, all personnel must remain clear of the bight of the wire. Only authorized personnel will work on arresting gear.

7. HERO. Follow approved HERO omission control procedures per reference (b).

SECTION C

CHAPTER 13

MACHINERY

1. Discussion

a. Machinery is located everywhere in the ship, from the more obvious examples of propulsion equipment in the engine room, to the less than obvious example of galley equipment. This chapter defines precautions for all types of machinery. Chapter C9 covers electrical safety precautions. Galley equipment is described in chapter C19.

b. All machinery has moving parts. The fact that moving parts are present means that the possibility of personnel injury is also present. While personnel injury is one aspect of machinery injury, the fact that a person has interrupted the machinery process can lead to even more disastrous mishaps.

c. Except in emergencies, and then only when no qualified operator is present, no person will operate, repair, adjust, or otherwise tamper with any machinery unless assigned by a competent authority, (for example, OOD, CDO, or engineering duty officer), to perform a specific function on such machinery. No person will be assigned to operate or adjust machinery unless he or she has demonstrated a practical knowledge of its operations and repair and all applicable safety precautions, and then, only when qualified by the department head having cognizance over such machinery. Unqualified personnel will operate machinery only under the supervision of qualified personnel.

2. General Precautions. Personnel must observe the following safety precautions and adhere to the SOPs for individual machine or ship system operations.

a. Never place any part of the body into moving machinery.

b. Never attempt to ride machinery that is not designed for transport, such as vertical package conveyors or weapons elevators.

c. Do not wear jewelry (e.g. rings, watches, necklaces, bracelets, loose fitted clothing, cell phones or other electronic devices while operating machinery).

d. Wear proper protective clothing and equipment suited to the operation being performed as required by technical manual or current IH survey (e.g., hearing protection, eye, hand and foot protection, respirators), or if indicated by the RPPM.

e. Observe manufacturer's safety precautions on the SDS and warning labels when handling flammable or toxic liquids; in particular, ensure that ventilation is adequate, and wear appropriate PPE. Wear proper personnel protective equipment such as goggles, gloves and respirators, as recommended in the current IH survey or if indicated by the RPPM.

f. Use only hand tools and work lights that are in good material condition. Electrical tools and lights must be used only if inspected and approved. Special non-sparking and explosion-proof electrical equipment may be required in the presence of flammable solvents and fuels.

g. Use electrical tools and lights only if inspected and approved. The DCA may require non-sparking and explosion-proof electrical equipment.

h. Ensure that equipment is de-energized, depressurized and properly tagged out of service before attempting to perform repairs or preventive maintenance.

i. Ensure machinery, hand tools, and electrical equipment are properly grounded prior to operation.

j. When working near electrical equipment or electrical cables, be alert to the presence of dangerous voltages and avoid striking such equipment with tools of any kind. Should such damage inadvertently occur, report it immediately to the chain-of-command and ship's electrical officer.

k. Do not use compressed air to clean personnel, clothing, or to perform general housekeeping in lieu of vacuuming or sweeping. Compressed air may be used to clean machinery parts that have been properly disassembled provided that the supply air pressure does not exceed 30 psi or the nozzle is equipped with a 30 psi limiter. Wear safety goggles when using compressed air for approved cleaning.

l. Do not store in-use quantities of paints, solvents, acids, or corrosives in unapproved containers or cabinets. Ensure material compatibility and proper labeling. Follow HAZMAT policies established for the ship.

m. Return closed, authorized containers of flammable consumables to approved storage lockers, the ship’s HAZMINCEN, or to the flammable liquid storeroom or paint locker at the end of each working day.

n. Keep containers of flammable, volatile fluids and adhesives tightly closed when not in use.

o. Supervisors must ensure that anyone who incurs any type of injury or who experiences any adverse health effect during or immediately following work activities receives prompt medical attention.

p. Promptly reinstall shaft guards, coupling guards, deck plates, handrails, flange shields, and other protective devices removed as interference immediately after completion of maintenance on machinery, piping, valves, or other system components.

q. Do not use LP air to unclog flammable fluid piping systems unless a specific directive or approved procedure requires its use.

3. Maintenance

a. Ensure that all installed safety devices, alarms, and sensors are inspected and tested per scheduled PMS and other TYCOM requirements.

(1) Assign the repair of defective safety devices a high priority.

(2) Correct oil leaks at their source. Wipe up spills of any kind immediately and store the wiping rags in fire safe containers. Dispose of oily rags daily per the ship's HAZMAT turn-in procedures.

(3) Avoid trip hazards by maintaining proper stowage.

(4) Do not allow fire hazards to accumulate.

(5) Ensure that all firefighting equipment is kept in a maximum state of readiness at all times.

(6) Ensure repair lockers are properly outfitted and restored after each use.

(7) Continually monitor fire and flooding alarm panels. No alarm or flag must be allowed to go uninvestigated. Alarm panels known to give false or spurious indications must either be labeled and repaired or replaced as soon as possible.

(8) Piping systems that have been opened for maintenance (after having been properly isolated and tagged-out of service) must not be left open overnight. Install appropriate metal blank flanges if a section of piping has to remain open overnight or for any extended period of time. Add such temporary openings to the list of items to be checked by the below decks, shutdown roving watch, or space watch for the duration of the maintenance period.

(9) Open all drains and vents to all drums and headers before loosening manhole or handhold plates. Stand clear of such fittings when initially opening them after service.

b. When maintenance exceeds boundaries of PMS, appropriate supervisors must ensure the quality assurance documentation and procedures are followed.

4. Industrial Equipment

a. General Industrial Equipment Operation and Repair Safety

(1) Read manufacturer's instruction books for essential details of readying machines and equipment for operation, cleaning, lubricating, and general care and maintenance. These instruction books, supplemented by technical handbooks, provide comprehensive instructions on all phases of shop practice.

(2) Inspect before operating industrial equipment (fixed or portable) to ensure that the equipment is in good working condition and that all installed or attached safety features (such as guards, limit switches, interlocks, and speed limiting controls) are in place and in good working order.

(3) Unplug or disconnect from power source and affix a red tag (DANGER - DO NOT OPERATE) on all fixed or portable industrial equipment requiring repairs.

(4) Unplug or disconnect from power source when changing industrial equipment parts such as faceplates or chucks on lathes, drill bits in electric drills, or saw blades. Open and Danger tag the power source circuit breakers of fixed industrial equipment that are “hard wired.”

(5) Block up ram where applicable and open the switches and red tag (DANGER - DO NOT OPERATE) on power shears, drills, punches, and presses when it becomes necessary to place any part of the body under or within the equipment.

(6) Replace machine guards and safety devices after repairing, oiling or greasing, or after inspections or PMS have been completed before the machine is started or operated.

(7) Remove all industrial tools or test equipment used in making repairs, adjustments to machinery, or other shipboard equipment or systems so that all working parts of the machinery, equipment, or system will be free to operate without damage.

(8) Take care that no one is in a position to be injured when the machinery, equipment, or system is again set in operation.

(9) Be sure all personnel are clear before starting any industrial tools or equipment.

(10) Do not permit anyone to operate electrical or mechanical equipment or machines in any space when alone.

(11) Make sure there is plenty of light to work by before operating a machine.

(12) See that tools and work are properly clamped before starting a machine.

(13) Place or mount a saw, cutter head, grinding wheel, or tool collar on a machine arbor only when the tool is the proper size to fit the arbor.

(14) Ensure each powered machine has a means of cutting off power which can be safely reached and operated from the operator's normal position, without reaching through the point of operation or other hazardous areas.

(15) On machines where injury to personnel might result if motors were to restart after power failures, check that provisions have been made to prevent machines from automatically restarting upon restoration of power.

(16) Make sure that operating controls, including treadles, are protected by recessing, guarding, location, or other effective means against unexpected or accidental activation of the machine.

(17) The point-of-operation is the area of a machine where the work is actually performed upon the material being processed. Check that the point-of-operation is guarded so that personnel cannot be injured by contact with the machine or by flying objects propelled from the machine. Methods of point-of-operation guarding include barriers, shields, interlocks, automatic feed and removal, and two-hand activation devices. The best guarding device is usually one designed and attached by the manufacturer as an integral part of the machine. The selection and design of guards other than those provided by the manufacturer must be adequate to protect personnel and not present a hazard in themselves.

(18) Power transmission devices include belts, chains, pulleys, shafting, fly wheels, gears, sprockets, and any other moving parts of a machine other than the point-of-operation. Ensure that power transmission devices are enclosed within the machine or otherwise guarded or so located that it is not possible for personnel to contact the moving parts. Power transmission devices over 7 feet above the deck or other standing or walking surface need not be guarded.

(19) Ensure all warning and caution signs, for eye hazards, noise hazards, pinch points, etc., and machine safety precautions are posted within sight of the machine operator. Machine safety precautions may be posted using standard stock placards or excerpts from technical manuals. Ensure caution areas and eye hazard areas around the machine are marked as defined in chapter C1.

b. Housekeeping

(1) Keep areas around machines clear of obstructions and in a non-slippery condition. Clean up all spilled oil or grease immediately.

(2) Keep machines clean.

(3) Do not clean chips from the surface of machines with compressed air or with hands; use a brush or hook and wear leather gloves.

(4) Do not use compressed air to clean clothing or to blow dust off the body or to assist in the cleanup of dust, debris, or other particulate matter.

(5) Do not place hand tools on lathes or other machines. Keep them in their assigned location.

(6) Turn off all power to the equipment before removing chips and other debris.

(7) Ensure all portable tools (electrical or pneumatic) have been tested prior to initial use and periodically, as prescribed by PMS or other data.

(8) Ensure that all machine guards and other safety devices are in place prior to equipment operation.

c. Portable Power Tools

(1) Ensure all portable electric power tools have a current safety inspection by the electrical tool issue room prior to use.

(2) Ensure that portable circular saws, electric or pneumatic chain saws, and percussion tools without positive accessory holding (e.g., equipped with a constant pressure switch that will shut off the power when the pressure is released) are equipped with an operable "dead-man" switch.

(3) Keep portable power tools clean, lubricated, and in good repair.

(4) Keep all electrical cords clear of moving parts when using portable electrical equipment around machine tools.

(5) Wear and use the required PPE, such as hearing or sight protection, for those tools and equipment requiring PPE.

d. Operating Precautions – General

(1) Remove chuck keys, wrenches, or other devices used to attach accessories to industrial machines before operating.

(2) Do not attempt to adjust a tool or feel the edge to be cut while the equipment or tool is in motion.

(3) Never attempt to stop or grab by hand or apply a wrench or tool to moving work or to moving industrial-equipment parts.

(4) Do not use hangers to knock cutters into positions.

(5) Never lean against a machine that is running.

(6) Never leave moving machinery unattended.

(7) Do not distract the attention of a machine operator.

(8) Remove cutting tools from machines when not in use.

(9) Avoid excessive cutting speeds, feeds, and depth of cut. Keep hands clear of moving parts. Use a separate block to feed stock into cutting blades.

(10) Never operate equipment without all guards in place.

e. Securing for Sea. When securing for sea, take all precautions to ensure that components of industrial equipment or tools, including accessories, will not sway or shift with the motion of the ship. These precautions should include, but are not limited to, the following in subparagraphs 4e(1) through 4e(8).

(1) Lower the arm of top-heavy equipment, such as a radial drill press, to rest on the table or base of the machine and then clamp and block securely.

(2) Secure chain falls, trolleys, overhead cranes, and other suspended equipment, such as counterweights on boring mills and drill presses.

(3) Secure tailstocks of lathes.

(4) Secure spindles of horizontal boring mills.

(5) Protect and secure tools stowed in cabinets or drawers. Secure drawers and cabinet doors. Where possible, install metal bands or fixtures vice using line to temporarily secure equipment. Secure all bar and sheet-metal stock and use caution when handling or moving while underway.

(6) Inspect foundation bolts of heavy equipment per PMS to ensure tightness.

(7) While underway or while at anchor in high sea states, do not operate shop machines whose components are subject to shifting or swaying with the motion of the ship, so as to present a hazard to operators, without permission of the commanding officer.

(8) Do not perform operations such as the melting and pouring of metal or similarly dangerous evolutions while the ship is underway.

f. Posted Safety Precautions and Deck Markings

(1) Post operating instructions and safety precautions tailored to the specific equipment at each piece of industrial plant equipment. Install warning plates, located to ensure visibility, wherever necessary to minimize possible injury. Also, include instructions to never allow machines to run unattended and not to distract the operator while the machine is in operation. Posting may be accomplished using standard stock placards or excerpts from technical manuals.

(2) Clearly establish and mark equipment hazard areas or zones per chapter B5 ship's plans and specifications, and IH survey.

g. Safety Precautions for Specific Types of Equipment

(1) Pneumatic Tools – General

(a) Wear and use necessary personnel protective devices, especially eye and hearing protection.

(b) Do not connect or drive pneumatic tools by air pressure in excess of that for which the tools are designed.

(c) Only authorized and trained personnel will operate pneumatic tools.

(d) Lay pneumatic tools down in such a manner that no harm can be done if the switch is accidentally tripped. Do not leave idle tools in a standing position.

(e) Keep pneumatic tools in good operating condition and thoroughly inspect them at regular intervals with particular attention given to on-off control valve trigger guard (if installed), hose connections, guide clips on hammers, and the chucks of reamers and drills.

(f) Pneumatic tools and airlines may be fitted with quick disconnect fittings which incorporate automatic excess flow shut-off valves, which shuts off the air at the airlines before changing grinding wheels, needles, chisels, or other cutting or drilling bits.

(g) Only use air hoses suitable to withstand the pressure required for the tool. Remove leaking or defective hoses from service.

(h) Do not lay hoses over ladders, steps, scaffolds, or walkways in such a manner as to create a trip hazard. Where a hose is run through doorways, protect the hose against damage by the door edge. Preferably, elevate air hose over walkways or working surfaces in a manner to permit clear passage and prevent damage to the hose.

(i) Connect a tool retainer on each piece of equipment that, without such a retainer, may eject the tool.

(j) Ensure that all portable pneumatic grinders and reciprocating saws are equipped with a safety lock-off device. The lock-off device must automatically and positively lock the throttle in the off position when the throttle is released.

(k) Pneumatic tool air hose fittings must not be interchangeable with the hose fittings designated for airline respirators.

(l) Ensure that air hoses are equipped with "quick disconnect" fittings at all hatches, doors, or scuttles.

(2) Pneumatic Hammers

(a) Do not point any pneumatic hammer at other personnel. Operate hammers in a careful and safe manner at all times.

(b) Ensure that all hammers are equipped with a device for holding the tool bit in the hammer. Inspect safety tool holders at frequent intervals per PMS.

(c) Do not restrict the air exhaust in any fashion.

(d) Ensure that all pneumatic hammers are equipped with a handgrip safety switch (dead-man switch).

(e) Use pneumatic hammers only for those purposes for which designed.

(f) When operating a power hammer, wear necessary eye, face, ear, and body protection, including gloves.

(3) Power Saws. In addition to the general precautions for portable electric and pneumatic tools contained in this instruction, observe the precautions in the following subparagraphs 4g(3)(a) through 4g(3)(x) for electric and pneumatic saws.

(a) Provide all circular power saws with guards that fully encompass the unused portion of the blades.

(b) Ensure that qualified personnel install circular saw blades.

(c) Only use portable electric or pneumatic saws that have handgrip "dead-man" switches installed.

(d) Grasp portable power saws with both hands and hold firmly against the work. Take care that the saw does not break away, thereby causing injury.

(e) Disconnect the power supply and inspect the blade at frequent intervals or immediately after it has locked, pinched, or burned.

(f) Inspect and remove potential obstacles from the material to be cut before using a saw.

(g) Immediately remove dull, badly set, improperly filed, or improperly tensioned saws from service before they can begin to cause the material to stick, jam, or kickback when it is fed to the saw at normal speed.

(h) Immediately clean saws when gum or pitch has adhered to the sides. Disconnect power before cleaning.

(i) Keep bearings well lubricated.

(j) Keep arbors of all circular saws free from play.

(k) Only trained and designated personnel will sharpen or tension saw blades or cutters.

(l) Maintain cleanliness around woodworking machinery, particularly as regards the effective functioning of guards and the prevention of fire hazards in switch enclosures, bearings, and motors.

(m)Remove all cracked saws from service.

(n) Do not permit the practice of inserting wedges between the saw disk and the collar to form what is commonly known as a "wobble saw."

(o) Provide push sticks or push blocks at the work place in the several sizes and types suitable for the work to be done. Push sticks, blocks, or other special hand tools are not substitutes for guards. Keep all required guards in place and operable when push sticks or blocks are used.

(p) On band saws, ensure all portions of the blade are enclosed or guarded, except for the working portion of the blade between the bottom of the guide rolls and the table. The portion of the guard between the upper-saw-wheel guard and the guide rolls must guard the front and outer side of the blade and must be adjustable to move with the guide as it is raised and lowered. When the band saw is in use, position the adjustable guard to maintain the minimum clearance between the guide rolls and the material consistent with free movement of the material being cut.

(q) To avoid vibration, welded joints in band saws must be the same thickness as the saw blade.

(r) Ensure that each circular table saw is guarded by a hood that completely encloses the portion of the saw above the table and above the material being cut. Mount the hood so that it will automatically adjust itself to the thickness of, and remain in contact with, the material being cut. An approved clear plastic guard cantilevered over the saw table may be used as an alternative to the enclosing hood. The plastic guard must be large enough and set low enough to prevent the hands of personnel from contacting the blade.

(s) Make sure that each hand-fed rip saw has a spreader mounted in a position 1/2 inch from the back of the largest saw which may be mounted on the machine. The spreader prevents material from squeezing the saw and being thrown back on the operator. The spreader must be thinner than the saw kerf and rigid enough to resist side thrust and bending. The spreader is not required for grooving, dadoing, or rabbeting but must be replaced immediately upon completion of such operations.

(t) Check that each ripsaw, including hand-fed rip saws with spreaders, is provided with non-kickback fingers or dogs to prevent material from being thrown toward the operator.

(u) Ensure that self-feed circular saws have a hood or guard that will prevent the operator's hands from contacting the nip point of the feed rolls.

(v) Verify that radial saws are guarded, as required by the following in subparagraphs 4g(3)(v)1 through 4g(3)(v)4.

1. The upper portion of the blade, including the arbor, must be completely enclosed by a hood. The sides of the lower portion of the blade must be guarded to the full diameter of the blade by a guard that will automatically adjust to the thickness of the material being cut.

2. The work surface must be wide enough, or a stop must be provided, to prevent the cutting head from traveling to a point where the blade extends beyond the outer edge of the table.

3. The unit must be tilted back or counterweights must be provided so that the cutting head will return to the starting position when released.

4. Ripping and ploughing with a radial saw must be against the direction that the saw rotates. The direction of rotation must be conspicuously marked on the hood. A label must be affixed to the rear of the hood reading, "DANGER: Do not rip or plough from this end." Non-kickback fingers must be provided for ripping and ploughing operations.

(w) Inspect saw blades by non-destructive, PMS test methods for surface cracks and defects.

(x) Ensure sawdust collectors are properly attached prior to use of wood saws and are in serviceable condition. Empty sawdust from the collector bags per the manufacturer's instructions.

(4) Sanding Machines

(a) Carefully inspect all sanders before use. Do not use sanding discs or belts if they are frayed or cracked.

(b) Use eye protection during sanding operations and while cleaning up. Consult the IH survey and the RPPM about the need for respirators while sanding or cleaning dust collectors. Operate dust-collecting systems for sanders, if installed, when sanding is in progress.

(c) Keep hands or other parts of the body from coming into contact with the abrasive surface of the sander.

(d) Grasp portable hand-held sanders with both hands and hold firmly against the work. Take care that the sander does not break away, thereby causing injury or damage.

(e) When permanently mounted sanders are used, grasp the work firmly and hold it to the sanding surface carefully to avoid finger contact with the sanding belt or disc. Sand small pieces of work that would bring the fingers within 1 inch of the belt or disc surface by hand, rather than on powered sanders.

(f) For portable sanders and fixed sanders having electric plugs, pull the electric plug before sanding belts or discs are changed or before repairs or adjustments are made to the sander. Open and danger tag the power source circuit breaker of fixed sanders that are "hard wired" before making repairs or adjustments or changing belts or discs.

(g) Ensure each belt sanding machine has both belt pulleys enclosed in such manner as to guard the points where the sanding belt runs onto the pulleys. Enclose the unused run of the sanding belt. Adjust belt type sanders to the proper tension.

(h) Ensure coast down brakes, where installed by the manufacturer, are in good working condition before commencement of sanding and use them to stop belt or disc motion after the power is secured.

(5) Buffers, Grinders, and Cut-Off Wheels – General

(a) Check the spindle speed of the machine before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.

(b) Gently tap wheels with a light non-metallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels, immediately before mounting. Do not use if they sound cracked (dead). This is known as the "ring test." It should also be noted that organic bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.

(c) Wheels must be dry and free from sawdust when applying the "ring test," otherwise the sound will be deadened.

(d) Dress or replace wheels that are chipped, have imbedded non-ferrous material, are rounded, or worn out of round prior to using the grinder.

(e) Replace fabric buffer wheels that are frayed or worn out of round.

(f) Replace wire buffer wheels that are badly worn or loose at the hub.

(g) Permanently mounted buffers and grinders must have a shatterproof safety shield in place between the operator's eyes and the work at all times while buffing and grinding. Wear eye and hearing protection (if posted as noise hazardous) when operating either portable or permanently mounted buffers or grinders.

(h) Clean the flange surface of grinding and buffing wheels, normally placed between washers and the spindle hole, before mounting the wheel so that clamping pressure will be evenly distributed.

(i) Ensure that the hole in the buffer or grinding wheel is of the proper size for spindle (neither too small nor too large).

(j) Use compression washers as large as the flanges in diameter for buffer and grinding wheels.

(k) Tighten spindle nuts just enough to keep the buffer or grinding wheel from moving out of position between the washers.

(l) Mount tool or work rests on firm supports and space not more than 1/8 of an inch from the surface of grinding wheel. Ensure any dust collection bags, of non-flammable material, are in place and emptied regularly.

(m) Ensure the hood around grinding wheels is constructed so its periphery can be adjusted to the constantly decreasing diameter of the wheel by means of an adjustable tongue or equivalent. Maintain the distance between the wheel periphery and the tongue or end of the periphery band at approximately 1/4 of an inch.

(n) Ensure that the upper point of opening in the grinding wheel hood facing the operator is not less than 25 degrees and not more than 65 degrees from a vertical line drawn through the spindle center.

(o) Ensure that the maximum exposure of a grinding or cut-off wheel periphery or circumference for hoods on a swing frame machine does not exceed 180 degrees and the top half of the wheel is protected at all times.

(p) Ensure that the maximum exposure of the wheel periphery or circumference on bench or floor stands does not exceed 90 degrees.

(q) Protect cup type wheels used for external grinding by either a movable cup guard or a band type guard. Provide all other portable abrasive wheels used for external grinding with safety guards (protection hoods), except as follows:

1. When the work location makes it impractical, use a wheel equipped with safety flanges.

2. When using wheels 2 inches or less in diameter, securely mount the wheel on the end of a steel mandrel.

(r) When safety flanges are required, use them only with wheels designed to fit the flanges. Use only safety flanges of a type and design and properly assembled as to ensure that the pieces of the wheel will be retained in case of accidental breakage.

(s) Ensure portable abrasive wheels used for internal grinding are provided with safety flanges (protection flanges), with the exceptions in the following subparagraphs 4g(5)(s)1 and 4g(5)(s)2.

1. When wheels are 2 inches or less in diameter, securely mount on the end of a steel mandrel.

2. If the wheel is entirely within the work area being ground.

(t) Ensure that all deck or bench mounted abrasive wheels have a work rest. Keep the work rest adjusted to within 1/8 inch of the wheel periphery to prevent the work from being jammed between the rest and the wheel.

(6) Operating Grinding, Buffing, and Cut-off Wheels

(a) Stand to one side of the wheel when first applying power.

(b) Take care that the hands are not drawn into contact with buffing, grinding, and cut-off wheels.

(c) Never operate stationary grinding wheels unless protective eye guards and hooks are in their place and the tool rest is correctly adjusted. Wear eye and face protection.

(d) Never operate portable pneumatic or electric grinding machines using wheels and wire brushes without a hood.

(e) Before the power is turned on, check to ascertain that the wheel runs true, is not out of balance, and does not strike or rub against housing, hood, safety shield, or tool rest. Dress wheels as necessary.

(f) Never use a grinding wheel on nonferrous materials. Nonferrous materials could build up on the wheel causing an imbalance condition, over-heating, or possible debris hazard. Dress grinding wheels that have excessive imbedded non-ferrous material.

(7) Industrial Slotted Hoods. Dip tanks, and varnish tanks may be equipped with local exhaust ventilation, usually in the form of slotted hoods, based on the hazardous chemical gas, vapor or mist that is expected to be generated during the operation or released when the tank is opened. A slotted hood removes gas, vapor or mist at the point of generation before the contaminant reaches the user's breathing zone.

(a) Ensure that local exhaust ventilation is operational prior to using. Know where the controllers are for local exhaust systems. If the system is not working properly, notify the supervisor.

(b) Ensure the slots on the hood area are not obstructed.

(c) Follow the posted operating instructions and safety precautions for the dip tank or washer and never put other than approved chemicals or cleaners into the tank.

(8) Drill Presses. Stationary, mounted drill presses must be equipped with guards to prevent injury from shattering drill bits or chips of material. Telescoping drill bit guards, which cover the drill bit as it is lowered and raised during use, are required for all drill presses.

(9) Parts Washers and Pollution Prevention Equipment. Enclosed parts washers, ultrasonic cleaners, degreasers, and other pollution prevention devices used in workshops will be provided with local exhaust ventilation and must have posted safety precautions. For top loading aqueous parts washers located in well ventilated areas, additional local exhaust ventilation will not be required since the equipment only emits a small amount of water vapor.

SECTION C

CHAPTER 14

ORDNANCE

Ref: (a) NAVSEA OP 4, Ammunition and Explosives Safety Afloat
(b) NAVSEA OP 3565/NAVAIR 16-1-529, Volume 2, Electromagnetic Radiation Hazards (U) (Hazards to Ordnance) (U)
(c) SW394-AF-MMO-090, Vertical Launching System MK 41 MODS 0/2/7/15/31
(d) C14-4. SW393-C0-MMM-A10, Decoy Launching System MK 53 MODS 3, 4, 5, 6, 7 and 8
(e) S6340-AA-MMA-010, Technical Manual for OTTO Fuel II
(f) SW300-BC-SAF-010, Clearing Live Ammunition from Guns
(g) SW323-F2-MMO-010, 5-Inch 54 Caliber Gun Mount MK 45 Mod 2

1. Discussion

a. All ships that support the United States Navy carry ordnance that can be used offensively, defensively, or to provide safe for sea capability. Ordnance is identified by family groups which include aircraft egress systems, air missiles, bombs, bulk explosives material, cartridges, cluster bombs, containerized explosives, demolition material, expendable countermeasures, fire bombs, fixed gun ammunition, grenades, landing force operation reserve material, mines, paraflares, practice bombs, precision guided munitions, projectiles, propelling charges, pyrotechnics, rockets, small arms ammunition, sonobuoys, underwater sound signals, sub-surface missiles, surface missiles, tactical air launched decoy vehicles, targets and torpedoes.

b. The greatest danger from ordnance is an explosion. Loss of life can be expected and propagation may result in progressive flooding of shipboard compartments leading to a catastrophic event. There is a great deal of safety built into weapon design that can include thermal coating to protect from fire, electrical, and mechanical safety interlocks to prevent premature arming and as a result of shipboard ordnance accidents occurring in the decade of the 1960's, the Navy has established a program to reduce the sensitivity of explosives and related material through development of insensitive munitions technologies and subsequent incorporation of those technologies into munitions. The major safety factor in preventing an ordnance catastrophe is using only qualified and certified personnel who have gone through a great deal of training and are under constant supervision that understands ordnance safety. A proactive explosives safety culture that resonates down from the commanding officer to junior ordnance handler is a must.

2. General Ordnance Precautions

a. No smoking, matches, lighters or open flames.

b. Per reference (a), no hot work to the space or boundaries with ordnance present unless the hot work procedures are followed.

c. No eating or drinking.

d. Do not sit or stand on any ordnance.

e. Competition with other handling parties is prohibited.

f. Horseplay is prohibited.

g. No unauthorized equipment will be used.

h. Any unusual conditions of the ordnance such as leaks, moisture damage, odors or shifting in stowage must be reported to supervisory personnel immediately.

i. Handling of ordnance must be kept to a minimum.

j. All ordnance must be secured against ship's movement.

3. General Safety Regulations for Ordnance, Weapons Systems, and Launchers

a. Per reference (a), ammunition and explosives operations on flight decks, exposed weather decks and other locations directly exposed to the weather must be halted when electrical storms are within a 5 nm radius of the ship.

b. Per reference (a), prompt first aid treatment of personnel hit by white phosphorus is required. First aid must consist of flushing with large amounts of water. Remove obvious large particles of white phosphorus from the skin by brushing with a knife, tool or stick, and cover with a wet dressing. The most effective treatment is neutralization of any phosphoric acid with a 5 percent bicarbonate solution (1 cup sodium bicarbonate dissolved in a gallon of water). Irrigation should be continued for 10 to 15 minutes. Do not use grease or ointments on white phosphorus burns.

c. Per reference (a), do not stand in danger circles around power-driven systems, such as gun mounts, turrets, gun and missile directors and missile launchers.

d. Per reference (a), adhere to all missile blast area danger signs.

e. Per reference (b), set HERO emission control following the ship's HERO bill prior to handling ordnance.

f. Per reference (c), be very careful when working in areas containing lethal voltages. Under some conditions, dangerous potentials may exist in electronic circuits after power is shut off. Do not perform work in a lethal voltage area under any circumstances without the presence of a second person who can give aid in the event of electric shock.

g. Per reference (c), be very careful when working with equipment that may reach high temperatures. Hatch covers, power supplies, and certain components (such as motors and lamps) can develop temperatures that can cause injury.

h. Per reference (c), do not perform any maintenance on the deluge or sprinkler systems until fire main water pressure is turned off. Do not disassemble any part of either system until all pressure in lines has been released.

i. Per reference (c), use protective devices (including hard hat, safety shoes, insulated gloves, ear plugs, facial mask, and personnel grounding devices, as applicable) when performing strike down and maintenance procedures on the Vertical Launching System (VLS) equipment. Use safety observer's safety switch and sound--powered telephones when performing any strike down or hatch operation. Always use hatch restraint tool or some other method to secure hatch open when performing maintenance on elevator hatch or uptake hatch. Use some other method, if possible, to secure cell hatch open when performing maintenance on cell hatch. Unless permanent carbon monoxide (CO) monitor is installed in launcher (ORDALT 16147), always use individual toxic gas sensor when working inside launcher.

j. Per reference (c), when a missile is fired from the VLS, the missile blast residue that remains can contain several heavy metals, including copper, nickel, lead, arsenic, chromium, and cadmium. Some of these chemicals can cause cancer and other adverse health effects if they are inhaled, ingested, or absorbed into the body. During missile launch, hydrogen chloride gas is formed, which can combine with water to form hydrochloric acid. Because the gases being created as the missile is launched are very hot (over 2,000 degrees Fahrenheit), there will be no water left in its liquid form inside the canister or launcher immediately after launch. Hydrochloric acid will not be present in the solid missile blast residue once any trapped gases remaining after the launch are dissipated, typically less than 2 hours. Personnel first opening the hatch immediately after a launch should inspect it for evidence of condensation on the inside. Absence of condensation ensures no water is present and hydrochloric acid was not formed. Personnel engaged in cleaning missile blast residue from the plenum, sills, or adapters are required to wear appropriate PPE and to practice good personal hygiene after completing work. The amount of missile blast residue remaining after cleaning is done is minimal, and PPE is not required when entering the VLS space to perform maintenance other than cleaning. However, anyone entering VLS launcher spaces should practice good personal hygiene upon launcher exit and wash their hands and face before eating, drinking, smoking, or applying cosmetics and emollient creams.

k. Per reference (c), do not work with or near high voltages unless familiar with methods of CPR.

l. Per reference (c), do not reach into any equipment or enter the launcher to service or adjust components except in the presence of someone who can give aid.

m. Per reference (c), personnel must remain clear of equipment that is in motion. Should equipment require adjustment while in motion, a safety watch must be posted. The safety watch should have full view of operation being performed and immediate access to controls capable of stopping equipment motion.

n. Per reference (d), chaff fibers are classified as a health hazard (irritant). Personnel must wear protective eye wear, dust mask, rubber gloves, and protective clothing, i.e., coveralls, smock, laboratory style coat, apron, etc., when chaff being blown back onto the ship is a possibility or when chaff particles that fall on the ship are being cleaned up. The protective clothing should be decontaminated or disposed of to prevent the chaff dipoles from being transported to living quarters.

o. Per reference (e), all operating personnel must be familiar with the nature and characteristics of OTTO fuel II.

p. Per reference (e), safety showers, eyewash fountain, emergency breathing air, and PPE must be available, and they must be inspected periodically prior to operations involving OTTO fuel II.

q. Per reference (e), remove personnel overexposed to OTTO fuel II from contaminated area into fresh air. If symptoms persist, obtain medical aid.

r. Per reference (f), all personnel working on a jammed gun must wear protective gear (i.e., flak jackets, battle helmets, and eye and ear protection). If loose propellant or powder is evident due to damaged cartridges, neutralize the exposed propellant with water to minimize the chance of ignition. Exposed propellant presents a risk of ignition that is best minimized by wetting the propellant with water.

s. Per reference (f), do not walk or stand in front of gun while live rounds remain in gun.

t. Per reference (g), personnel assigned to operate or maintain, 5-inch 54-caliber gun mount MK 45 MOD 2 must be familiar with naval safety precautions for ammunition and explosives handling and gun mount operation. In addition, these personnel must receive a thorough indoctrination in the safety precautions applicable to the gun mount.

u. Do not leave exposed ordnance unattended. Do not leave open magazines or lockers unattended.

SECTION C

CHAPTER 15

SANITATION (SEWAGE) SYSTEMS

Ref: (a) OPNAVINST 5090.1D, Environmental Readiness Program
(b) NAVSEAINST 9593.1C, Certification Program for Marine Sanitation Devices (MSDs) Installed on Surface Ships, Craft and Boats in the U.S. Navy
(c) NSTM 593, NAVSEA S9086-T8-STM-000/CW 593R, Pollution Control
(d) NMCPHC TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix (Edition 12), August 2015
(e) BUMEDINST 6230.15B, Immunizations and Chemoprophylaxis for the Prevention of Infectious Diseases
(f) NSTM 074, NAVSEA S9086-CH-STM-030/CH-074-VOL3, Gas Free Engineering

1. Discussion

a. All naval ships have a marine sanitation device (MSD) designed and operated to prevent the overboard discharge of untreated or inadequately treated sewage into navigable waters of the United States or other countries.

b. MSDs either hold raw sewage until it can be discharged overboard or to a pier connection, or treat sewage in certified treatment-based MSDs.

c. All naval ship MSDs must be certified by NAVSEASYSCOM per references (a) and (b) to ensure the MSDs meet performance and safety and health requirements. Navy certification of shipboard MSDs is a one-time requirement – there is no time-based recertification requirement for shipboard MSDs. The need to recertify an existing MSD based on modifications by a ship change is determined by NAVSEASYCOM and the appropriate ship program manager or TYCOM.

2. Sanitary, Hygienic, and Safety Procedures

a. Hygienic Procedures. The following basic hygienic procedures are applicable to all MSDs (e.g., CHT systems, vacuum CHT systems, and treatment based MSDs. Detailed information is contained in reference (c)).

(1) Wear appropriate PPE (e.g., rubber gloves, rubber boots, chemical splash goggles, face shield, and disposable coveralls), while connecting or disconnecting sewage hoses, while performing maintenance requiring disassembly of MSD equipment, or when contact with sewage is possible.

(2) Ensure that personnel exposed to sewage or who work on MSDs or graywater systems are placed in medical surveillance and maintain their basic immunizations as required by references (d) and (e).

b. Leak or Spill Clean-up Procedures

(1) In the event spaces become contaminated with sewage as a result of leaks, spills, or sewage system backflow, evacuate the space immediately and notify the OOD, DCA, and MDR of the spill.

(2) Secure the spill area from traffic.

(3) See reference (c) for information on spill cleanup and sanitation of the space.

(4) EEBDs are to be mounted in all MSD pump rooms and equipment spaces, and kept available in MSD work areas for emergency exiting. A minimum of two EEBDs must be mounted in each pump room and equipment space.

3. Gas Free Engineering for MSD Systems. MSD tanks and sewage collection and transfer piping systems (piping, valves, pumps, etc.) are considered IDLH. Do not open or enter an MSD tank, pump, pipe, or valve. Do not remove a component which will leave an opening to the tank unless approval is granted by the commanding officer and the system is inspected and certified gas free per references (c) and (f).

4. Control of Toxic Gas Hazards in Sewage MSD Systems. To minimize the potential hazards resulting from the release of toxic gases from the MSD system, observe the precautions in the following subparagraphs 4a through 4e.

a. Always assume that the MSD tank and piping system contains sewage and toxic gases, and have an oxygen deficient atmosphere. Of particular concern is hydrogen sulfide (H_2S), a gas with a rotten egg smell at low concentrations. This odor is not reliable as a warning signal because H_2S deadens the sense of smell. As H_2S concentration increases, the degree of danger increases.

b. If H_2S is detected by smell when working in the MSD pump room, MSD space, comminutor space, or any space containing sewage piping, evacuate the space immediately. If the space is equipped with a H_2S alarm, evacuate the space immediately when the alarm sounds.

c. Contact a gas free engineer immediately. A space in which the H_2S odor has been detected or an H_2S alarm sounds should only be re-entered by personnel who have been properly trained and are wearing the proper IDLH respiratory protection equipment.

d. In any space where a sewage spill has occurred, do not conduct any work or maintenance other than work required to clean up the spill, until gas levels are below acceptable limits, as determined by a gas free engineer, and all sewage wastes, including solids, have been removed from the space and the space washed down.

e. Ensure all H_2S alarms and ventilation low flow indicators are properly maintained and operable at all times. In spaces where the ventilation low flow indicator reads zero or the low flow alarm has sounded, ensure the atmosphere is tested prior to entry.

5. Graywater Collection, Transfer Systems, and Graywater Collection Tanks. The sanitary, hygienic, and safety procedures, gas free engineering requirements, and requirements related to the control of toxic gas hazards provided herein also apply to dedicated graywater collection and transfer systems and graywater collection tanks where installed. See reference (c) for additional information.

6. Discharge Requirements and Additional Guidance. Refer to reference (a) prior to any discharge of sewage overboard.

SECTION C

CHAPTER 16

HEAVY WEATHER

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion

a. Heavy weather is defined as any weather condition that results in high winds, extreme sea states, heavy rain, heavy snow or hail.

b. There are multitudes of hazards present in heavy weather. Objects can slide or fall on personnel causing injury. Personnel can fall into machinery or equipment. Heavy weather is as dangerous now as it was during the days of sail, and all personnel must be aware of potential hazards and safety requirements.

2. Lifelines

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

b. Keep unguarded openings adjacent liferail or lifeline sections or an end section and adjacent structures to a minimum and in no case greater than 5 inches.

3. Tie-Downs

a. Use approved tie-downs or lashing to secure moveable shipboard items, such as aircraft, vehicles and cargo, against the motion of the ship and exposed areas against the forces of wind and waves.

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

4. Safety Precautions Under Heavy Weather Conditions

a. Be aware of stowage locations of all equipment necessary for rigging heavy weather lifelines.

b. Inspect tie-down equipment such as cables, turnbuckles, deck pads and bolts, at frequent intervals to ensure their security.

c. Only use the fittings provided on the aircraft, vehicle, and equipment to be transported to secure the item to the ship.

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

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

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

g. Take special precautions in dealing with equipment which may have broken loose during heavy weather conditions. Conduct an ORM assessment (see reference (a)) to evaluate the hazards to personnel and to the ship and identify and implement controls prior to attempting to secure equipment, vehicles, or aircraft.

h. Refrain from the use of machinery, tools, moving heavy stores, or other non-essential evolutions that may have an increased risk due to the ship's movement during heavy weather.

i. Supervisors must take into account the physical condition (sea sickness) of crew members during heavy ship movement before assigning critical or hazardous tasks.

j. In cold weather situations where crew members are assigned to remove snow or ice from topside areas, ensure personnel are properly outfitted with cold weather gear and gloves.

k. Avoid any mast or topside work, and secure personnel from exterior areas when thunderstorms threaten, whether or not lightning is sighted.

SECTION C

CHAPTER 17

ABANDONING SHIP

Ref: (a) NSTM 077, Personnel Protection Equipment

1. Safety Precautions During Abandoning Ship

a. Wear a full set of clothing including long sleeve shirt, shoes and a soft cap or head covering as protection from exposure. Do not wear a helmet (e.g., Kevlar®) or plastic hard hat when going over the side. If ordered to abandon a sinking ship, don the abandon-ship inflatable life preserver by removing the life preserver from the pouch, unrolling it, pass head through the life preserver collar, and ensure that the lower end of the preserver is out of the pouch. Do not abandon a ship surrounded by flames with the MK-1 inflatable life vest or an inherently buoyant preserver. These life preservers will not permit the wearer to swim underwater, below the flames.

b. The abandon ship inflatable life preserver is USCG approved and provides 33 pounds of buoyancy. It consists of a waist belt, a pouch for stowing the buoyancy chamber and the manual inflation assembly with a CO_2 cylinder and a pocket stowing the distress marker light, whistle, and toggle line. Life preservers authorized by reference (a) must be securely fastened to the person.

c. Go over the sides by means of a line, ladder, or debarkation net if time permits.

d. If it is necessary to jump, look before jumping into the water to be sure that water below is clear of personnel, floating gear, or wreckage. Know the direction of the wind and go to the windward side of the ship if possible, to avoid flames, oil, and the drift of ship.

e. Do not dive into the water. Always jump feet first, with feet and legs together, and arms crossed over the chest holding onto the life preserver. If necessary to jump into burning water, place one hand over mouth with palm under the chin and fingers split over the nose. The other hand is placed on the inflatable life preserver collar to keep it from riding up.

f. The abandon ship inflatable life preserver must not be inflated until the wearer is in the water and clear of flames or other danger. The life preserver must be manually inflated by pulling down on the inflator lanyard or through the oral inflation tube.

g. When in the water, concentrate on staying calm and avoiding panic. Obey the rules in the below subparagraphs 1g(1) through 1g(6).

(1) Swim away from the ship. If there is debris and oil in the water, use the breast stroke to clear a path. If space is available, climb into a lifeboat or life raft. If there is no room in the rafts of boats, use a safety line or the life preserver toggle line to attach life preserver to a raft, boat, or other personnel in the water wearing life preservers.

(2) After arriving at a safe distance from the ship, attach the distress marker light to the velcro patch on the buoyancy chamber, to conserve energy by moving as little as possible.

(3) If possible, keep clear of oil slicks. If not possible to avoid oil slicks, protect eyes, mouth and nose by keeping head high or swimming underwater. If swimming underwater, prior to surfacing, put hands above head and splash the water surface to disperse oil, debris, or flames.

(4) If there is danger of underwater explosion, float or swim on the back as near to the water surface as possible.

(5) Remain with other personnel in the water to reduce danger of sharks and facilitate rescue attempts. In cold water, forming close circles with others will preserve heat. Conserve energy by moving as little as possible.

(6) If ship is sinking rapidly, promptly swim clear and tow injured persons clear to avoid suction effect.

h. Follow all other procedures and precautions as delineated in the ship's abandon ship bill.

SECTION C

CHAPTER 18

PAINTING AND PRESERVATION

Ref: (a) NSTM 631, NAVSEA S9086-VD-STM-010/Volume 3 Painting and Preservation of Ships
(b) OPNAVINST 5090.1D, Environmental Readiness Program

1. Discussion

a. For precautions for application and removal procedures of lead-based paint, see chapter B10. This chapter deals exclusively with the application and removal of paint not containing lead or other toxic metals such as cadmium and chromium. Prior to paint removal, submit paint samples to a certified IH lab to verify absence of toxic metals.

b. Many paints, varnishes, lacquers, cleaners, solvents, and other finishing materials contain flammable solvents and, therefore, present a fire hazard. In addition, these same products may give off toxic vapors which can be harmful to health and the environment. It is therefore necessary that personnel take proper precautions in handling and using these products. Appendix C18-A provides a list of best practices that should be followed, if at all possible, to reduce the environmental impact of paint vapors and debris. Reference (a) provides detailed procedures for paint application. The shipboard marine coating use section of reference (b) contains information on volatile organic compounds and environmental recording that may be required.

c. Paint removal operations can produce extremely high personnel exposures to toxic substances found in paints, depending on the method of removal. Chipping causes scale to be dislodged, presenting possibility of eye or facial injury. It is therefore necessary that personnel take proper precautions in handling and using these products. Follow administrative and protective measures to reduce the amount of dust from sanding, grinding, and chipping paints and from fumes generated during hot work on painted surfaces.

2. Safety Precautions for Paint Removal

a. Ship's force must not perform routine shipboard paint removal for cosmetic reasons or due to excessive coating thickness. Ship's force should only remove paint when required to accomplish preservation of corroded surfaces, incidental to hot work, welding, or when bare metal is necessary for an inspection.

b. Wear eye protection, and a long sleeve shirt or coveralls with sleeves rolled down. Consult the RPPM about any respirator requirements for the operation.

c. For paint removal, keep mechanical grinding and sanding to the absolute minimum with primary reliance on manual removal methods, impact tools and authorized chemical paint strippers.

d. Use only pneumatic, not electric powered, wire brushes and chipping tools over the side. Tie all tools off by small stuff (line), to prevent tools from falling on someone below.

e. When working over the side or aloft, see chapter B13 and chapter C8 for additional precautions.

f. Wear protective gloves when handling cleaning compounds or chemical removers.

g. Wear electrical safety gloves when using portable, electric-powered tools. See chapter C9 for additional precautions when using electrical power tools.

h. Many paint removal tools are noise hazardous equipment. If equipment is labeled as noise hazardous, ensure that proper hearing protective equipment is worn. See chapter B4 for additional information.

i. Assume all paint contains substances, such as lead and chromate, which are hazardous to health if ingested or inhaled in small amounts, unless proven otherwise by sample analysis.

j. Treat all paint debris as environmentally HAZMAT and control and dispose of accordingly. When working topside, set up barriers to prevent paint debris from entering surrounding waters.

k. Provide local exhaust ventilation as needed during painting operations to remove airborne particles and vapors. Reference (b) should be consulted for environmental requirements that may apply to exhaust ventilation of airborne particles and vapors. If IH surveys identify that respirators are required to provide additional protection, follow the recommendations of the RPPM and the requirements of chapter B6 regarding the use and care of respirators.

l. Secure and cover all deck drains and installed ventilation systems and openings in the paint removal work area to control dust. Isolate the work area to the maximum extent possible with drop cloths or plastic.

m. Personnel must minimize the use of water as dust control or clean-up in the paint removal process, since any used in the operation must be treated as HAZMAT.

n. Tools and surfaces in the work area must be wiped down with a damp cloth or tack cloth after completion of the task to remove dust.

o. Ensure that paint debris, wipe down rags, and other disposable materials are separated from reusable coveralls, gloves, and boots. Place disposable materials into plastic bags and turn them in to the ship's HAZMINCEN or HAZMAT coordinator.

3. Safety Precautions for Surface Preparation and Painting Operations

a. Wear eye and face protection and long sleeve shirts or coveralls with sleeves rolled down and all buttons buttoned at all times while chipping or operating power brushes, chipping, or scaling tools. Consult the RPPM about any respirator requirements for the operation. If lead-containing paint or paint containing other toxic metals is to be removed, an industrial hygienist should evaluate the operation and recommend proper respiratory protection and other personal protective clothing per chapter B10.

b. Do not paint in any area where welding or other hot work is being performed.

c. Wear respirators for painting operations if directed by the RPPM.

d. Return paint in closed, authorized containers, to the paint locker or ship's HAZMINCEN at the end of each day.

e. Store paint, brushes, and stirring sticks in closed metal containers. Do not place or store paint and paint wastes on the pier for extended periods of time. Do not place used paint containers in pier dumpsters after use. Turn in all paint waste to the ship's HAZMINCEN or designated area for disposal.

f. Ensure local exhaust ventilation system is switched on and operational in closed areas when painting.

g. Wear protective gloves when handling cleaning compounds, thinners, paints, removers, or other irritants. Do not use electrical safety gloves for paint work.

h. De-energize all equipment in areas being painted if using highly flammable paints.

i. Do not allow eating, drinking, or using tobacco products in the paint area. Ensure that when handling painting materials, take care to wash hands prior to eating, drinking, using tobacco products, or using the head.

j. When working over the side or aloft, see chapter B13 for additional precautions.

k. Use explosion-proof lighting during spray painting operations if using highly flammable paints.

l. All paints, paint cleaners, solvents and brush cleaners are HAZMAT. Return all containers of paints and thinners to the paint locker or ship's HAZMINCEN upon completion of the job, at the end of the workday, or when taking a lengthy break.

m. Only perform paint mixing in the paint locker or ship's HAZMINCEN if adequately ventilated. If not adequately ventilated, only mix paints on the weather decks. Provide posted barricades to ensure smoking, open flames, or hot work does not occur in the vicinity of the paint mixing area.

n. Avoid prolonged skin contact with paints and thinners and do not use paint thinners or mineral spirits to clean paint off of skin. Use an approved industrial skin cleaner to remove paint from skin. Never use bare hands to mix paints.

o. Use approved painting pollution prevention equipment according to the safety precautions provided.

(1) Wear eye and skin protection when dispensing paint, maintaining dispensers and brush holders, and cleaning paint brushes.

(2) Paint dispensing systems and paint brush holders are to be operated and maintained only by authorized personnel.

(3) Approved paint brush holders, provided for storage of paint brushes in mineral spirits, will be kept closed to avoid evaporation and release of vapors into the air.

APPENDIX C18-A
BEST MANAGEMENT PRACTICES (BMP) FOR REMOVAL AND APPLICATION OF PAINT, FINISHING, AND COATING MATERIALS

1. Surface preparation and the application of paints, finishes and coatings to ships can be sources of pollutants. Potential pollutants include organic compounds, oils and greases, heavy metals, and suspended solids. It is important both on ships and on the pier that painting and sanding operations be covered and contained and that good housekeeping and preventive maintenance practices are applied to prevent the contamination of storm water with paint over sprays and grit from sanding, chipping and needle gunning. The following subparagraphs 1a through 1p contain BMPs that should be applied if at all possible to minimize both water contamination and air emissions.

a. If using JLG Industries, Inc. aerial lifts, etc.:

(1) put tarps in floor of basket and get basket as close to the side of the ship where painting is occurring such that any drips of paint will be into the tarped basket,

(2) use smallest possible cans or drums of paint to reduce potential spillage, and

(3) ensure can is secured (tabs down) when not actively transferring paint.

b. If using paint floats or other floating platforms:

(1) pull the float as close to the hull as possible such that any drips will be captured on the float,

(2) use shrouds, tarps, or other protective devices between the float and the hull (can be secured by magnets) to protect any drips from entering the water,

(3) use smallest possible cans or drums of paint to reduce potential spillage, and

(4) ensure can is secured (tabs down) when not actively transferring paint.

c. When working pier side, whether in a JLG or just standing on the pier:

(1) a tarp should be placed above the water surface underneath the work area between vessel and pier or shore to prevent spillage into the water, when feasible, and the bottom edges of tarps and plastic sheeting need to be weighted to keep them in place;

(2) shrouds should be cleaned frequently to prevent material from being blown into the water;

(3) if a tarp cannot be secured between the ship and shore, use extreme caution to eliminate drips of paint into the water; and

(4) ensure cans are secured (tabs down) when not actively transferring paint.

d. When painting onboard ship or pier side, minimize air emissions:

(1) do not thin paint used on vessels or components;

(2) take care when transferring material to avoid spills, and clean up and properly containerize all spill residues immediately; and

(3) do not soak paint-related items such as stir rods in open thinner containers. Paint and solvent containers must remain closed at all times when material is not being added or removed.

e. Use drop cloths, cardboard, tarpaulins or other protective devices in staging area on pier where paint buckets, brushes, rollers, etc. are stored and paint transfer between containers is performed to keep any spills from reaching the pier or water or both.

f. Use minimal amount of paint on rollers and brushes so no drips are evident when removing from the staging and work area.

g. Use a roller pan to apply paint to roller and remove excess paint prior to extending the roller over the water. Use of 5 gallon buckets as dip pans is not acceptable for this purpose.

h. When not transferring paint, paint cans must be covered and sealed (tabs secured) to reduce the chance of spillage.

i. Collect and contain any debris generated from surface preparation work. Complete recovery of blasting material and paint chips is required.

(1) Use vacuum sanders that have dust-containment bags to remove paint from hulls and collect paint dust.

(2) Use plywood or plastic sheeting or both to cover open areas between decks when sandblasting (scuppers, railings, freeing ports, ladders, and doorways).

(3) Plug scuppers to contain dust and debris.

(4) Wipe down small amounts of sanding dust with a damp rag and vacuum or sweep paved surfaces regularly if debris has reached them. Never hose down areas that have spilled paint or debris. Properly dispose of debris.

j. Do not conduct spraying, blasting, or sanding activities in windy conditions such that containment measures are rendered ineffective.

k. Have absorbent and other cleanup items readily available for immediate cleanup of spills. Wipe up spills immediately.

l. Use a storm drain cover, filter fabric, or similarly effective runoff control device if dust, grit, paint, or other pollutants may escape the work area and enter a catch basin or pier drain. The containment device(s) must be in place at the beginning of the workday.

m. Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as brush cleaning outside or where spills can contaminate stormwater.

n. Inspect the condition of all protective devices at minimum before each work shift and repair and reposition as needed.

o. Store paint or tools with residual paint under cover during precipitation events and when not in use to prevent contact with stormwater.

p. Rags contaminated with solvent must be bagged and turned in for proper disposal. Do not allow to air dry. Never keep rags contaminated with solvent in work areas or other non-fire protected spaces as rags could self combust.

2. It is important to note that these are just some of the BMPs that can be used. Not all are applicable for every application. Judgment must be used to determine which can be used with the ultimate goal of keeping the paint and debris from reaching the pier and water. If there is a method for containing paint and debris that is not listed above and the applicability is uncertain, contact the local base environmental office for assistance.

SECTION C

CHAPTER 19

FOOD SERVICE AND SOLID WASTE DISPOSAL EQUIPMENT

Ref: (a) NAVMED P-5010, Manual of Preventive Medicine, Chapter 1
(b) NSTM 555, Surface Ship Firefighting

1. Discussion

a. A basic necessity for any ship is a galley. The crew must be fed and personnel must prepare food for consumption. The food preparation required to feed a large body of people means that machinery and equipment must be used. The use of this machinery introduces hazards unique to the galley and food preparation areas.

b. Every Navy ship is equipped with solid waste and garbage processing machinery, frequently under the purview of the supply department. This equipment includes pulpers, trash compactors, incinerators, plastic waste processors (PWP), and garbage disposers. Use of this machinery has unique hazards as well as environmental pollution ramifications.

2. General Precautions. Before attempting to operate machinery, observe the general precautions contained in the following subparagraphs 2a through 2x.

a. Check for and determine the location of emergency equipment, such as fire extinguishers, cut-off switches, and first aid boxes, to ensure their availability should an accident occur. Ensure machinery, hand tools and electrical equipment is properly grounded prior to operation. Report any deficiencies or malfunctioning equipment to the supervisor.

b. Ensure that the work area around the equipment is clear of obstructions and thoroughly dry. Clean up all spills immediately to ensure a clean, dry, non-slippery walking surface.

c. Ensure the installed lighting in the work area is operating properly and provides sufficient light.

d. Read, observe, and follow posted operating instructions and safety precautions.

e. If there is any doubt about operating procedures or safety precautions, ask the supervisor.

f. Only qualified personnel will attempt to operate equipment.

g. Ensure no loose gear is in the vicinity of moving parts of machinery. Make sure all safety guards, screens, and devices are in place before turning on machinery.

h. When operating a machine, maintain a safe distance from all moving parts. Never use hands or the body to stop moving blades and parts even if power has been secured.

i. Never lean against a machine while it is operating.

j. If ship movement is severe, exercise caution in operating machines; if severe movement continues, secure nonessential machines.

k. Use eye and hand protection, and safety equipment such as dip baskets while handling chemicals or hot water. Personnel at the deep sink must wear protective gloves with elbow-length or longer sleeves and apron to prevent hot water burns.

l. Keep hands, the body, and clothing away from operating machine parts.

m. Never leave operating machinery unattended.

n. Do not distract the attention of personnel who are operating machinery.

o. Do not attempt to clean or service machinery while it is in operation. Before cleaning, adjusting, oiling or greasing equipment, be sure power is secured and equipment is danger tagged. Follow tag-out procedure when servicing or cleaning equipment. If in doubt about the requirement to tag out any equipment, consult with the supervisor.

p. Ensure only qualified personnel make all repairs and service machines.

q. Make sure safety devices such as safety interlocks on galley equipment, such as the covers of garbage grinders, vegetable peelers and bread slicer, are maintained in proper working condition at all times. If removed for any reason, replace such devices before the machine is returned to operation.

r. Remove rings and watches, pagers, cell phones, and eliminate any loose clothing such as rolled-up sleeve cuffs, oversized gloves, and ill-fitting coats and jackets.

s. Ensure that permanently-mounted equipment is hardwired (extension cords are not permitted). Know where the cut-off switches for hard-wired equipment are located. Obey all tag-out tags on switches.

t. When cleaning, look before reaching into enclosed spaces or under grills or griddles for loose wires or sharp obstructions.

u. Use caution when applying conductive cleaning fluids or water in the vicinity of electrical devices to mitigate shock hazards and damage to electrical equipment.

v. Avoid touching sharp metal edges of opened cans and lids.

w. Report any injuries, such as burns, cuts or open wounds, to the MDR.

x. Additional precautions may be found in reference (a). Personnel assigned to permanent and temporary work in food service areas must be given a copy of these precautions prior to beginning their assignment.

3. Cooking Utensils

a. Secure all coffee pots and urns to prevent dislodging and splashing.

b. Exercise extreme caution and care when handling hot oils, water, and other liquids or when operating steam valves and equipment. In heavy or moderate sea states, do not transfer hot liquids.

c. Never leave operating hot plates, pots, griddles, steam kettles, or fryers unattended.

d. Be careful not to place meat, vegetables, or other foods on a knife or other sharp instrument. The food may conceal the cutting edge.

e. Do not place knives in the wash water until ready to wash them. Lay them in plain view beside the sink.

f. Keep the free hand away from the sharp edge of the cleaver when chopping foods.

g. Use a protective glove (e.g., metal fiber or Kevlar®) when boning meat.

h. Keep the surfaces of meat blocks level.

i. Store utensils in their proper places.

j. Do not allow pot or pan handles to extend beyond the edge of the range or counter. They can be bumped and serious burns to personnel resulting from spilled food or liquid.

k. Before removing foods from hot ranges and ovens, be sure there is a clear place on which to set them and clear the path to that place.

l. Use only the proper implements for opening cans and other containers.

m. Hold knives firmly. Ensure knife handles are dry or free of grease before handling them.

n. Knives should be stored in National Sanitation Foundation racks.

o. Magnetic knife racks are prohibited due to knife magnetism picking up foreign material.

p. Keep knives sharp at all times.

q. Never handle a knife while carrying another object.

r. Ensure hot pads are clean and dry.

s. Keep all tools clean and dry.

4. Food Preparation

a. Practice good personal hygiene at all times, and report all illnesses and injuries to the supervisor.

b. Keep hands clean and thoroughly wash hands with soap and water after using the head, touching the mouth or nose, or handling any food.

c. Keep fingernails short.

d. Wear appropriate hair covering at all times in food-handling areas.

e. Do not touch food with bare hands. Use appropriate implements for handling food or wear plastic food handling gloves when working with ready to eat foods.

f. Never handle food with an open wound or infection of any kind on the hands or arms. Sore throats, colds, intestinal disturbances, or symptoms of other general diseases must be reported to the MDR at once.

g. Clean up spilled food immediately.

h. Do not use leftovers held over 24 hours. Ensure all leftovers are marked with the date and time they were placed in storage.

i. Ensure that distant-reading dial thermometers and, when required, electronic temperature-monitoring units are installed, calibrated and operating. Verify thermometer accuracy monthly. Ensure the emergency door-release mechanism required in "walk-in" refrigerators and freezers is installed and properly operating.

j. Discard protein foods that have remained at temperature between 41 degrees Fahrenheit and 135 degrees Fahrenheit longer than 4 hours.

k. Observe safety precautions around all electrical equipment to avoid injury from shock. Do not reach into areas for cleaning around griddles and ovens that have exposed wiring unless the equipment has been tagged out.

l. Wear eye and hand protection when using oven cleaners or other strong cleaning materials. Do not dispense bulk cleaners into spray bottles without properly labeling the spray bottle with the new contents; see chapter B3 for details on labeling HAZMATs.

5. Safe Operation of Food Service Equipment

a. General precautions. Observe all posted operating procedures or manufacturers operating instructions for each piece of food service equipment prior to operating. Additionally, inspect all electrical equipment (range, griddle hotplate, and disposals) for exposed, chafed or frayed wiring.

(1) Ensure all power switches are functional.

(2) Ensure all required guards are in place.

(3) Ensure rubber boots over switches in wet areas are in good condition.

(4) Ensure all personnel operating equipment or performing food service functions are trained and properly supervised.

b. Deep Fat Fryer

(1) Beware, this is high voltage equipment.

(2) Extinguish a fire in the deep fat fryer per reference (b).

(3) Never leave fryer unattended when in use.

(4) Ensure heating coils are completely covered with cooking oil before turning on the equipment.

(5) Never exceed the maximum temperature noted by manufacturer.

(6) Monitor cooking oil temperature with a proper thermometer whenever the deep fat fryer is in use. Ensure backup safety thermostat is installed and operational.

(7) Install cover when fryer is not in use.

(8) Secure deep fat fryer following posted instructions when not in use.

(9) Ensure that grease spills are cleaned up promptly.

(10) Wash and change grease filters in range hoods as often as necessary per PMS, but not less than weekly, to avoid the danger of fire.

c. Dough Mixing Machine

(1) Never attempt to cut dough while the agitator is revolving.

(2) Never attempt to knead or feel consistency of dough product while machine is in operation.

(3) Never attempt to clean out a bowl in the tilt position by reaching in unit while the agitator is revolving.

(4) Check safety switch to lid cover for proper functioning per PMS requirements.

d. Food Mixing Machine

(1) Use proper machine speed for the specific operation.

(2) Never place hands into the bowl while machine is in operation.

e. Vegetable Cutting and Slicing Machine

(1) Always use plunger when applying pressure on vegetables being fed into the hopper.

(2) Do not use loose-fitting gloves when operating the machine.

f. Meat Slicing Machine

(1) Never operate the machine unless the blade guard is secured in place.

(2) Do not use hands to press down food.

(3) Never touch the blade when it is running or exposed for slicing.

(4) Set index at zero and secure power at the distribution box or by pulling the plug when cleaning blade.

(5) Ensure slicing machines are provided with a toggle -switch finger-guard that is oriented in the proper direction for protection.

(6) Always disconnect power cord prior to cleaning and reconnect only when ready to use.

(7) Ensure meat slicers are de-energized at the power source, not just turned off with a local switch, prior to dismantling and reassembling for cleaning. Ensure any switches on meat slicers are guarded to prevent then being turned on unintentionally.

(8) Once de-energized, clean the blade with a clean, detergent-soaked cloth wrapped around a cook's fork or other extension utensil. Rinse the blades following a similar procedure and sanitize them with an approved disinfectant.

(9) Reassemble machine after cleaning.

(10) Meat slicers that are hardwired must have an interlocking switch installed. Tag-out procedures must be followed prior to blade removal.

g. Direct Steam Kettle

(1) Each day this equipment is used, test the safety relief-valve while under operating pressure by pulling the chain attached to the safety relief valve arm.

(2) Do not tamper with the safety-valve or tie it closed. It is there to prevent the kettle from exploding.

(3) Do not apply steam to an empty kettle; never put water into a hot, dry kettle.

(4) Ensure safety relief-valve levers are equipped with an 18-inch chain to allow activation from a safe distance. Chains must be mounted in such a way that the need to reach over or between or behind hot kettles is eliminated.

(5) Ensure relief valves are hydrostatically tested as required by applicable PMS.

(6) Piping from relief valves must extend to just inside the deck coaming.

(7) Lagging under steam kettle must be removed and replaced with perforated steel or aluminum with approximately 1/2-inch standoff.

h. Electric Steam Kettle

(1) If required, check water level as necessary and fill when the kettle is cool.

(2) Prior to kettle maintenance, ensure the kettle is cool with power secured. Follow tag-out procedures before completing kettle maintenance.

(3) Relief valves should only be lifted when the kettle has been laid up and is cold per MIP 6520. An 18-inch pull chain is not required for electric kettles.

(4) Ensure relief valves are hydrostatically tested as required by applicable PMS.

(5) Piping from relief valves must extend to just inside the deck coaming.

i. Electric Griddle

(1) Keep griddle turned off when not in use.

(2) Keep cooking surface and grease gutter scraped and wiped clean at all times.

(3) Remove, empty, and clean grease drawer after each use. Do not reach into the drawer area for cleaning unless the griddle is tagged out.

(4) Use griddle guards to keep food from sliding off the cooking surface.

(5) Never use water to clean a griddle surface. Wipe the surface with clean, dry paper towels when the griddle is cold. Use pumice stone block to clean hard-to-remove burn spots.

j. Coffee Urn

(1) Do not introduce water too quickly into the boiler.

(2) Do not overfill boiler. Be sure water has stopped rising in the gauge glass after the water-inlet valve is closed. Do not turn on activating switch until water-level gauge reads full or the pressure control dial reads 36 ounces.

(3) Do not open urn cover while siphon valve is open. Do not agitate coffee while cover is open. Do not remove leacher from the urn body until it is completely drained.

(4) Do not obstruct safety-valve outlet. Keep equipment clean. Clean the urn immediately after use to prevent development of rancid taste.

k. Ranges and Ovens

(1) Do not allow grease to collect in oven.

(2) Do not clean oven while it is hot.

(3) Clean oven thoroughly once a week in addition to normal daily cleaning.

(4) Turn off surface units when not in use.

(5) Keep range drip-pan and grease trough clean. Never allow grease to accumulate since it is a serious fire hazard.

(6) Observe the electrical wiring under the range griddle and hot plate to see if wiring is secured in place and not chafed or in contact with the grease drip-pan. Tag-out the power source prior to cleaning under the range, griddle, or hot plate. Do not attempt to correct faulty wiring. Report electrical hazards to the supervisor.

l. Combi-Ovens

(1) Do not use chemicals intended for oven cleaning these may be harmful to the interior and exterior oven surfaces.

(2) Cool oven to 140 degrees Fahrenheit before cleaning. If idle, operate in steam mode 3 to 4 minutes before cleaning.

(3) Prior to oven maintenance ensure the oven is cool with power secured. Follow tag-out procedures before completing any oven maintenance.

m. Proofer

(1) Only authorized personnel are permitted to operate this equipment.

(2) Clean the proofer after each use.

n. Dishwashing Machine. Observe operating instructions and safety precautions.

(1) Ensure rubber protectors over switches are in good condition (no cracks or tears).

(2) Wear protective equipment when changing out cleaner dispensers.

(3) General ventilation in the space and local exhaust ventilation to remove steam from the machine must be operational.

(4) Do not reach into the dishwashing machine while operating - secure power before trying to clear the conveyor.

o. Steam Table

(1) Use the proper implements, such as pot holders and tongs, for handling the containers.

(2) Tilt containers away from oneself when inserting them into the wells.

(3) Carry hot liquids in covered containers with the covers securely in place and use heat protective hand protection.

(4) Promptly mop up grease which is spilled on the deck. Greasy decks are doubly hazardous. They can cause fires as well as falls.

p. Gaylord Exhaust Hoods

(1) The fire extinguisher control box contains a live electrical circuit. Prevent water or other cleaning fluids from entering this box.

(2) The baffle blades and interior of hood should be cleaned at least once a day to prevent fires from accumulation of grease.

(3) Keep the access doors closed during the wash and rinse cycles to prevent hot water from splashing personnel.

(4) Keep hood drains clear at all times.

q. Meat Chopping Machine

(1) Never feed this equipment by hand. Use a pestle (stomper).

(2) Never attempt to remove anything from these machines while they are operating.

(3) Always disconnect the machines before cleaning them.

r. Potato Peeler

(1) Make sure water is running before operating this equipment.

(2) Never put hands in this machine while it is operating.

(3) Ensure power is properly secured prior to cleaning the machine. Remove the internal bottom with two round rods and clean with hot soapy water; rinse before reinstalling bottom.

s. Microwave Ovens

(1) Keep the inside of the oven door and cabinet surfaces clean at all times. Do not use tools or abrasives on door closing surfaces.

(2) Do not allow oven door to be closed on any object including rags, towels, etc.

(3) Do not attempt to defeat the oven door safety interlocks.

(4) Do not operate the oven with an empty cavity and keep all metal utensils out of the oven cavity at all times.

(5) Do not obstruct cooling vents in the oven housing.

(6) Keep the oven door closed when the oven is not in use.

6. Solid Waste Processing Equipment

a. Garbage Disposers

(1) Do not put hands into disposers when in operation.

(2) Ensure guards, safety cutoffs, and other safety features provided with the unit are installed and functional prior to use.

(3) Start disposers and turn on water before feeding waste.

(4) Feed food waste gradually.

(5) Do not feed metal, wood, paper products, cloth, rubber, plastics, rice, or corn husks into the disposer. If such material is fed accidentally, secure power to the disposer. Notify the supervisor to see if tag-out procedures are needed to safely remove the object. Do not feed bones larger than 1/4 inch in diameter for the 400-pound per hour model or larger than 1 inch in diameter for the 1,600-pound per hour model into the disposer.

b. PWPs

(1) Only authorized personnel may operate the PWP.

(2) Hazards with the PWP include hot surfaces, electrical hazards when cleaning, and slippery decks.

(3) Follow operating instructions provided with the PWP.

(4) Wear the proper PPE including heavy-duty gloves, safety glasses, and leather apron while operating the PWP.

c. Incinerator

(1) Only authorized personnel may operate the incinerator.

(2) Hazards with the incinerator include hot surfaces.

(3) Follow operating instructions provided with the incinerator.

(4) Wear the proper PPE including fire retardant coveralls, heavy-duty gloves, face shield, and apron while operating the incinerator.

(5) Ensure guards, safety cutoffs, and other safety features provided with the unit are installed and functional prior to use.

(6) During ash removal, wear the proper PPE including heavy-duty gloves, face shield, apron, and respirator with P100 filter.

(7) Do not process feminine hygiene products or pilot urine bags through the shredder.

(8) Do not batch load any waste material, other than feminine hygiene products or pilot urine bags, directly into the combustion chamber.

(9) Due to explosion or health hazards, do not incinerate any HAZMATs including:

(a) flammable liquid or explosive material,

(b) aerosol cans,

(c) medical and dental waste,

(d) batteries,

(e) butane lighters,

(f) heavily soaked oily rags (lightly soaked oily rags may be burned in Golar incinerators), and

(g) CO_2 cartridges.

(10) Incinerate no more than 25 percent of load volume or greater than 50 pounds per hour of plastics and textiles (e.g., packing material, foams, shrink wrap, pilot maps).

d. Pulper

(1) Do not put hands into pulper when in operation.

(2) Only authorized personnel may operate the pulper.

(3) Hazards with the pulper include electrical hazards when cleaning and slippery decks.

(4) Follow operating instructions provided with the pulper.

(5) Wear the proper personnel protective equipment including rubber gloves, face shield, and apron while operating the pulper.

e. Solid Waste Shredder

(1) Do not put hands into shredder when in operation.

(2) Only authorized personnel may operate the solid waste shredder.

(3) Hazards with the shredder include electrical hazards when cleaning and slippery decks.

(4) Follow operating instructions provided with the shredder.

(5) Wear the proper personnel protective equipment including heavy-duty gloves, safety glasses, and leather apron while operating the shredder.

SECTION C

CHAPTER 20

LAUNDRY

Ref: (a) NSTM 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables
(b) NSTM 300, Electrical Plant Safety
(c) NAVSEA S0400-AD-URM-010, Tag-Out User's Manual (TUM), Revision 7
(d) NSTM 655, Laundry and Dry Cleaning

1. Discussion. Hazards in laundries include mechanical equipment, toxic chemicals, electric power, noise, and heat stress. General safety precautions to be followed in these areas are provided in this chapter. Ships must provide a copy of these precautions to personnel assigned to work with laundry equipment prior to beginning their assignment.

2. Laundry Precautions

a. General Precautions

(1) See reference (a) concerning handling and stowage requirements for HAZMATs used in laundries.

(2) Personnel must use protective equipment listed in reference (a), SDS, or the current IH survey as required.

(3) Do not disable two-hand safety switches on any of the presses and ensure personnel using presses are trained in their safety precautions.

(4) Ensure ventilation systems and spot coolers are functioning in laundry and press areas, and that presses are provided with local exhaust ventilation.

(5) Ensure automated detergent dispensers are properly maintained and electrically grounded per reference (b) and PMS requirements.

b. Washer Extractor

(1) Thoroughly examine all clothing before cleaning; remove all foreign materials such as lighters, ink pens, and metallic objects.

(2) Ensure that the inner pocket door is firmly latched before operating the machine.

(3) Do not exceed the prescribed loading capacity of the cylinder; doing so may damage the machine or prove hazardous to personnel.

(4) Ensure the machine is entirely disconnected from the circuit before cleaning or servicing. Use safety tag-out procedures as required by reference (c) and PMS requirements.

(5) Ensure safety devices are maintained in proper working condition at all times. If removed or out of order for any reason, replace safety devices before the machine is put into operation.

(6) Use only approved detergents in recommended quantities. Ensure a neutralizer is used in the wash as residual detergent may cause skin irritation.

(7) Ensure safety precautions and operating procedures are posted.

c. Tumbler Dryer

(1) Never overload the machine.

(2) Never open the door while the tumbler is in motion.

(3) Before servicing or cleaning, be sure the power to the tumbler dryer is entirely disconnected. Use safety tag-out procedures as required by reference (c) and PMS.

(4) Maintain safety devices in proper working order at all times. If removed for any reason, replace safety devices before machine is put into motion.

(5) Ensure that the primary lint screen is checked and cleaned as required prior to use and after every drying cycle and at the end of the workday. Ensure the secondary lint filter (40-mesh) is cleaned after every 8 hours of operation and at the end of the workday.

(6) Ensure the laundry is manned and equipment is monitored while in operation.

(7) Ensure NAVSEA 1995/93 Preventing Laundry Dryer Fires are posted (S/N 0118-LF-981-6600).

(8) Never allow the thermostatic control switch on the type 1 steam operated dryer to exceed 160 to 185 degrees Fahrenheit, plus or minus 10 degrees Fahrenheit, per reference (d).

d. Self-Service Laundries

(1) Ensure self-service laundry equipment is installed only in authorized areas, where dryer ventilation, drainage, and electrical service are provided.

(2) Post NAVSEA 1995/93 at each unit.

(3) Clean dryer primary lint filters after each use. Ensure the secondary lint filter (40-mesh) is cleaned after every 8 hours of operation.

(4) Dryer vents must be directed into an approved overboard exhaust, never to water filter units within the space.

SECTION C

CHAPTER 21

MEDICAL AND DENTAL FACILITIES

Ref: (a) BUMEDINST 6250.12D, Pesticide Applicator Training and Certification for Medical Personnel
(b) NAVMED P-117, Manual of the Medical Department, Chapter 21, Pharmacy Operation and Drug Control
(c) NSTM 670, Stowage, Handling, and Disposal of Hazardous General Use Consumables
(d) OPNAV P-45-113-3-99, Afloat Medical Waste Management Guide

1. Discussion. This chapter contains basic safety precautions that medical and dental personnel must observe to protect themselves and their patients from harm. Consult operating manuals and PMS cards for complete safety precautions related to specific equipment.

2. Safety Precautions for Medical and Dental Facilities

a. Special Precautions

(1) Dispose of disposable needles and syringes in "sharps" containers as an entire unit.

(2) Keep all liquid pesticides under lock and key. Keep bulk amounts in a flammable liquid storeroom.

(3) Ensure that only medical department personnel who are certified as shipboard pest management specialists use pesticides per reference (a).

(4) Keep all poisons under lock and key.

(5) Double lock the pharmacy when not in use, with keys made available only to authorized personnel.

(6) Do not stow, use, or dispense methyl alcohol in the pharmacy.

(7) Account for methyl alcohol in same manner as ethyl alcohol and narcotics. Attach a prominent label to each container of methyl alcohol with clear warning of its dangerous qualities.

(8) Stow acids and bases in NAVSEASYSCOM-approved corrosive lockers segregated as required by references (b) and (c). Corrosive lockers may be stored in the medical storeroom or other spaces as required by reference (c). Contact the HAZMAT coordinator for assistance in determining proper storage locations.

(9) Stow a minimum working stock of flammable materials (e.g., alcohol and acetone) in a NAVSEASYSCOM-approved flammable locker in medical department spaces. Keep bulk stock in the flammable liquid storeroom.

(10) Ensure only medical department personnel handle bacteriological specimens.

(11) Due to a large number of extremely hazardous shipboard jobs requiring full attention at all times, label all medications affecting awareness.

(12) When handling and disposing of medical waste follow the guidelines in reference (d).

b. General Safety Precautions

(1) Do not permit any smoking, including use of e-cigarettes or vapes, in areas where oxygen is being administered.

(2) Secure all medical equipment having wheels when not in use. Use wheel blocks or securing straps for this purpose.

(3) Do not plug non-medical or personal electronic equipment into electrical outlets designated “for medical equipment use only.”

SECTION C

CHAPTER 22

CO_2 FIXED FLOODING SYSTEMS

Ref: (a) NSTM, NAVSEA S9086-CH-STM-030/CH-074 V3, Gas Free Engineering

1. Discussion

a. This chapter contains basic safety precautions that personnel must observe to protect themselves from harm from carbon dioxide (CO_2) fixed flooding systems. Consult operating manuals and PMS MRCs for complete safety precautions related to specific items of equipment.

b. Follow the procedures and precautions in this chapter whenever performing corrective or preventive maintenance work inside or outside a space protected by a CO_2 fixed flooding system. This includes work on the CO_2 fixed flooding system and in the immediate area of manual or electrical controls for the system.

c. This chapter discusses the health hazards of CO_2, general safety precautions, and procedures for disabling CO_2 fixed flooding systems, for general maintenance and for rescue personnel.

d. CO_2 is a colorless, odorless gas that is naturally present in the atmosphere at an average concentration of 0.03 percent. It extinguishes fires at high concentrations by reducing the concentration of oxygen to the point that combustion stops. Concentrations of CO_2 in the range of 30 to 70 percent are needed to extinguish fires.

e. CO_2 for firefighting is stored as a liquid at high pressures. Upon discharge into a protected space, most of the liquid flashes to vapor and the rest forms fine, dry ice particles.

2. Health Hazards of CO_2

a. CO_2 is 1.5 times heavier than air, and will collect at low points. Unless forced ventilation is provided, CO_2 will remain in the protected space and may migrate to adjacent spaces, especially if they are lower than the protected space. Ship's personnel should be aware of this whenever they approach a room in which the CO_2 has discharged.

b. If CO_2 concentrations are greater than 30 percent, loss of consciousness will occur within half a minute. As the concentration increases further, cardiac arrest, brain damage due to lack of oxygen and even death might occur. The body reacts to concentrations less than 10 percent by rapid and deeper breathing, headaches, and vomiting.

c. Tests have shown that within 2 seconds of actuation of a CO_2 fixed flooding system within a protected space, visibility is obstructed and within 3 seconds enough pressure has built up to prevent opening inward swinging doors.

3. Safety Precautions

a. Personnel performing work inside CO_2-protected spaces without a CO_2 system time delay must ensure that inward swinging access doors are blocked open by a positive means, such as a C-clamp rigidly attached to the frame or door, to provide a minimum opening of 6 inches.

b. Ensure that the safety precautions in the below subparagraphs 3b(1) through 3b(9) are followed when working on the CO_2 system inside a CO_2-protected space with the CO_2 system functional.

(1) Do not begin work on a CO_2 fixed-flooding system until a safety briefing has been given to all personnel involved in the maintenance work, the assigned rescue personnel, and persons in areas susceptible to CO_2 leakage.

(2) Verify that CO_2-protected space ventilation is in operation.

(3) Evacuate all personnel from the CO_2-protected space except those directly associated with the maintenance work. Evacuate all non-essential personnel from areas susceptible to CO_2 leakage.

(4) Identify and be familiar with an escape path from the protected space and areas susceptible to leakage of CO_2 to a safe haven not susceptible to CO_2 leakage.

(5) Verify that doors or hatches to the CO_2-protected space and from areas susceptible to CO_2 leakage are blocked open and hatches or doors on the way to a well-ventilated space or to the weather are blocked open.

(6) Post temporary danger signs to warn personnel of the hazard and temporary warning signs to limit access to the CO_2-protected space and spaces susceptible to leakage of CO_2. These signs should have lettering of at least 1 inch high. Danger signs must include the words, "DANGER - CARBON DIOXIDE GAS - WHEN ALARM SOUNDS - VACATE IMMEDIATELY." Post signs inside and at accesses to CO_2-protected spaces and inside all spaces susceptible to CO_2 leakage.

(7) Ensure all personnel inside CO_2-protected spaces wear operating SCBA.

(8) Verify that all personnel in spaces susceptible to leakage of CO_2 have EEBDs immediately available.

(9) Ensure rescue personnel are assigned, equipped, and located per paragraph 6. Rescue personnel must maintain a count of personnel inside the CO_2-protected space.

c. Ensure that the following safety precautions are followed when working on the CO_2 system outside a CO_2-protected space with the CO_2 system functional. Follow the procedures listed in subparagraph 3b for work done inside the CO_2-protected space with the exception of the following escape path procedures in subparagraphs 3c(1) and 3c(2).

(1) Verify that the doors and hatches to the CO_2-protected space are closed.

(2) Verify that the doors or hatches in the escape path are blocked open.

d. Test the alarm systems within the guidelines provided by the PMS cards.

e. Be aware that any movement of the cylinder or the pull cable can actuate the pull-cable actuation systems.

f. Be aware that the seawater sprinkling system controls look similar to components of the CO_2 fixed-flooding systems.

g. Be aware that CO_2 can be discharged from CO_2 bottles if they are dropped and their discharge heads become damaged.

h. Take precautions not to accidentally rotate the CO_2 cylinder in its brackets, thereby putting tension on the actuation cable.

i. Follow PMS procedures carefully during the process of removing and installing discharge and control heads to avoid accidental discharge of CO_2.

4. General Procedures During Maintenance Work

a. Ensure that the DCA, the EOOW, cognizant department head, and the OOD, when underway, or the CDO, engineering department duty officer, cognizant department head, the OOD, and damage control central, when in-port, are notified and requested to be ready to respond immediately in case of an emergency before the work starts.

b. Ensure that all personnel directly involved follow tag-out procedures, including tag-out of all locations from which CO_2 discharge can be actuated.

c. The cognizant division officer must verify that all ship maintenance personnel involved in maintenance on CO_2 fixed-flooding systems meet the applicable personnel qualification standards and that knowledgeable, qualified supervision is assigned.

d. Ensure that any actuation of a CO_2 discharge alarm, either audible or visual, is investigated. An alarm that continues longer than one minute is abnormal and should be immediately investigated.

e. When corrective or preventive maintenance work is being done on the CO_2 system, do not permit normal space functions and other maintenance work in the CO_2-protected space.

5. Disabling Procedures

a. Always disable CO_2 fixed-flooding systems by removal of the discharge heads and removal of the CO_2 cylinder control head, when installed.

b. Ensure that the period of time that a CO_2 fixed-flooding system is disabled is limited whenever flammable material is in the CO_2 protected space.

c. Establish backup flammable liquid firefighting capabilities (such as an aqueous film forming foam hose or a seawater hose with a 5-gallon can of aqueous film forming foam concentrate and a portable educator) during the period the CO_2 system is disabled.

d. Establish fire watches during the period that the CO_2 system is disabled.

6. Rescue Personnel Procedures

a. Ensure that a minimum of two rescue personnel are assigned. Assign additional personnel when more than four maintenance personnel are present using a ratio of one rescue person for each two maintenance personnel.

b. Locate rescue personnel at or near the access to the CO_2-protected space in which the maintenance work is being performed or in the area in which the work is being done outside the CO_2-protected space. Position rescue personnel so that they can monitor maintenance personnel, as well as space and area conditions.

c. One rescue person must have communications, such as a sound-powered phone, with a manned location such as damage control central, main control, the quarterdeck, or the bridge.

d. Equip assigned, qualified rescue personnel with SCBA and ensure they are capable of providing CPR.

e. Once accidental discharge of CO_2 has occurred; rescue personnel should do the following contained in subparagraphs 6e(1) through 6e(9).

(1) Inform DC central, main control, and the quarterdeck (when in port) or the bridge (when underway) of the emergency and request assistance, including medical assistance.

(2) Help maintenance personnel escape.

(3) Count personnel leaving area to assure all personnel have departed.

(4) Search for personnel who have not departed and assist them to escape.

(5) Verify that space in which CO_2 is dumped is free of personnel and then close the access door or hatch to reduce spread of CO_2 to other areas of the ship or space.

(6) Proceed to a safe haven.

(7) Perform CPR on any personnel that require help until assistance arrives.

(8) Report status of escape to operating station.

(9) Start ventilation to space.

f. Rescue personnel must wear PPE (e.g., SCBA) appropriate for entry into IDLH atmospheres (refer to reference (a)).

SECTION D. SUBMARINE SAFETY STANDARDS

CHAPTER 1

BASIC SAFETY

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion

a. Shipboard life is one of the more hazardous working and living environments that exist. The existence of HAZMATs and equipment, in addition to the fact that a ship is a constantly moving platform subject to conditions such as weather, collision, and grounding contribute to a potentially hazardous environment. Any chain of mishaps could lead to a major catastrophe. It is for this reason, practical safety must be followed and the prescribed safety regulations strictly followed to prevent personal injury and illness.

b. As a risk control measure, and a consideration when using ORM to plan an evolution, consider assigning a safety observer, whose only responsibility is safety, during any evolution that could injure personnel or damage equipment. This safety observer should be knowledgeable in the proper performance of the evolution and have the ability to identify safety related concerns or procedural violations. Reference (a) contains additional guidance on ORM.

c. The general safety standards in the following paragraph 2 are applicable to all shipboard operations and spaces. These standards have been adopted from requirements from the NAVSEASYSCOM, the OSHA, USCG SOLAS, ANSI, and previous OPNAV directives. The standards provided in this chapter may not be all inclusive for every possible evolution on board ship, and the lack of a specific standard does not imply that a practice is safe just because it is not mentioned. Use ORM to determine the safety requirements for unique evolutions and operations.

2. General Safety Standards

a. Ladders and Egress

(1) Be familiar with all exits and egress routes from working and living spaces.

(2) Always move up or down a ladder with one hand on the railing. Never slide down inclined ladder rails. Do not carry loads up or down ladders that obstruct movement or sight (use additional personnel to support the load and a spotter when required).

(3) Always ensure exits are not locked or blocked with equipment or any other type of interference.

(4) Do not run onboard except for designated exercise locations.

(5) Always be cautious when nearing a "blind" corner or opening doors.

(6) Never lock escape scuttles or other accesses so they cannot be opened from the inside.

(7) Never dismantle or remove any inclined or vertical ladder without permission of the commanding officer. Such areas must be secured with temporary lifelines and must be posted with a warning sign on every deck affected.

(8) After opening and prior to passing through a watertight door or hatch for extended access, scuttle or manhole cover for routine access, ensure hatch brace pins, safety pawls, scuttle covers, and manhole covers are positively locked. Properly secure watertight door, hatch, scuttle, or manhole cover when access is complete.

(9) Provide temporary barriers using guardrails, lines, or chains; suitably supported by stanchions or pads, when opening accesses in bulkheads or decks that are normally closed.

(10) Ensure that low overheads above inclined ladders (less than 72 inches in height), ladder grab bars, and passageways (less than 75 inches in height) and obstructions in passageways are padded or protected to prevent head injury if struck.

b. Non-skid. Ensure non-skid decking material, non-skid paint or three adhesive non-skid strips (no space in between strips) are installed at the following locations listed in subparagraphs 2b(1) through 2b(6).

(1) At the top and bottom of each ladder.

(2) On both sides of doors and arches with sills or coaming higher than 4 inches.

(3) On both sides of doors to mess room, galley, and sanitary spaces (may be on exit side only if non-skid tiles are installed in messing spaces).

(4) Outside of refrigerated stores spaces.

(5) On the passage side of doors from spaces which may have wet decks.

(6) In the machinery operators work areas.

c. Damage Control

(1) Know the location and operation of all emergency breathing devices and other emergency equipment in or near the living and working spaces.

(2) Know the location of all fire stations and other firefighting equipment throughout the ship.

(3) If passing through a watertight door, hatch, or scuttle designated to be closed during normal operations, be certain to properly close and dog it.

(4) Never tamper with any damage control or rig for dive fittings or equipment.

(5) Personnel entering the void or tank must wear a harness with a safety line attached, wear proper protective equipment, and have a second person tending the safety line outside the tank or void unless alternate precautions have been specified by a gas free engineer.

d. Stowage and HAZMATs

(1) Make sure that all movable objects are secured for sea using appropriate materials. Whenever feasible, provide permanent secure-for-sea mountings with metal bands, bolts or other securing devices.

(2) Ensure all HAZMATs, including cleaners and paints, are properly labeled, safely used, and returned after use, per the ship's procedures.

e. Machinery

(1) Wear short sleeves or roll up sleeves when operating rotating industrial machinery. See chapter B12 for specific protective clothing requirements.

(2) Know the emergency shut-down procedures for all equipment used.

(3) Do not wear rings, watches, key rings, bracelets, pagers, cell phones, and other items that may become entangled or caught on projections, or may be a shock hazard when working with electrical or electronic equipment.

(4) Always wear approved safety shoes when required.

(5) Do not operate machinery and tools without proper training and authorization.

(6) Keep decks free of obstacles and materials causing slippery conditions, particularly in work areas. Post warning signs in areas that are slippery.

(7) Never operate machinery or equipment with defective or missing safety devices.

(8) Ensure hazardous area boundaries around machinery are established and marked with appropriate deck marking.

(9) Never tamper with or render ineffective any safety device, interlock, ground strap or similar device intended to protect operators or the equipment without specific approval of the commanding officer.

(10) Never open or close electrical switches and pipe valves without authorization.

f. Ventilation. Always ensure ventilation ducts are free of blockage. Never alter ducts or diffusers without authorization. Know where ventilation controllers are located for the work and living areas.

g. General Space Safety

(1) Keep constantly familiar with the whereabouts of crewmembers in the work space; especially if they are working in tanks, voids, or other restricted movement areas.

(2) Observe and enforce all PPE requirements.

(3) Promptly report all unsafe conditions discovered.

(4) Never straddle or step over lines, wires, or chains under tension.

(5) Never hesitate to stop a shipmate from doing something that may be hazardous or unsafe, and never leave a worksite in an unsafe condition.

(6) Use of personal earphones and headphones is not authorized except in recreation and study areas, in berthing spaces or other specific submarine authorized spaces.

h. Topside

(1) Appropriate sunglasses may be worn when topside. Sunglasses will not be worn as a substitute for impact safety glasses, sun and wind goggles, flight deck goggles, or as protective equipment for operations such as fire watch or welding.

(2) Know where all life rings, dye markers, and flares are located for man overboard emergencies.

(3) Do not lean against lifelines. Never dismantle or remove any lifeline, hang or secure any weight or line to any lifeline except as authorized by the commanding officer. Use temporary lifelines when possible.

(4) Wear an IBLP or auto-inflatable utility life preserver and approved topside shoes where the potential exists of falling, slipping, being thrown or carried into the water. Wear authorized safety harnesses on the main deck, bridge and other areas as specified by the ships SOP, standard submarine organization and regulations manual, or the commanding officer while underway.

3. Safety Color Code and Signs for Marking Physical Hazards

a. Danger. Red is the basic color for the identification of dangerous equipment or situations.

(1) Safety cans or other approved portable containers of flammable liquids. These metal cans must be painted red with some additional clearly visible identification either in the form of a yellow band around the can or the name of the contents conspicuously stenciled or painted on the can in yellow.

(2) Danger signs are red, with black and white lettering, to indicate a hazardous situation, equipment, area, or condition, which has a high probability of death or severe injury.

(3) Emergency stop bars on hazardous machines, such as rubber mills, wire blocks, or flat work ironers. Stop buttons or electrical switches, on which letters or other markings appear and are used for emergency stopping of machinery, must be red.

(4) Red danger tape is used to indicate an immediate hazard or area and excludes any unauthorized personnel from entering the area.

b. Caution. Yellow is the basic color to denote caution.

(1) Yellow is the basic color for designating caution and for marking physical hazards such as: striking against, stumbling, falling, tripping, and "caught in between." Solid yellow, yellow and black stripes with suitable contrasting color should be used interchangeably, using the combination, which will attract the most attention in the particular environment. Overhead obstructions (less than 72 inches in height), monorails, and turntables must be painted solid yellow.

(2) Yellow and black are the colors of caution signs used to indicate a hazardous situation, which may result in minor or moderate injury. Caution signs must be yellow with black lettering, and must be used for eye hazard and noise hazard signs.

(3) Use yellow and black striping or checkerboard designs, painted or taped, to indicate industrial eye hazardous areas, trip hazard areas, or other areas where caution should be exercised.

(4) Yellow caution tape is used to indicate a potential hazard or area and only authorized personnel with knowledge of the hazard may be allowed to work in the area.

c. Safety Information. Green is the color of general safety information and instructional signs, such as the location of emergency eye wash stations and safety precaution placards.

d. Workshop Deck Markings. Deck markings are used around permanently installed workshop machinery to alert personnel nearby of potential hazards. Markings may be applied using commercially available safety tape or painted onto surfaces. Markings are to be applied around each machine. Do not mark an entire space as hazardous by applying deck markings at a doorway or entrance. Operator and eye hazard areas may overlap if machines are installed close together.

(1) Operator Work Areas. The area at the machine where the operator normally stands while using the machine is marked to alert personnel not to enter that operator area. The operator should be provided enough room to safely operate the equipment without being bumped by transiting personnel. An operator area is marked by painting the entire operator area as a solid yellow block. The operator area must also have non-skid decking to prevent slipping on oily decks and falling into the machines. The non-skid may be non-skid paint or adhesive non-skid strips with no spaces between the strips. Non-skid should not be painted yellow. The operator area around the non-skid strips must be painted yellow or for non-skid painted areas a boarder outlining the operator area must be painted yellow. For submarine engine room work areas, a temporary boundary must be established using rope and a "Machine Operation in Progress – Eye Hazard" sign will be posted on both sides of the boundary.

(a) The sign must be 7 inches long by 5 inches wide. The sign must have a red background with white lettering. The sign must be hung from the center of the rope holding it.

(b) The rope must be erected such that the boundary will not slide into the area.

(2) Eye Hazardous Areas. Any area around a machine determined to pose an eye hazard must have those boundaries outlined in black and yellow stripping or checkerboard paint or tape, or marked with a temporary boundary and sign. To determine the extent of the eye hazard, note areas where chips or debris are thrown or materials splashed during operation. That area or machine must also be labeled with a "Caution – Eye Hazard" sign in yellow and black (see chapter B5 for details).

(3) Safe Passage and Caution Areas. If space permits, lanes used for normal traffic through a machine shop or around industrial machinery should be outlined using solid white (safe) or yellow (caution) lines.

SECTION D

CHAPTER 2

DRY CARGO OPERATIONS, STORES HANDLING, AND RIGGING

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management

1. Discussion

a. Stores and dry cargo are any material that are carried in their own containers and are not in bulk form, such as fuel. Examples of stores are provisions and supplies that are carried aboard submarines.

b. This chapter is written from the standpoint that a submarine would be the receiver of stores. Such stores may be received from a tender or from the shore through the use of cranes or other lift equipment.

c. Dry cargo and stores handling evolutions are extremely dangerous even though they appear routine. Stores and cargo being handled can fall or shift, causing injury to personnel and damage to the ship. Additionally, HAZMAT that is damaged often causes illness or death in extreme conditions. Stores and cargo handling gear can fail, causing not only stores damage, but also the handling gear itself can maim or even kill, as well as cause physical damage. It is for these reasons that care must be used during stores and cargo handling operations.

d. Submarines are required to perform some rigging operations for the removal of or installation of equipment. Rigging aboard submarines will frequently involve the use of chain-falls and come-a-longs and may involve the use of the ship's davit.

e. Working parties and personnel moving stores throughout a submarine are a source of numerous injuries. Handlers may need hand and foot protection, back injury prevention training, and supervision to prevent injuries.

f. Complete an ORM review, per reference (a), prior to the evolution and mitigate risks as feasible.

2. Precautions – Working Parties Moving Stores. The following precautions in subparagraphs 2a through 2f are for personnel assigned to temporarily assembled or routine working parties, and their supervisors, when handling and moving stores through a submarine.

a. Ensure the path throughout the submarine where stores will be moved is clear of obstructions and traffic through those areas restricted during stores movement.

b. Wear hand protection (when handling wire rope or banded material) and steel-toed safety shoes.

c. Ensure there are sufficient personnel assigned to allow passing of boxes or material and that all members are fit to handle the anticipated weight.

d. Arrange sufficient numbers of personnel in the working party to minimize twisting or exertion while passing the material. Never toss or throw boxes, cases, or materials from one person to the next.

e. Prior to each handling evolution, review proper handling techniques to avoid back injury (lift with legs, do not bend at waist to lift, get help with heavier loads, get a firm grip before releasing to next person, and stop and report any strains immediately).

f. Review spill response procedures if handling HAZMATs.

3. Precautions During Cargo Operations. All personnel handling cargo should follow the precautions in the below subparagraphs 3a through 3n during cargo handling operations.

a. Always know where the cargo is during a transfer.

b. Wear a hardhat with chin strap in place under the chin, gloves (when handling wire rope or banding material), and steel-toed safety shoes.

c. Never walk under suspended cargo.

d. Do not ride on pallets, containers, or hooks.

e. Know firefighting and safety equipment locations.

f. Do not walk backwards.

g. Never allow cargo to swing or remain suspended for a period longer than necessary.

h. When stores are being lowered, keep feet and hands clear. Never put hands under cargo during transfer.

i. Never throw anything down a hatch or onto a dock.

j. Never step into bights of line.

k. Never grab or hold onto cargo lines.

l. Do not smoke.

m. Inform supervisors of unsafe conditions.

n. Wear eye, face, and hand protection when removing steel strapping. Stand to one side or out of the path as the strapping may recoil when cut.

4. Chainfalls and Come-A-Longs

a. Do not use chain, whether new, repaired, or to which hooks or rings have been added, without thoroughly inspecting and weight testing, as required.

b. Never kink, twist, or knot chains or slings, as these are among the greatest causes of failures.

c. Never splice or shorten chains by bolting, wiring, or knotting.

d. Clearly mark chain falls and come-a-longs to show the lifting capacity. Do not exceed marked capacity.

e. Do not use chain, whether new, repaired, or to which hooks or rings have been added, without thoroughly inspecting or weight testing, if required. Tag defective chains or slings or immediately cut up and properly dispose of them.

f. Do not subject chains to sudden shock while in use. Sudden movements put severe strains on the chain.

g. Keep chains free from grit and dirt. Do not drag chains or drop them on hard materials.

h. Use attachments or fittings for chains of the type, grade, and size suitable for service with the size of chain used.

i. Keep brakes free from grease, oil, and rust. Adjust for wear as required.

j. Do not operate unless the ratchet and pawl mechanism is engaged.

k. Keep the equipment dry and rust-free. Lubricate only the load chain.

SECTION D

CHAPTER 3

WIRE AND FIBER ROPE

Ref: (a) OPNAVINST 3500.39D, Operational Risk Management
(b) NSTM 613, Wire and Fiber Ropes and Rigging

1. Discussion. Ropes come in a multitude of types, quality, and sizes, each with its own characteristics. In general, there are two types of rope: fiber (natural and synthetic) and wire. When removed from a coil or reel, fiber ropes are generally referred to as lines. Wire is referred to as "wire rope" or "wire," but not "cable." Additionally, there is a fiber and wire hybrid known as "spring lay" rope. Spring lay rope is composed of six main strands laid around a fiber core. Each main strand consists of three preformed wire strands and three fiber strands laid alternatively around a fiber center. Each of these ropes has been developed to satisfy a specific requirement. They can be safely used, but must be properly maintained. Complete an ORM assessment prior to the evolution per reference (a). Mitigate risks as feasible.

2. General Precautions

a. Always inspect wires and lines before use. Look for deterioration, broken wires or fibers, visible signs of rot, chafing, variations in color, crushing, or other signs of damage. Refer to reference (b) for additional information on use, maintenance, and material requirements for ropes.

b. Wear topside shoes with skid-proof soles for handling lines. When handling lines, do not wear rings, watches, cell phones, pagers, key rings, and other items that may become entangled.

c. Check and test capstans to ensure they are operating satisfactorily.

d. Avoid getting hands, feet, or clothing caught in bights formed by lines, ropes or wires.

e. Do not stand directly in line with the point where chains, wire, ropes or lines change direction (e.g., around a bitt, capstan, or through a block).

f. Do not straddle or stand on chains, wires, ropes or lines whether under tension or not. Never step over chains, wires, ropes or lines under tension.

g. Avoid placing wires, ropes, or lines on rough or sharp surfaces that can cause chafing or cutting. Use chafing gear.

h. Do not place objects on wires, ropes, or lines.

i. Ensure all kinks are out of wires, ropes, or lines before use.

j. Check sheaves and blocks being used for proper size and strength. Do not use sheaves or blocks that are too small for the wire, rope, or line used.

k. Listen to lines under tension. Any unusual popping or tearing noises may mean that the wire, rope, or line is in danger of failing.

l. Always place hands above lines fairled into capstans or bitts.

m. Do not lubricate lines.

n. Do not apply loads suddenly.

o. Never leave wires or lines under strain on capstans.

p. Do not use sheaves or drums with corrugated grooves.

q. Remove the loose ends of splices.

r. Seize all bitter ends.

s. Use the same type of material for stoppers as the hawser being held (e.g., synthetic stopper for synthetic line). Chain must be used for stoppers on wire rope.

t. Do not use manila, wire, spring-lay rope, or synthetic line together on the same chock, bitt, or reel.

u. Carefully make up lines not in use.

v. Do not permit rat guards and sharp edges to wear mooring lines. Use chafing gear and lash well.

w. Change mooring lines per planned maintenance system (PMS) procedures. Failure to make such changes can result in serious injury.

x. Make up wires, ropes, and lines not in use and stow clear of walkways and passages.

y. Ensure wires, lines, and rigging are not subject to overload.

z. Use steadying or frapping lines on boat falls and large lifts to prevent uncontrolled swinging or twisting.

3. Natural Lines. In addition to the precautions stated in paragraph 2, also follow these precautions contained in subparagraphs 3a through 3l.

a. Do not use natural lines in sheaves and blocks built for wire rope service.

b. Never use natural fiber lines 5 or more years old.

c. Do not continue to use natural fiber line in which any of the conditions in the below subparagraphs 3c(1) through 3c(7) are present.

(1) Ruptured fibers and powdering between the strands.

(2) Dark red, brown, or black spots between the strands, and a sour, musty or acidic odor.

(3) Thirty percent of the yarns in the cross-section have been worn through.

(4) Long jawed and distorted strand areas.

(5) Salt incrustation and swollen areas.

(6) A harsh, dry, dead feel in manila or sisal lines.

(7) Evidence of gritty material between the strands.

d. Store lines in cool, dry spaces.

e. Fake lines down after use to dry out.

f. Always thaw frozen lines before use.

g. Do not allow lines to come into contact with chemicals, acid, alkalis, paints, soaps, rust, or vegetable oils.

h. Do not drag lines over sand, grit areas, or non-skid decks.

i. Do not let line wear become localized; rotate lines.

j. Use chafing gear if necessary.

k. Only use undamaged lines. Always remove damaged lines from use and repair or discard immediately.

l. Do not use chain or wire stoppers on fiber lines.

4. Synthetic Lines. In addition to the precautions in paragraph 2, the following precautions in subparagraphs 4a through 4g must be observed.

a. Do not expose lines unnecessarily to heat, sunlight, excessive cold, or chemicals.

b. Always thaw frozen lines before use.

c. Install tattletale lines to gauge how far mooring lines are stretching.

d. Payout lines on cleats, bitts, or capstans slowly. Exercise extreme care when easing out synthetic lines under heavy load. Because of their high extendibility under load, their rapid recovery, and their low coefficient of friction, these ropes may slip suddenly on easing out, thereby causing injury to line handlers. For control in easing out or surging, take two round turns on the bitts and then apply one or two figure eight bends. No more than two figure eight bends must be used. Because these bends tend to lock under surge, use of more than two figure eight bends will cause difficulty in easing out operations.

e. Double-up lines under excessive strain.

f. Never use wire or chain stoppers on fiber lines.

g. Stand clear of lines under strain due to synthetic line snapback.

5. Wire and Spring Lay Rope. In addition to paragraph 2, the precautions in the following subparagraphs 5a through 5h must be observed.

a. Always wear heavy-duty hand protection when handling wire and spring lay rope.

b. Always wear eye protection while splicing.

c. Seize wire ends to prevent unlaying.

d. Store wire and spring lay rope away from weather, acid, and chemicals.

e. Inspect wire and spring lay rope per PMS procedures.

f. When using U-bolt clamps to form an eye, always put the U-bolt itself over the bitter end. Tighten clamps only after putting line under stress.

g. Do not use sheaves or blocks designed for use with fiber rope with wire rope.

h. Inspect end fittings, such as sockets, connectors, and wire rope clips prior to use, to determine if there is an area of break adjacent to the fitting. Tighten clips after the first hour of running and at PMS specified intervals thereafter. Remove clips after long use and examine rope for broken wires. Remove the damaged part, if broken wires are found, and make a new attachment.

SECTION D

CHAPTER 4

WORKING OVER THE SIDE, AERIAL WORK PLATFORMS, AND DRY DOCK SAFETY

Ref: (a) COMSUBLANT/COMSUBPACINST 5400.49, The Submarine Organization and Regulations Manual (SORM)

1. Discussion

a. When a submarine is in dry dock there are many hazards not normally encountered when underway or pierside. This chapter will discuss the hazards and precautions associated with this unique evolution. See chapter A1, subparagraph 4c, for information on safety precautions for in-port maintenance availabilities.

b. "Over the side" is defined as anywhere outboard the boundary of the ship's safety lines and above water, whether or not safety lines are rigged. For ships without athwartship safety lines, the area aft of the aft-most stanchions and forward of the forward fore-most stanchions is also "over the side" when above water. The key hazard for working over the side is asphyxiation by drowning. The term "over the side" does not include the potential for fall hazards from working at height.

c. When exposed to falls of 5 feet or more to a lower level, or where there is a possibility of a fall from any height onto dangerous equipment, or onto an impalement hazard wear appropriate fall protection equipment per chapter B13.

Note: It is important to understand the mutually exclusive distinctions between the terms "over the side" and "at height." A person working outboard of a lifeline system and above a lower deck or an empty dry dock would not be working over the side. However, that person could be working "at height" if there is a possibility of a fall from 5 feet or more to a lower level; or, where there is a possibility of a fall from any height onto dangerous equipment, or onto an impalement hazard.

d. As a risk control measure, assign and position a safety observer near the work being performed, whose only responsibility is safety. This safety observer must be knowledgeable in the proper performance of the evolution.

e. Additional safety precautions and a work request form for working over the side or in the dry dock for submarines can be found in reference (a).

2. Procedures for Working Over the Side. Complete and forward a "Working Over the Side Check Sheet" found in reference (a) to the OOD and CDO requesting permission to work over the side.

a. Personnel working over or near water, where the danger of drowning exists, must wear a NAVSEASYSCOM-approved IBLP.

b. Where water directly abuts the ship and the distance from walking and working surface to the water is 25 feet or more, fall protection is required; IBLPs are not required.

c. Where the distance from the walking and working surface to the water surface is less than 25 feet and the water depth is less than 10 feet, or hazards (i.e., machinery, barges, camels, or other structures fastened to and directly abutting ship) are present, fall protection is required. IBLPs are not required.

d. When using both IBLP and fall protection, the harness must be worn under the IBLP.

3. Dry Dock Safety Precautions

a. Personnel working at heights while in dry dock must comply with the precautions indicated in this chapter. Personnel working at heights in dry dock will normally be in a man basket with full body safety harness and safety lanyard worn. On scaffolding with guard rails, a safety harness is not required.

b. Complete and forward a "Working Over the Side Check Sheet" found in reference (a) to the OOD and CDO requesting permission to work over the side.

c. Ensure all temporary elevated work areas (e.g., staging, scaffolding, etc.) are properly constructed and supported per chapter B13.

d. Only enter the dock with a hard hat that meets ANSI/ISEA Z89 standards, steel-toed safety shoes that meets ANSI/ISEA Z41 standards, and eye protection that meets ANSI/ISEA Z87 standards. PPE that meets ANSI/ISEA standards will be labeled, stamped, or embossed with the applicable standard.

e. Attach safety lanyards to all tools, if practicable. Never carry tools up and down ladders. Rig a line and raise and lower tools in a bucket.

f. Shift no weight greater than allowed by docking agreements within the ship while in dry dock without the permission of the docking officer.

g. Ensure the ship is adequately grounded at all times.

h. Drain all lines subject to freezing in freezing weather. If frequent service is required, maintain a small flow through the line to prevent freezing.

i. Ensure adequate topside lighting is provided by either installed dock lights or by temporary lighting, particularly in areas where normal passage is obstructed or disrupted by service lines or work in progress.

j. Ensure any equipment that projects through the hull is operated only with the permission of the commanding officer and then with a safety observer outside the hull.

k. Do not permit horseplay, leaning on lifelines or other negligent practices that could lead to falling over the side.

l. Do not throw anything over the side into the dock, including debris from cleaning or preservation.

m. When carrying fuel of any kind in dry dock, do not allow fuel to drain into the dock. Should it be necessary to remove any fuel from tanks or containers while in dry dock, take precautions that will prevent any of the fuel from reaching the floor of the dock.

n. Safety nets must be rigged extending a minimum of 6 feet on both sides under all access brows between the ship and the dock apron.

4. Operating Aerial Work Platforms

a. Aerial work platforms include aerial lift equipment (i.e., vehicle-mounted rotating and elevating aerial devices, or boom-supported elevating work platforms), scissor lifts, and mobile scaffolds.

b. Before an aerial work platform operation begins, the operator must:

(1) be qualified and licensed according to local instructions;

(2) read and understand the operating instructions and safety rules for the equipment being used;

(3) understand all decals, warnings, and instructions displayed on the work platform;

(4) complete and forward a “Working Over the Side Check Sheet” found in reference (a) to the OOD and CDO requesting permission to work over the side;

(5) inspect the equipment for defects that would affect its safe operation, and be alert for cracked welds or other structural defects, leaks in the hydraulics, damaged control cables, loose wires, and bad tires; and

(6) test the operating controls to make sure they work; and check the operating condition of the brakes, lights and other automotive-operating accessories, such as the horn and warning devices. Test all limit switches.

c. Before each elevation, the aerial work platform operator must:

(1) check for overhead obstructions and high-voltage conductors;

(2) elevate the work platform on only a firm, level surface;

(3) make sure the load and its distribution on the platform is according to the manufacturer's rated capacity, and never exceed the manufacturer's rated workload;

(4) use the outriggers or stabilizers, if required, according to the manufacturer's instruction;

(5) make sure guardrails on the platform are installed correctly and the gates or openings are closed; and

(6) check all occupants' safety harnesses and lanyards, making sure they are attached properly to a staple or pad eye inside the man basket. Do not attach lanyards to objects outside the basket.

d. Before and while driving with the aerial work platform elevated, the operator must:

(1) look in the direction of, and keep a clear view of the path of travel, and make sure the path is firm and level;

(2) maintain a safe distance from obstacles (ahead, behind, below, and above), debris, drop-offs, holes, depressions, ramps, and other hazards; and

(3) set the brakes and chock the wheels once stopped.

e. While using the aerial work platform, the operator must <u>not</u>:

(1) use ladders or makeshift devices on the platform to obtain greater height - such practices are prohibited;

(2) climb up or down extendible arms;

(3) sit on or climb on the edge of the basket.

(4) delay reporting any defects or malfunctions to the supervisor; and

(5) engage in stunt driving or horseplay.

SECTION D

CHAPTER 5

ELECTRICAL SAFETY, ELECTRONIC SAFETY, AND TAG-OUT PRECAUTIONS

Ref: (a) NSTM 300, Rev 9, Electrical Plant General
(b) NSTM 223, Submarine Storage Batteries, Lead Acid Batteries
(c) NAVSEA S9310-AQ-SAF-010, Navy Lithium Safety Program Responsibilities and Procedures
(d) NSTM 555, Submarine Firefighting
(e) NAVSEA SE 000-00-EIM-100, Electronics Installation and Maintenance Book (EIMB), General Handbook
(f) NSTM 634, Deck Coverings
(g) NAVSEA S0400-AD-URM-010, Tag-Out Users Manual (TUM)

1. Discussion

a. Practically every piece of equipment on board ship requires electrical power. Radars, communication equipment, as well as lighting, portable tools, and personal equipment all use power from the ship.

b. The fact that electrical equipment and tools are so commonplace means that hazards involved with electricity are often taken for granted. This occurs despite the fact that the hazards of electrical shock are commonplace ashore where the extra shipboard hazards of high-powered equipment, unstable work spaces, and saltwater are usually non-existent. Compared to other environments, the potential for electrical shock aboard ship is far greater. Because ships' electrical systems and electronic systems are ungrounded, personnel and equipment may easily become a path to ground in cases of faulty wiring, resulting in injury, death or damage to equipment.

c. Reference (a) is the primary technical reference for shipboard electrical safety.

2. Definitions

a. "Electrical equipment" includes generators, electrically powered machinery and mechanisms, power cables, controllers, transformers, and associated equipment.

b. "Electronic equipment" includes radars, sonars, radios, power amplifiers, antennas, electronic warfare equipment, computers, and associated controls and peripherals.

3. Electrical Precautions

a. Portable electrical equipment is any device that is hand-held, may be plugged into the ship's electrical power, and is generally used in a variety of different locations throughout the ship (drills, grinders, vacuums, etc.). All personnel using portable electrical tools must:

(1) wear approved electrical grade gloves when using electric portable tools in hazardous conditions, such as wet decks or bilge areas;

(2) wear leather gloves over rubber gloves when the work being done could damage the rubber gloves;

(3) conduct the required PMS on electrical safety gloves before issue and use, inspect electrical safety gloves prior to storage and store them so they are protected from damage, and not use electrical safety gloves for cleaning, painting, or any purpose other than electrical work;

(4) wear required eye protection when working where particles may strike the eyes;

(5) wear hearing protection (earplugs or circumaural muffs or both) when working with noise hazardous tools or in the area where such work is being conducted;

(6) not use spliced cables on tool cords or extension cords;

(7) not use any portable electrical equipment that has a frayed cord or broken or damaged plug;

(8) ensure that the on and off switch is in the "off" position prior to inserting or removing the plug from the energized receptacle;

(9) always connect the cord of portable electrical equipment into the extension cord before the extension cord is inserted into the energized receptacle;

(10) always unplug the extension cord from an energized receptacle before the cord of the portable electrical equipment is unplugged from the extension cord;

(11) arrange the cords so that they will not create a trip hazard;

(12) never pick up the tool by the electrical cord;

(13) check the opposite side for cables and pipes when drilling or cutting through bulkheads;

(14) only use electric equipment in explosive atmospheres if the equipment is approved for such use (explosion-proof or intrinsically safe);

(15) not allow cords to run through hatches, scuttles, or watertight doors or over sharp objects or hot surfaces;

(16) not join more than two 25-foot extension cords together;

(17) protect the cord by installing chafing gear to guard against accidental closing of the door or hatch on the cord when it is necessary to run electrical leads through doors or hatches;

(18) visually inspect portable cables for any signs of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles, and the cables must be of the proper length and cross-sectional area; and

(19) only use COMNAVSEASYSCOM-authorized extension or trouble lights for shipboard use in order to eliminate or drastically reduce the many hazards associated with the use of unauthorized commercial grade lights. These lights are intended for temporary use and should not be mounted in any manner.

b. Do not touch any conductor until it is properly tagged out of service and tested to be sure it is de-energized or discharged.

c. Obey all warning signs; read equipment warning labels before use.

d. Never work on live (energized) electrical equipment unless in strict adherence with reference (a).

e. Always de-energize and "tag-out" installed electrical equipment before starting any maintenance or repair unless directed by higher authority (PMS, EOSS, etc.). Test for energized circuits prior to performing work per reference (a).

f. Do not energize any electrical equipment that is danger tagged-out. Properly clear the tag first. If a caution tag is installed, ensure compliance with caution prior to energizing equipment.

g. Only use authorized equipment to perform maintenance on electrical equipment. Ground all metal-cased electrical equipment, except power tools verified to be double insulated on the label and by electrical safety check.

h. Close all fuse boxes, junction boxes, switch boxes, and wiring accessories.

i. Use the one-hand rule when turning on electrical equipment. Never operate a switch with the other hand on a metal surface, which would provide a path to ground through the body.

j. Never use outlets that appear to be burnt or damaged. Do not use equipment with worn or damaged cords, or crushed or damaged plugs. They are not to be patched with electrical tape. Turn in such items immediately to electrical tool issue, informing them of the problem.

k. Use an authorized voltage meter to test whether equipment or circuits are energized.

l. Never remove overload relays except for corrective or preventive maintenance.

m. Follow all safety precautions in reference (a) when working on energized circuits or equipment.

n. Only install fuses of the rating specified on a fuse box or panel. Do not over-fuse.

o. Do not use aluminum or metal portable ladders when working on electrical equipment.

p. Use only Navy-approved power strips for computer equipment, printers, and peripherals per reference (a). Never use power strips in series (connected one to another and “daisy-chained”).

q. Wear skin and eye protection when changing out battle lantern batteries.

r. Use skin and eye protection when working with wet cell batteries.

s. Visually inspect portable cables, such as shore power "pigtails," for any sign of an unsatisfactory condition, such as tears, chafing, exposed insulated conductors, and damaged plugs and receptacles. Cables must be of the proper length and cross-sectional area. Do not use spliced portable cables except in emergency conditions, as outlined in reference (a).

4. Batteries

a. Main Storage Batteries

(1) Observe the following safety precautions when working in the battery compartment:

WARNING

REMOVE ALL METAL FROM BODY AND POCKETS.

(a) Do not enter the battery compartment while a charge is in progress (not applicable to valve regulated lead acid

(b) Never work alone in the battery compartment except when performing daily specific gravity checks.

(c) Make no repairs to battery storage connectors when battery current is flowing.

(d) Measure battery ground resistance prior to any work in the battery compartment. Insulate the body from ground by using a rubber sheet.

(e) Use only insulated tools and non-metallic flashlights in the battery compartment. Be very careful never to short-circuit any part of the battery. Appropriate precautions should be taken (e.g., insulated carrying tray) to ensure that no tools or equipment are dropped between battery cells.

(f) Tools used in the battery compartment must be shorter than the distance between metal terminals, when practical.

(g) Ground detectors should never be used with personnel inside the battery compartment due to the potential for electrical shock.

(h) Keep cell service openings closed except when they must be opened to take readings or add water (not applicable to VRLAs).

(i) Keep cell tops clean.

(j) Never stow loose gear in the battery compartment. Gear such as cleaning rags, hydrometer boxes, pieces of wire, and tools must be removed immediately after use.

(k) Station a fire watch in the battery compartment whenever hot work is being performed at a compartment boundary. Have an insulated CO_2 fire extinguisher available for minor fires. Two insulated CO_2 fire extinguishers should be mounted near the battery compartment. Periodically check the extinguishers to ensure that the insulating material (typically Plastisol) is adequate.

(2) The charging of batteries will produce hydrogen gas that may be ignited causing fire and explosion. Keep the battery compartment properly ventilated during charging (not applicable to VRLAs). Hydrogen gas is not expected if a submarine VRLA is installed.

(3) Follow applicable shipboard instructions for battery compartment access at all times. Post a warning placard at the battery compartment while battery charging is in progress (not applicable to VRLAs).

(4) Hydrogen is emitted from lead acid batteries during discharge, stand, or charge, and therefore must be continuously ventilated (not applicable to VRLAs). When submarine VRLA is installed, ventilation may be secured with the battery off-service, but the battery compartment should not be made airtight.

(5) Hydrogen detectors must be operated continuously with readings taken at either 15 or 30-minute intervals, depending on the voltage or charging rate. See reference (b) for details (not applicable to VRLAs).

(6) Do not pour water into concentrated sulfuric acid. The heat generated will cause a violent reaction. Sulfuric acid is highly corrosive. Wash up spillage with water and sodium bicarbonate. When handling acid or electrolyte, always wear a rubber apron, rubber boots, rubber gloves, chemical goggles, and a face shield. Know locations of nearest emergency eyewash station.

(7) Do not charge a battery for which the resistance is less than 50,000 ohms.

(8) Add to the battery only pure distilled water or water that analysis has found to be pure enough for battery use. Do not use the battery watering hose for any other purpose (not applicable to VRLAs).

(9) Refer to references (b) and (c), applicable technical manuals and shipboard operating procedures for battery operating and maintenance procedures (reference (b) is not applicable to VRLAs).

b. Equipment Batteries

(1) Mercury batteries must not be used in nuclear submarines without approval of COMNAVSEASYSCOM.

(2) Lithium batteries must not be used aboard ship without specific approval of COMNAVSEASYSCOM per reference (c).

(3) Primary batteries, especially mercury and lithium batteries must never be punctured, incinerated, compacted or recharged.

(4) Remove batteries from equipment before shipment or storage. Cover terminals of batteries with an insulating material to prevent short circuits.

(5) Store spare and used batteries in an adequately ventilated and cool fireproof area.

(6) Turn battery switch off when equipment is not in use or after the battery fails to operate the equipment.

5. Electrical Fires

a. For electrical firefighting procedures, see reference (d).

b. Main storage battery fires

(1) A battery fire may be preceded by an explosion. Great care is required fighting such a fire to avoid creating another explosion.

(2) The safest and most effective method for fighting a battery compartment fire is through oxygen starvation. Secure the compartment and stop all ventilation within, including agitation air, to deprive flames of oxygen.

WARNING

NEVER ATTEMPT TO EXTINGUISH A BATTERY FIRE
BY POURING WATER ON THE BATTERY.
THE HYDROGEN AND OXYGEN GENERATED COULD
PRODUCE A VIOLENT EXPLOSION.

c. Electrical fire prevention

(1) Keep electric motors and generators clean.

(2) Ensure proper maintenance is performed on electrical equipment (e.g., motors, generators, bearings and filters).

(3) Report overheating or arcing of any electrical equipment.

(4) Keep air filters clean.

(5) Do not overfuse.

6. First Aid for Electrical Shock

a. Fundamentally, electric current rather than voltage is the criterion of shock intensity. The passage of even a very small current through a vital part of the human body can cause death. The voltage necessary to produce the fatal current is dependent upon the resistance of the body, contact conditions, the path through the body, etc.

b. It is imperative to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from 115 volts or even lower voltage; fatalities from as low as 30 volts have been recorded. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms and possibly as low as 100 ohms from temple to temple if the skin is broken.

(1) Electrical Shock Symptoms. In the event of severe electrical shock, the victim could become very pale or "bluish." His pulse is extremely weak or entirely absent, unconsciousness is

complete, and burns are usually present. The victim's body may become rigid or stiff in a few minutes. This condition can be caused by muscular reaction to shock, and it must not, necessarily, be considered as rigor mortis. Therefore, artificial respiration must be administered immediately, regardless of body stiffness, as recovery from such a state has been reported. Consequently, the appearance of rigor mortis must not be accepted as a positive sign of death.

(2) Victim Rescue. The rescue of electrical shock victims is dependent upon prompt administration of first aid.

CAUTION

DO NOT ATTEMPT TO ADMINISTER FIRST AID OR
COME IN PHYSICAL CONTACT WITH
AN ELECTRICAL SHOCK VICTIM BEFORE THE POWER IS SHUT OFF, OR,
IF THE POWER CANNOT BE SHUT OFF IMMEDIATELY,
BEFORE THE VICTIM HAS BEEN REMOVED FROM THE LIVE CONDUCTOR.

(3) Steps for First Aid. When attempting to administer first aid to an electrical shock victim, proceed as follows as per subparagraphs 6b(3)(a) through 6b(3)(c).

(a) Shut off the power.

(b) If the power cannot be deactivated, per subparagraph 6b(3)(a), remove the victim immediately, observing the precautions in the following subparagraphs 6b(3)(b)1 and 6b(3)(b)2.

1. Use dry insulating material for protection.

2. Use a dry board, belt, dry clothing, or other available non-conductive material to free the victim (by pulling, pushing, or rolling) from the power-carrying object. Do not touch the victim.

(c) Immediately after removal of the victim from the power-carrying object, call for emergency medical assistance team and automated external defibrillator and administer CPR.

(d) When providing initial first aid measures, take into account any possible spinal injuries or fractures.

7. Electronic Precautions

a. Definitions

(1) Repair is the removal or replacement, by any method, of any component, subassembly, module, circuit card, or conductor to bring malfunctioning equipment back to an operational status.

(2) Corrective maintenance is the alignment, adjustment, tuning, or trouble shooting of malfunctioning equipment per published maintenance or technical manual procedure.

(3) Preventive maintenance is the alignment, adjustment, tuning, or testing of operational equipment to ensure performance within published MRC or technical manual procedures.

b. Repair of electronic equipment is normally accomplished with the circuit de-energized. Every effort should be made to avoid making repairs to energized equipment. Do not repair energized electronic equipment unless or the commanding officer has granted permission to perform such repair. In such an emergency, trained personnel must accomplish the repair of energized circuits and an experienced technician or officer must supervise. Electronic repair personnel should observe the safety precautions in references (a) and (e).

c. Corrective maintenance on energized electronic equipment is authorized when done according to published maintenance or technical manual procedures. Freelance corrective maintenance (e.g., maintenance without a procedure) on energized electronic equipment must be performed ONLY with the specific permission of the commanding officer. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

d. Preventive maintenance on energized electronic equipment is authorized when it is per a published MRC or technical manual procedures. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

e. Perform preventive or corrective maintenance on energized electronic equipment only when authorized by higher authority and trained on that type of equipment. Refer to reference (a) for specific safety instructions when performing work on energized equipment.

f. Whenever work on energized electronic equipment exposes the technician to 30 volts or greater, adhere to the following precautions in subparagraphs 7f(1) through 7f(11).

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Research into or enter energized electronic equipment enclosure for the purpose of servicing or adjusting only when prescribed by applicable technical manuals, MRC, or other approved documentation.

(3) Obtain the commanding officer's permission whenever work on energized electronic equipment deviates from published corrective or preventive maintenance procedures.

(4) Station a safety observer capable of securing power and rendering adequate aid in the event of an emergency.

(5) Provide warning signs and suitable guards to prevent personnel from coming in accidental contact with dangerous voltage.

(6) Obey all warning signs and heed all equipment warning labels.

(7) Insulate the work from ground with approved electrical grade rubber matting. Installation requirements for electrical grade matting are contained in reference (f).

(8) Remove or snugly secure any loose clothing. Remove all jewelry.

(9) Adequately insulate all metal tools.

(10) Use only one hand, if practical, in accomplishing the work.

(11) Wear electrical grade rubber gloves on both hands, if possible. If the nature of the work is too cumbersome to wear gloves on both hands, then a glove must be worn on the non-working hand.

g. Reaching into de-energized equipment also requires special care and precaution.

(1) Study the applicable schematic and wiring diagrams before servicing.

(2) Ensure familiarity with all circuits that must be de-energized and all voltage storing and high voltage components.

(3) Discharge all voltage storing components with an approved safety shorting probe and applicable PPE.

(4) Do not touch a conductor or electronic component unless it has been proven to be de-energized by using a known, approved voltage tester.

h. Removal of a unit or part from the normal location within an assembly and the energizing of the unit or part, while it is outside the normal enclosure, removes the protective features such as interlocks, enclosures and the grounding. These safety features may then no longer function as designed. Ground the chassis and frame of all units removed for servicing and ground all circuits normally grounded in operation whenever power is applied to the unit.

i. Do not energize any equipment that is danger tagged out. Properly clear the tag-out first. If a caution tag is installed, ensure compliance with the caution before energizing equipment.

j. Never defeat an interlock or built-in safety device. Modify such safeguard circuits only as authorized by the cognizant system command.

k. Refer to references (a) and (e) for additional precautions regarding electric systems.

8. Tag-Out Precautions. Tagging out of electrical or electronic energy sources must be conducted per reference (g).

SECTION D

CHAPTER 6

SHIPBOARD FUELS

Ref: (a) NSTM 541, Ship Fuel and Fuel Systems
(b) NSTM 542, Gasoline and JP-5 Fuel
(c) OPNAVINST 3500.39D, Operational Risk Management
(d) NSTM 074, Volume 3, Gas Free Engineering
(e) NSTM 505, Piping Systems

1. Discussion

a. Fuels are used aboard submarines to power emergency auxiliary equipment. There are two types of fuels in use, each with its own characteristics and traits. It is impossible to cover all the scenarios that can occur with shipboard fuels; however, this chapter will cover the main points. See references (a) and (b) for additional information concerning fuels.

b. The biggest hazards with shipboard fuels are explosion and fire. Other hazards include asphyxiation, body burns, dermatitis, eye and respiratory difficulties, and environmental hazards. Due to the incredible impact a shipboard explosion and fire would have, the possibility that a catastrophe could occur should constantly be in the minds of all personnel, especially those involved in fuel storage and transfer operations.

c. Complete an ORM review before refueling operations and mitigate risks, as feasible. Reference (c) contains additional guidance on ORM.

2. Definitions

a. Hazardous areas are locations where hazardous vapors (whether physical or health hazard) could accumulate.

b. Class I flammable liquids are fuels and other liquids with a flashpoint of 100 degrees Fahrenheit (38 degrees Celsius). Class I flammable liquids in contact with air will release flammable vapors under most typical shipboard conditions.

3 General Precautions

a. Never smoke in fuel storage or transfer areas during maintenance, fueling, or venting operations.

b. Prohibit any open flames, hot work, or the use of non-explosion proof fixtures or equipment near opened fuel storage or transfer areas.

c. Ensure forced ventilation is in operation during fueling or venting operations.

d. Always ventilate fuel tanks and obtain a gas free engineer's certification before entering. Ensure gas free certification is done per reference (d).

e. Never enter a fuel tank to aid an unconscious crewmember without permission, an EAB as respiratory protection, and a back-up person standing by. The back-up person must also be equipped with the proper emergency breathing apparatus.

f. Detect leaks and make immediate repairs in all fuel systems. Report and clean up spilled fuel immediately using appropriate HAZMAT or oil spill clean-up equipment and procedures. Dispose of fuel contaminated materials as directed by the HAZMAT coordinator.

g. Inspect tanks, piping, fuel hoses, pumps, and communication equipment before transferring fuel. Ensure a drip pan is under all transfer hose connections and that gaskets are in place in hose joints and couplings.

h. Store oily wastes and rags in an approved container and empty daily per local HAZMAT procedures to avoid spontaneous combustion.

i. Do not discharge fuel or oily wastes over the side. Report any spills over the side immediately. Place absorbent pads at deck edges to prevent spillage from running over the side and report spill immediately to the supervisor.

j. Ensure that flash screens (flame arresters) on tank vents are in place and in good material condition.

k. Check air relief valves or pressure-vacuum relief valves to ensure that they are operating properly per the PMS.

l. Do not move fuel until all involved personnel have signaled readiness. Maintain a hose and overboard discharge watch during transfer operations.

m. Frequently monitor fuel levels in tanks. Constantly monitor fuel level when fueling.

n. Avoid physical contact with fuel(s). Remove fuel-soaked clothing and thoroughly wash off any fuel spilled on skin with soap and fresh water. Seek immediate medical attention if fuel is ingested or inhaled during the spill.

o. Do not access or work in a space where there is a potential exposure to fuel vapors without the appropriate respiratory protection.

p. Always ground hoses before transferring fuel. Do not break that ground until hoses are disconnected.

q. While pierside, stop all transfer operations during electrical storms or thunderstorms.

r. Install flange shields over pipe joints per with reference (e). The purpose is to prevent flammable liquids from spraying over a greater area or contacting hot surfaces in the event a leak occurs.

SECTION D

CHAPTER 7

WELDING, CUTTING, BRAZING, AND HOT-WORK

Ref: (a) NSTM 074, Volume 1, S09086-CH-STM-010, Welding and Allied Processes
(b) NAVSEA OP 4, Ammunition and Explosives Safety Afloat

1. Discussion

a. The convenience of metal arc and gas welding and cutting lies largely in the fact that the equipment can be taken to the job. This convenience leads to the performance of construction or repair jobs in spaces that have not been designed for such concentrated heat, or mixtures of toxic or explosive gases. The failure to take proper precautions, during welding or cutting operations in such spaces, presents a serious fire, explosion, electric shock, or health hazard.

b. Health hazards common to welding, cutting, and brazing are numerous. In addition to electric shock, burns to the eyes and skin can be caused by sparks, molten metal, and ultraviolet and infrared radiation. Fumes and gases generated by welding, brazing, and cutting can produce ozone and oxides of nitrogen which are poisonous. Lead, zinc, chrome, and cadmium in alloys (strips or wire in coils or rods) produce toxic fumes. Paints and coatings may produce toxic gases when heated by the flames of the welding torch. Additionally, some metal fumes are capable of producing metal-fume fever, although metal fume fever is commonly associated with galvanized or zinc-containing metals. Local exhaust ventilation is a must to remove excessive concentrations of air contaminants to safe levels. Welding in closed, unventilated spaces can result in respiratory irritation or poisoning of personnel.

c. Hot work includes:

(1) flame heating, welding, torch cutting, brazing, carbon arc gouging; and

(2) any operation producing temperatures of 400 degrees Fahrenheit or higher.

Note: Operations not producing hot sparks and flames such as spark-producing or arc producing tools or equipment, static discharge, friction, open flames or embers, impact, and non-explosion-proof equipment such as lights, fixtures, or motors are not considered hot work unless occurring in the presence of flammable liquids or in a flammable atmosphere.

d. Hot work is divided into two classes where only class alpha materials (ordinary combustibles) (e.g., wood, cloth, paper, rubber, and many plastics) are exposed. These classes are described in subparagraphs 1d(1) and 1d(2) below.

(1) Class I. These processes produce either high energy sparks or slag that can be thrown or dropped at the work site or produce heat that can be transferred through the deck, overhead, bulkhead, or structure to a location not visible to the hot work operator. This class includes:

(a) flame cutting,

(b) welding,

(c) plasma cutting,

(d) arcing and gouging,

(e) electric arc welding,

(f) thermal spraying, and

(g) other hot spark or flame producing process not included in class II.

(2) Class II. These processes produce flames or minimal energy sparks or slag that is generally localized to the immediate work area. This class includes:

(a) stud welding with an electric stud gun,

(b) fas-tungsten-arc welding,

(c) torch brazing, and

(d) ferrous metal grinding with abrasive disks.

2. General Precautions

a. Clothing and Protective Equipment

(1) Use the appropriately shaded goggles, welder's helmet, or face-shield, as well as flameproof gloves, jackets, leggings and boots, as required by reference (a), or other applicable reference. A respirator may be required if indicated by the IH survey, RPPM or RPA.

(2) Remove lighters from pockets during hot work.

(3) Only wear flame resistant clothing.

(4) Do not roll up sleeves, cuffs, or have open pockets.

(5) Always wear a welder's jacket or sleeves and apron while welding. Helmets and welding shields must be fitted with the proper filter and cover lenses.

(6) Always wear electrical safety gloves when removing or replacing electrodes, or handling energized holders, tables, or equipment. The gloves must be dry and in good condition.

(7) Consult with the RPPM or RPA for specific guidance regarding respirator needs or selection. Cartridge respirators, when properly selected (see chapter B6), will protect against the metal fumes generated during welding. They do not provide oxygen, which may need to be supplied when working in a confined space. Metal inert gas and tungsten inert gas welding generate hazardous gases and require adequate ventilation or the use of a supplied-air respirator.

(8) To protect passers-by from ultraviolet arc flash and combustible materials from sparks, use NAVSEASYSCOM-approved welding curtains or panels as defined in reference (a).

b. Space Precautions

(1) Observe the precautions in the following subparagraphs 2b(1)(a) through 2b(1)(k) during the performance of hot work.

(a) Do not perform hot work when flammable liquids or flammable atmospheres are present without specific instructions from the gas free engineer.

(b) Inspect the other side of the bulkhead, deck, overhead, or other structure to ensure that hot work will not damage materials or equipment that may be on the other side of the hot work operation.

(c) Remove explosive materials and flammable liquids or vapors and take suitable precautions against the re-accumulation of such materials. For welding in spaces in which explosive materials are located (e.g., torpedo rooms, missile compartments, etc.), refer to reference (b).

(d) Where practicable, relocate all combustibles at least 35 feet from the work site. Where relocation is impracticable, protect combustibles with metal guards or curtains constructed of military specification (MIL-C-24576) material. Tighten edges of covers at the deck to prevent sparks from going underneath the cover. This precaution is also important at overlaps where several covers are used to protect a large pile of combustibles.

(e) Protect intricate and vulnerable machinery and equipment from falling sparks or other potential sources of fire with metal guards or curtains constructed of MIL-C-24576 material. Secure protection in-place before commencing hot work.

(f) For hot work processes that generate slag, weld splatter, or sparks, cover openings in decks, bulkheads, or overheads within 35 feet which can be a path to prevent ignition sources from passing into adjacent compartments, spaces, or decks below. A complete containment system as described in reference (a) meets this requirement. If openings cannot be covered, post a fire watch on the far side.

(g) Blank-off or otherwise suitably protect ducts that might carry sparks to distant combustibles.

(h) When hot work is done near decks, bulkheads, partitions, or overheads of combustible construction, take precautions to prevent ignition.

(i) Do not undertake hot work on pipes or other metal in contact with insulation or combustible decks, bulkheads, partitions, or overheads if the work is close enough to cause ignition by heat conduction.

(j) Do not start hot work in areas other than those specifically designated for hot work without approval of the commanding officer or his designated representative. Abrasive disk grinding with a small wheel (typically 3-inch diameter or less) does not require notification or approval.

(k) De-energize all electrical equipment exposed to the hot work.

(2) Ensure that a gas free engineer's survey has been completed before working in tanks, voids, or confined spaces, including adjacent spaces (especially if those tanks contained flammable liquids or vapors) if these spaces are identified as a confined space per reference (a).

(3) Obtain the commanding officer's permission before starting hot work underway (CDO, in port). Conduct hot work in or on fuel tanks, in spaces in which fuel tank vents terminate, or in other confined spaces known to contain flammable fuel, only with the commanding officer's approval.

(4) Set fire watches as per the following subparagraphs 2b(4)(a) through 2b(4)(i).

(a) In confined or enclosed spaces, machinery rooms, bilges, and other locations proximate to flammable atmospheres (e.g., near fuel tank vents and sounding tubes), post fire watches at the worksite when hot work is undertaken. After completion of the hot work operation, fire watches must remain on station for a minimum of 30 minutes, ensure that the area is cool to the touch, and ensure that no smoldering embers remain.

(b) For class I hot work, post fire watches when hot work is undertaken. The fire watches must stand watch for 30 minutes after hot work is completed, or until hot work area is cool to the touch.

(c) For class II hot work, a commanding officer's representative (normally the CDO, engineering officer of the watch, or engineering duty officer) must determine the need for a fire watch based on his assessment of the worksite prior to undertaking hot work. When posted, the fire watch(es) must stand watch for 30 minutes after hot work is completed, or until hot work area is cool to the touch.

Note: Abrasive disk grinding on a ferrous material with a large wheel (typically larger than 3 inches in diameter) typically throws large sparks long distances. A fire watch is recommended for large wheel grinding when class alpha materials (ordinary combustibles) are exposed. A commanding officer's representative must determine the need for a fire watch.

(d) When a fire watch is not required for class II hot work, the hot worker must have the appropriate fire extinguishing equipment available. The hot worker may leave the site after hot work is completed and after he or she has conducted a thorough survey of the area to check for smoldering fires. When grinding a ferrous material with a large abrasive disk wheel (larger than 3 inches in diameter), the hot worker must stand watch for 30 minutes after the hot work ends, or until hot work area is cool to the touch.

(e) When any type of hot work is being performed on bulkheads, decks, or overheads where sparks or heat transfer may ignite combustibles on the opposite, accessible side, set a fire watch on the far side.

(f) The hot worker and the hot worker's supervisor are responsible for ensuring fire watches are in place prior to starting work.

(g) Train fire watches per reference (a).

(h) Equip fire watches with PPE as required for the operation being conducted and anticipated hazards.

(i) When more than one fire watch is required, establish a communication means between fire watches.

(5) Ensure fire extinguishing equipment is available in immediate area. The types of fire extinguishing equipment fire watches must use are specified in reference (a).

(6) Provide ventilation as specified in reference (a), IH survey, gas free chit, or hot work chit.

(7) Contact the gas free engineer to ensure adequate ventilation is provided in the space prior to commencing hot work.

(8) Personnel in areas adjacent to welding areas exposed to arc-produced ultraviolet radiation must be protected by providing screens, appropriate welding goggles, or other approved means.

(9) Never weld near a source of halocarbons, such as refrigerant gases. Phosgene gas can be produced when halocarbons are exposed to high temperatures.

(10) Do not perform hot work during fueling or ammunition transfer operations.

(11) When anticipating welding or burning on areas treated with vinyl, chip and scrape the area free of vinyl before starting hot work.

(12) Ship's force will not normally weld on the hull. If such welding is necessary, take proper precautions to ensure that special requirements are met. Accomplish all appropriate non-destructive testing at the first opportunity.

c. Practices

(1) Never use oxygen to operate pneumatic tools, blow out pipe lines, blow dust from clothing or work, create pressure, or for ventilation purposes.

(2) Do not carry oxygen, acetylene, or other fuel gas cylinders into confined spaces. Use leads of an appropriate length to reach the work area while properly securing gas cylinders away from the confined space point of entry.

(3) Always return cylinders to the proper storage when work is completed and ensure cylinders are secured in place by metal retaining collars.

(4) Ground and bond all electrical welding equipment before use.

(5) Stand on a dry surface or insulating material if surface is not completely dry to avoid electric shock.

(6) Never permit the metal part of the electrode or the electrode holder to touch the bare skin or any damp clothing which the operator may be wearing. Do not loop the welding cable over a shoulder or other parts of the body. Operators have been dragged off staging or scaffolds when the cables were fouled by other workmen or moving equipment.

(7) When stopping work for a significant time (lunch or overnight), remove electrode from electrode holder, de-energize the equipment and disconnect the welding supply cable from the welding machine.

(8) When using portable machines, ensure the primary supply cables are separately laid out do not become entangled with welding supply cables.

(9) Inspect work and electrode lead cables regularly for wear and damage. Replace cables with damaged insulation or exposed conductors. Use connecting devices specifically intended for the purpose when joining lengths of supply and electrode cables. Adequately insulate connecting devices for the service conditions.

(10) Keep welding cables dry and free from grease and oil, wherever practical, to prevent premature breakdown of the insulation which could cause dangerous short circuits.

(11) Suitably support cables overhead when it is necessary to run them away from the vicinity of the welding machine. If this cannot be done, and cables are laid on deck, protect them in such a manner that they will not be damaged or interfere with safe passage of personnel. Take special care to see that welding supply cables are not close to power supply cables, lighting circuits, sensitive electronics, or any equipment that utilizes magnetic tapes or depends upon a magnetic principle for operation. Block hatches and doors open to prevent damage to welding cables.

(12) Protect welding equipment used in the open from weather conditions (e.g., rain, snow, sleet, spray) to prevent short-circuiting.

(13) Do not smoke cigarettes or use other forms of tobacco while welding or brazing.

d. Cylinder Safety. Refer to chapter D15 for compressed gas safety precautions.

SECTION D

CHAPTER 8

MACHINERY

1. Discussion

a. Machinery is located everywhere in the ship, from the more obvious examples of propulsion equipment in the engine room, to the less than obvious example of galley equipment. This chapter defines precautions for all types of machinery, including industrial equipment. Electrical safety precautions are covered in chapter D5. Galley equipment is described in chapter D13.

b. All machinery has moving parts. Whenever there are moving parts, there is the possibility of personnel injury. While personnel injury is one aspect of machinery injury, the fact that a person has interrupted the machinery process can lead to even more disastrous mishaps.

c. Except in emergencies, and then only when no qualified operator is present, no person will operate, repair, adjust, or otherwise tamper with any machinery unless assigned by a competent authority, (for example, OOD, CDO, or engineering duty officer), to perform a specific function on such machinery. No person will be assigned to operate or adjust machinery unless he has demonstrated a practical knowledge of its operations and repair and all applicable safety precautions, and then, only when qualified by the department head having cognizance over such machinery. Unqualified personnel will operate machinery only under the supervision of qualified personnel.

2. General Precautions. Personnel must observe the safety precautions and adhere to the SOPs for individual machine or ship system operations.

a. Never place any part of the body into moving machinery.

b. Never attempt to ride machinery that is not designed for transport.

c. Do not wear jewelry (e.g., rings, watches, necklaces, bracelets, loose fitted clothing, cell phones or other electronic devices while operating machinery).

d. Wear proper protective clothing and equipment suited to the operation being performed as required by technical manual or baseline IH survey (e.g., hearing protection, eye, hand and foot protection, dust and paint respirators, if indicated by the RPPM).

e. Observe manufacturer's safety precautions in the SDS and warning labels when handling flammable or toxic liquids; in particular, ensure that ventilation is adequate and wear appropriate PPE, such as eye protection and respirators, if indicated by the RPPM.

f. Use only hand tools and work lights that are in good material condition. Electrical tools and lights must be used only if inspected and approved. Special non-sparking and explosion-proof electrical equipment may be required in the presence of flammable solvents and fuels.

g. Use electrical tools and lights only if inspected and approved. The DCA may require non-sparking and explosion-proof electrical equipment.

h. Ensure that equipment is de-energized or depressurized or both, if appropriate, and properly danger-tagged before attempting to perform repairs or preventive maintenance.

i. Ensure machinery, hand tools, and electrical equipment are properly grounded prior to operation.

j. When working near electrical equipment or electrical cables, be alert to the presence of dangerous voltages and currents and avoid striking such equipment with tools or conductive material of any kind. Should such damage inadvertently occur, report it immediately to the chain of command and ship's electrical officer.

k. Do not use compressed air to clean personnel, clothing or to perform general space cleanup in lieu of vacuuming or sweeping. Compressed air may be used to clean machinery parts that have been properly disassembled provided that the supply air pressure does not exceed 30 psi and that a proper safety shield tip is used. Wear safety goggles, hearing protection, and proper respiratory protection, if indicated by the RPPM, when using compressed air for approved cleaning.

l. HAZMAT is frequently used in the operation and maintenance of machinery. Refer to chapter D15 for safety precautions associated with HAZMAT.

m. Supervisors must ensure that anyone who incurs any type of injury or who is exposed to any occupational hazard receive prompt medical attention.

n. Promptly reinstall shaft guards, coupling guards, deck plates, handrails, flange shields, and other protective devices removed as interference immediately after completion of maintenance on machinery, piping, valves, or other system components.

o. Do not use LP air to unclog flammable fluid piping systems unless a specific directive or approved procedure requires its use.

3. Maintenance. Ensure that all installed safety devices, alarms, and sensors are inspected and tested following scheduled PMS and other TYCOM requirements.

a. Assign the repair of defective safety devices a high priority.

b. Correct oil leaks at their source. Wipe up spills of any kind immediately and store the used or soiled rags in fire-safe containers, emptied daily. Dispose of rags as directed by the HAZMAT coordinator.

c. Avoid trip hazards by maintaining proper stowage.

d. Do not allow fire hazards to accumulate.

e. Ensure that all firefighting equipment is kept in a maximum state of readiness at all times.

f. Ensure repair lockers are properly outfitted and restored after each use.

g. Continually monitor fire and flooding alarm panels. No alarm or flag will be allowed to go uninvestigated. Alarm panels known to give false or spurious indications must either be labeled and repaired or replaced as soon as possible.

h. Piping systems that have been opened for maintenance (after having been properly isolated and tagged-out of service) must not be left open overnight. Install appropriate metal blank flanges if a section of piping has to remain open overnight or for any extended period of time. Add such temporary openings to the list of items to be checked by the below decks, shutdown roving watch, or space watch for the duration of the maintenance period.

i. Open all tank or piping drains and vents before loosening manhole or handhold plates or flanges. Stand clear of such fittings when initially opening them after service.

4. Industrial Equipment

a. General Industrial Equipment Operation and Repair Safety

(1) Read manufacturer's instruction books for essential details of readying machines and equipment for operation, cleaning, lubricating, and general care and maintenance. These instruction books, supplemented by technical handbooks, provide comprehensive instructions on all phases of shop practice.

(2) Inspect before operating industrial equipment (fixed or portable) to ensure that the equipment is in good working condition and that all installed or attached safety features (such as guards, limit switches, interlocks, and speed limiting controls) are in place and in good working order.

(3) Unplug or disconnect from power source and affix a red tag (DANGER - DO NOT OPERATE) on all fixed or portable industrial equipment requiring repairs.

(4) Shut off the power when changing industrial equipment parts such as face plates or chucks on lathes, drill bits in electric drills, or saw blades.

(5) Replace machine guards and safety devices after repairing, oiling or greasing, or after inspections or PMS have been completed before the machine is started or operated.

(6) Remove all industrial tools or test equipment used in making repairs, adjustments to machinery, or other shipboard equipment and systems so that all working parts of the machinery, equipment, or system will be free to operate without damage.

(7) Take care that no one is in a position to be injured when the machinery, equipment, or system is again set in operation.

(8) Be sure all personnel are clear before starting any industrial tools or equipment.

(9) Do not permit anyone to operate electrical or mechanical equipment or machines in any space when alone.

(10) Ensure there is plenty of light to work by before operating a machine.

(11) See that tools and work are properly clamped before starting a machine.

(12) Place or mount a saw, cutter head, grinding wheel, or tool collar on a machine arbor only when the tool is the proper size to fit the arbor.

(13) Ensure each powered machine has a means of cutting off power that can be safely reached and operated from the operator's normal position, without reaching through the point of operation or other hazardous areas.

(14) On machines where injury to personnel might result if motors were to restart after power failures, check that provisions have been made to prevent machines from automatically restarting upon restoration of power.

(15) Ensure that operating controls are protected by recessing, guarding, location, or other effective means against unexpected or accidental activation of the machine.

(16) The point of operation is the area of a machine where the work is actually performed upon the material being processed. Check that the point of operation is guarded so that personnel cannot be injured by contact with the machine or by flying objects propelled from the machine. Methods of point-of-operation guarding include barriers, shields, interlocks, automatic

feed and removal, and two-hand activation devices. The best guarding device is usually one designed and attached by the manufacturer as an integral part of the machine. The selection and design of guards other than those provided by the manufacturer must be adequate to protect personnel and not present a hazard in themselves.

(17) Power transmission devices include belts, chains, pulleys, shafting, flywheels, gears, sprockets, and any other moving parts of a machine other than the point of operation. Ensure that power-transmission devices are enclosed within the machine or otherwise guarded or so located that it is not possible for personnel to contact the moving parts.

(18) Ensure non-skid strips are installed on the deck (in the operator's work area) in front of permanently mounted machine tools.

(19) Ensure all warning and caution signs, for eye hazards, noise hazards, pinch points, etc., and machine safety precautions are posted within sight of the machine operator. Signs should also be posted in other conspicuous areas within the work-center to warn other personnel of the hazards. Ensure caution areas and eye hazard areas around the machine are marked as defined in chapter B5.

b. Housekeeping

(1) Keep areas around machines clear of obstructions and in a non-slippery condition. Clean up all spilled oil or grease immediately.

(2) Keep machines clean.

(3) Do not clean chips from the surface of machines with compressed air or with hands; use a brush or hook and wear leather gloves.

(4) Do not use compressed air to clean clothing or to blow dust off the body or to assist in the cleanup of dust, debris, or other particulate matter.

(5) Do not place hand tools on lathes or other machines. Keep them in their assigned location.

(6) Turn off all power to the equipment before removing chips and other debris.

(7) Ensure all portable tools (electrical and pneumatic) have been tested prior to initial use and periodically, as prescribed by PMS or other data.

(8) Ensure that all machine guards and other safety devices are in place prior to equipment operation.

c. Portable Power Tools

(1) Ensure all portable electric power tools have a current safety inspection prior to use.

(2) Ensure that deck grinders and pneumatic needle guns without positive accessory holding are equipped with an operable, manufacturer-installed "dead-man" switch.

(3) Keep portable power tools clean, lubricated, and in good repair.

(4) Keep all electrical cords clear of moving parts when using portable electrical equipment around machine tools.

(5) Wear and use necessary PPE, such as hearing protection for those tools and equipment labeled as noise hazardous.

d. Operating Precautions – General

(1) Remove chuck keys, wrenches, or other devices used to attach accessories to industrial machines before operating.

(2) Do not attempt to adjust a tool or feel the edge to be cut while the equipment or tool is in motion.

(3) Never attempt to stop or grab by hand or apply a wrench or tool to moving work or to moving industrial-equipment parts.

(4) Never lean against a machine that is running.

(5) Never leave moving machinery unattended.

(6) Do not distract the attention of a machine operator.

(7) Remove cutting tools from machines when not in use.

(8) Avoid excessive cutting speeds, feeds, and depth of cut. Keep hands clear of moving parts. Use a separate pusher bar or block to feed stock into cutting blades.

(9) Never operate equipment without all guards in place.

e. Securing for Sea. When securing for sea, take all precautions to ensure that components of industrial equipment or tools, including accessories, will not sway or shift with the motion of the ship. These precautions should include, but are not limited to, the following in subparagraphs 4e(1) through 4e(6).

(1) Lower the arm of top-heavy equipment, such as a radial drill press, to rest on the table or base of the machine and then clamp and block securely.

(2) Secure chain falls and other suspended equipment, such as counter-weights on drill presses.

(3) Secure tailstocks of lathes.

(4) Protect and secure tools stowed in cabinets or drawers. Secure drawers and cabinet doors. Where possible, install metal bands or fixtures vice using line to temporarily secure equipment.

(5) Inspect foundation bolts of heavy equipment annually per PMS to ensure tightness.

(6) While underway or while at anchor in high sea states, do not operate shop machines whose components are subject to shifting or swaying with the motion of the ship, so as to present a hazard to the operators, without the expressed permission of the commanding officer.

f. Posted Safety Precautions and Deck Markings

(1) Post operating instructions and safety precautions tailored to the specific equipment at each piece of industrial plant equipment. Install warning plates, located to ensure visibility, wherever necessary to minimize possible injury. Also, instructions to never allow machines to run unattended and not to distract the operator while the machine is in operation are appropriate. Posting may be accomplished using standard stock placards or excerpts from technical manuals.

(2) Clearly establish and mark equipment hazard zones and eye hazard areas per chapter B5, ship's plans and specifications, or technical manuals.

g. Safety Precautions for Specific Types of Equipment

(1) Pneumatic Tools – General

(a) Wear and use necessary personnel protective devices, especially eye and hearing protection.

(b) Do not connect or drive pneumatic tools by air pressure in excess of that for which the tools are designed.

(c) Only authorized and trained personnel will operate pneumatic tools.

(d) Lay pneumatic tools down in such a manner that no harm can be done if the switch is accidentally tripped. Do not leave idle tools in a standing position.

(e) Keep pneumatic tools in good operating condition and thoroughly inspect them at regular intervals with particular attention given to on-off control-valve trigger guard (if installed) and hose connections.

(f) Pneumatic tools and air lines may be fitted with quick-disconnect fittings which incorporate automatic excess flow shut-off valves, which shuts off the air at the air lines before changing grinding wheels, needles, chisels, or other cutting or drilling bits.

(g) Only use air hoses suitable to withstand the pressure required for the tool. Remove leaking or defective hoses from service.

(h) Do not lay hoses over ladders, steps, scaffolds, or walkways in such a manner as to create a trip hazard. Where a hose is run through doorways, protect the hose against damage by the door edge. Preferably, elevate air hose over passageways or working surfaces in a manner to permit clear passage and prevent damage to the hose.

(i) Connect a tool retainer on each piece of equipment which, without such a retainer, may eject the tool.

(j) Ensure that all portable pneumatic grinders are equipped with a safety lock-off device. The lock-off device must automatically and positively lock the throttle in the off position when the throttle is released.

(k) Ensure that air hoses are equipped with "quick disconnect" fittings at all hatches, doors, or scuttles.

(2) Buffers, Grinders, and Cut-Off Wheels – General

(a) Check the spindle speed of the machine before mounting of the wheel to be certain that it does not exceed the maximum operating speed marked on the wheel.

(b) Gently tap wheels with a light non-metallic implement, such as the handle of a screwdriver for light wheels, or a wooden mallet for heavier wheels, immediately before mounting. Do not use if they sound cracked (dead). This is known as the "ring test." It should also be noted that organic-bonded wheels do not emit the same clear metallic ring as do vitrified and silicate wheels.

(c) Wheels must be dry and free from sawdust when applying the "ring test," otherwise the sound will be deadened.

(d) Dress or replace wheels that are chipped, have imbedded non-ferrous material, are rounded, or worn out of round prior to using the grinder.

(e) Replace fabric buffer wheels that are frayed or worn out of round.

(f) Replace wire buffer wheels that are badly worn or loose at the hub.

(g) Permanently mounted buffers and grinders must have a shatterproof safety shield in place between the operator's eyes and the work at all times while buffing and grinding. Wear eye and face protection and hearing protection when operating either portable or permanently mounted buffers or grinders.

(h) Clean the flange surface of grinding and buffing wheels, normally placed between washers and the spindle hole, before mounting the wheel so that clamping pressure will be evenly distributed.

(i) Ensure that the hole in the buffer or grinding wheel is of the proper size for spindle (neither too small nor too large).

(j) Use compression washers as large as the flanges in diameter for buffer and grinding wheels.

(k) Tighten spindle nuts just enough to keep the buffer or grinding wheel from moving out of position between the washers.

(l) Mount tool or work rests on firm supports and space not more than 1/8 inch from the surface of grinding wheel. If equipped with dust collector bags, ensure they are of non-flammable material and are emptied regularly.

(m) Ensure the hood around grinding wheels is constructed so its periphery can be adjusted to the constantly decreasing diameter of the wheel by means of an adjustable tongue or equivalent. Maintain the distance between the wheel periphery and the tongue or end of the periphery band at approximately 1/4 of an inch.

(n) Ensure that the upper point of opening in the grinding wheel hood facing the operator is not less than 25 degrees and not more than 65 degrees from a vertical line drawn through the spindle center.

(o) Ensure that the maximum exposure of a grinding or cut-off wheel periphery or circumference for hoods on a swing frame machine does not exceed 180 degrees and the top half of the wheel is protected at all times.

(p) Ensure that the maximum exposure of the wheel periphery or circumference on bench or floor stands does not exceed 90 degrees.

(q) Protect cup-type wheels used for external grinding by either a movable cup guard or a band type guard. Provide all other portable abrasive wheels used for external grinding with safety guards (protection hoods), with the exceptions in subparagraphs 4g(2)(q)1 and 4g(2)(q)2.

1. When the work location makes it impractical, use a wheel equipped with safety flanges.

2. When using wheels 2 inches or less in diameter, securely mount the wheel on the end of a steel mandrel.

(r) When safety flanges are required, use them only with wheels designed to fit the flanges. Use only safety flanges of a type and design and properly assembled as to ensure that the pieces of the wheel will be retained in case of accidental breakage.

(s) Ensure portable abrasive wheels used for internal grinding are provided with safety flanges (protection flanges), with the following exceptions in subparagraphs 4g(2)(s)1 and 4g(2)(s)2.

1. When wheels are 2 inches or less in diameter, securely mount on the end of a steel mandrel.

2. If the wheel is entirely within the work area being ground.

(t) Ensure that all deck or bench mounted abrasive wheels have a work rest. Keep the work rest adjusted to within 1/8 inch of the wheel periphery to prevent the work from being jammed between the rest and the wheel.

(3) Operating Grinding, Buffing, and Cut-Off Wheels

(a) Stand to one side of the wheel when first applying power.

(b) Take care that the hands are not drawn into contact with buffing, grinding, and cut-off wheels.

(c) Never operate stationary grinding wheels unless protective eye guards and hooks are in their place and the tongue or the tool rest is correctly adjusted. Wear eye and face protection.

(d) Never operate portable pneumatic or electric grinding machines using wheels and wire brushes without a hood.

(e) Before the power is turned on, check to ascertain that the wheel runs true, is not out of balance, and does not strike or rub against housing, hood, safety shield, or tool rest. Dress wheels as necessary.

(f) Never use a grinding wheel on nonferrous materials. Nonferrous materials could build up on the wheel causing an imbalance condition or possible debris hazard. Dress grinding wheels that have excessive imbedded non-ferrous material.

SECTION D

CHAPTER 9

SANITATION (SEWAGE) SYSTEMS

Ref: (a) OPNAVINST 5090.1D, Environmental Readiness Program
(b) NSTM 593, Pollution Control
(c) BUMEDINST 6230.15B, Immunizations and Chemoprophylaxis for the Prevention of Infectious Diseases
(d) NMCPHC TM OM-6260, Medical Surveillance Procedures Manual and Medical Matrix (Edition12), August 2015
(e) NSTM, NAVSEA S9086-CH-STM-030/CH-074 V3, Gas Free Engineering

1. Discussion

a. Submarine sanitation systems are designed and operated to prevent the overboard discharge of untreated sewage into navigable waters of the United States or other countries.

b. Sanitation systems hold raw sewage until it can be discharged following reference (a) or to a pier connection.

2. Sanitary, Hygienic, and Safety Procedures

a. Hygienic Procedures. The following basic hygienic procedures in subparagraphs 2a(1) and 2a(2) are applicable to all submarine sanitation systems. Detailed information is contained in reference (b).

(1) Wear appropriate PPE (e.g., rubber gloves, rubber boots, chemical splash goggles, face shield, and disposable coveralls), while connecting or disconnecting sewage hoses, or when contact with sewage is possible.

(2) Ensure that personnel exposed to sewage or who work on sanitation systems are placed in medical surveillance and maintain their basic immunizations as required by references (c) and (d).

b. Leak or Spill Clean-up Procedures

(1) In the event a space becomes contaminated with sewage as a result of leaks, spills, or sewage system backflow, evacuate the space immediately and notify the executive officer, DCA, and the MDR.

(2) Secure the spill area from traffic.

(3) See reference (b) for information on spill cleanup and sanitation of the space.

3. Gas Free Engineering for Sanitation Systems. Do not open or enter a sanitary tank or remove a component which will leave an opening to the tank unless inspected and certified gas free per reference (e).

4. Control of Toxic Gas in Submarine Sanitation Systems. To minimize the potential hazards resulting from the release of toxic gases from the sanitation system, observe the following precautions contained in subparagraphs 4a through 4i.

a. Venting pressure from the sanitary tank should be done through the installed restriction lines to improve filtering by installed charcoal filter by reducing gas velocity through the charcoal. Use of the restrictor lines also minimizes the chance of wetting the charcoal with entrained moisture.

b. Always assume that the sanitary tank and piping systems contain sewage and toxic gases, and have an oxygen-deficient atmosphere. Be especially attentive for H_2S, a gas with a rotten egg smell at low concentrations. This odor is not reliable as a warning signal because H_2S will desensitize the sense of smell over time. As the H_2S concentration increases, the degree of danger increases.

c. To minimize hazards, always flush tanks and blow twice and ensure gas free if components are to be removed or disassembled outside the tank, or from the piping below the highest point of the sanitary tank overflow.

d. Never enter the tank or open the manhole access at any time unless at a suitable industrial facility, and only after certification by a gas free engineer or NFPA certified marine chemist. The ship will follow the shore gas free engineer and NFPA certified marine chemist recommendations during confined space operations, including recommendations on ventilation requirements. If any space is closed and reopened, another gas free test is required per reference (e).

e. Always recheck gas levels in the tank before reopening the tank or piping to replace repaired components if more than 2 hours have elapsed since the tank was last certified gas free (1 hour if the ambient temperature is above 90 degrees Fahrenheit).

f. If levels of gases have climbed above acceptable limits, repeat flushing procedure.

g. Wear proper supplied air respiratory protective equipment as indicated by the gas free engineer.

h. In any space where a sewage spill has occurred, do not conduct any work or maintenance other than work required to clean up the spill, until gas levels are below acceptable limits and all sewage wastes, including solids, have been removed from the space and the space washed down.

i. If any space is closed and reopened, another gas free test is required per reference (e).

5. Discharge Requirements and Additional Guidance. Refer to reference (a) prior to any discharge of sewage overboard.

SECTION D

CHAPTER 10

HEAVY WEATHER

1. Discussion

a. Heavy weather is defined as any weather that results in high winds, extreme sea states, heavy rains, snow and hail. While a submarine is on the surface, heavy weather will generate excessive rolls, yaws, and pitching which makes working and living conditions on board a potentially dangerous environment.

b. A multitude of hazards may occur in heavy weather. Objects can slide or fall on personnel causing injury. Personnel can fall into machinery or equipment. Personnel topside and on the bridge can be swept overboard. Heavy weather is as dangerous now as it was during the days of sail, and all personnel must be aware of potential hazards and safety requirements.

2. Safety Precautions While Moored in Port or Anchored

a. Keep complete topside safety lifelines and stanchions rigged at all times while in port except when mooring another submarine alongside. Do not dismantle any lifeline on the ship without the CDO's permission and ensure temporary lifelines are rigged prior to dismantling. Keep lifelines and stanchions in good repair.

b. Keep complete floating lifelines rigged and in good repair at all times while moored.

c. Keep a Jacob's ladder rigged from the ship's safety track or cleat in the vicinity of the hatch used for ship access at all times while moored or anchored. Keep ladder in good repair. Attach the Jacob's ladder so that it can be quickly removed and relocated to another location.

d. Inspect all topside safety equipment daily. Ensure no gear adrift is permitted to accumulate topside and report any unsafe conditions to the immediate supervisor.

e. Topside watchstanders in port must wear approved topside shoes when standing watch on board the submarine vice on the pier.

f. Topside watchstanders must be secured to the ship and wear an authorized life preserver after dark, in inclement weather, and at other times prescribed by the CDO when standing watch on board the submarine vice on the pier.

g. If worsening weather conditions make it prudent to shift the watch to the bridge, ensure that topside equipment is unrigged as feasible and secure topside for sea.

h. Normally mooring lines are doubled. With worsening weather conditions, use triple lines or install wire rope lines. Forward and after wire rope night riders may also be used.

3. Open Ocean Operations

a. Based on the consideration of personnel safety, sending personnel topside in open sea heavy weather conditions should be authorized only for emergency situations, sea air rescue operations, and extreme operational or tactical necessity.

b. The chief of the boat (person in charge of topside evolutions) will inspect personnel going topside to ensure that they are wearing the proper gear and that it is donned properly. Personnel going topside should utilize the buddy system such that one man in the hatch will tend a safety line to each man going topside until he has fastened his safety harness to the safety track. Conversely, when proceeding below, each man will attach the line being tended from the hatch to his safety harness before disconnecting from the safety track.

c. During normal surfaced underway steaming, all bridge personnel must wear, as a minimum, an approved personal flotation device. Personnel that are required to man the bridge during heavy weather should wear a safety harness attached to the bridge and wear an authorized life preserver. In sea states of three or higher, rig the bridge for dive and shift the watch to control.

d. Use of a protective helmet and IBLP will minimize potential injuries when striking the hull or deck if washed overboard.

SECTION D

CHAPTER 11

ABANDONING SHIP

1. Safety Precautions During Abandoning Ship

a. Follow the specific safety procedures and precautions in the ship's abandon ship casualty bills as delineated in the ship systems manual.

b. Wear a full set of clothing including long sleeve shirt, shoes, and a soft cap or head covering as protection from exposure.

c. All personnel should don a submarine escape immersion equipment suit prior to abandoning ship. Otherwise personnel should use an inherently buoyant type life preserver, if available. If time permits, deploy life rafts prior to entering water. Do not inflate auto-inflatable life preservers until the wearer is in the water. Inflate the life preserver as soon as wearer enters the water.

d. Do not dive into the water. Always jump feet first, with feet and legs together, and arms crossed over the chest holding onto the life preserver. If necessary to jump into burning water, place one hand over mouth with palm under the chin and fingers split over the nose. The other hand is placed on the inflatable life preserver collar to keep it from riding up.

e. Always abandon ship as far away from the damage as possible.

f. Know direction of the wind and go to windward side of ship, if possible, to avoid flames, oil, and the drift of ship.

g. When in the water, stay calm and do not panic. Obey the rules in the following subparagraphs 1g(1) through 1g(6).

(1) Swim away from the ship. If there is debris and oil in the water, use the breast stroke to clear a path. If space is available, climb into a lifeboat or life raft. If there is no room in the rafts of boats, use a safety line or the life preserver toggle line to attach life preserver to a raft, boat, or other personnel in the water wearing life preservers.

(2) After arriving at a safe distance from the ship attach the distress marker light to the Velcro patch on the buoyancy chamber, conserve energy by moving as little as possible.

(3) Keep clear of oil slicks, if possible. If possible, protect eyes and breathing passages by keeping head high or swimming underwater. If swimming underwater, prior to coming the surface, put hands above head and splash the water surface to disperse oil, debris, or flames.

(4) If a danger of underwater explosion exists, float or swim on the back as near the surface of the water as possible.

(5) Remain with other persons in the water to reduce danger of sharks and make rescue easier. In cold water, forming close circles with others will preserve heat. Conserve energy by moving as little as possible.

(6) If ship is sinking rapidly, swim clear promptly, and tow injured persons clear, to avoid suction effect.

h. Follow all other procedures and precautions as delineated in the ship's abandon ship bill.

SECTION D

CHAPTER 12

PAINTING AND PRESERVATION

Ref: (a) NSTM 631, Painting and Preservation of Ships
(b) OPNAVINST 5090.1D, Environmental Readiness Program
(c) NAVSEA S6360-AD-HBK-010, Technical Handbook for Special Hull Treatment Maintenance and Repair for Submarines
(d) NAVSEA 6310-081-015, Submarine Maintenance Standard (Submarine Preservation)

1. Discussion

a. For application and removal precautions for lead-based paint, see chapter B10. This chapter deals exclusively with the application and removal of paint not containing lead. Ensure paint samples are submitted to the local IH lab for analysis prior to starting paint removal project. If paint samples are found to be lead containing, utilize chapter B10 for paint removal procedures and consult with the local industrial hygienist.

b. Many paints, varnishes, lacquers, cleaners, solvents, and other finishing materials contain flammable solvents and, therefore, present a fire hazard. In addition, these same products frequently give off toxic vapors that can be harmful to health and the environment. For this reason, paints and similar products are not normally carried aboard submarines, although ships may carry rust converters to temporarily arrest corrosion. The SMCL provides additional guidance for cautions associated with submarine atmosphere control. Appendix D12-A-1 provides a list of best practices that should be followed, if at all possible, to reduce the environmental impact of paint vapors and paint debris. Reference (a) contains procedures for paint application. Reference (b), the shipboard marine coating use section contains information on volatile organic compounds and environmental recording that may be required.

c. Paint removal operations can produce extremely high personnel exposures to toxic substances found in paints, depending on the method of removal. Chipping causes scale to be dislodged, presenting possibility of eye or facial injury. It is therefore necessary that personnel take proper precautions in handling and using these products. Administrative and protective measures need to be followed to lessen the amount of dust from sanding, grinding, and chipping paints and from fumes generated during hot work on painted surfaces.

2. Safety Precautions for Paint Removal

a. Ship's force must not perform routine submarine paint removal for cosmetic reasons or due to excessive thickness. Ship's force should only remove paint when required to accomplish

preservation of corroded surfaces, incidental to hot work, welding, or when bare metal is necessary for an inspection.

b. Wear eye protection and a long sleeve shirt or coveralls with sleeves rolled down. Consult the RPPM or RPA about any respirator requirements for the operation.

c. For paint removal, keep mechanical grinding and sanding to the absolute minimum with primary reliance on manual removal methods, impact tools and authorized chemical paint strippers.

d. Wear electrical safety gloves when using portable, electric-powered tools. See chapter D5 for additional precautions when using electrical power tools.

e. Many paint removal tools are noise hazardous equipment. If equipment is labeled as noise hazardous, ensure that proper hearing protective equipment is worn. See chapter B4 for additional information.

f. Assume all paint contains toxic substances which are hazardous to health if ingested or inhaled in small amounts, unless proven otherwise by sample analysis.

g. Avoid prolonged skin contact with paints and thinners and do not use paint thinners or mineral spirits to clean paint off skin. Use an approved industrial skin cleaner to remove paint from skin. Never use bare hands to mix paints.

h. Do not allow eating, drinking, or using tobacco products in the paint area. When handling painting materials wash hands prior to eating, drinking, using tobacco products, or using the head.

i. Ensure that all personnel involved in paint removal wear disposable coveralls, hand protection, and other PPE as required.

j. Provide ventilation during paint removal to minimize personnel exposure to airborne particles and vapors. If IH surveys identify that respirators are required to provide additional protection, follow the recommendations of the RPPM or RPA and the requirements of chapter B6 regarding the use and care of respirators.

k. Secure and cover all deck drains and installed ventilation systems and openings in the paint removal work area. Isolate the work area to the maximum extent possible with drop cloths or plastic.

l. Personnel must minimize the use of water as dust control or clean-up in the paint removal process, since any used in the operation must be treated as HAZMAT.

m. Tools and surfaces in the work area must be wiped down with a damp cloth or tack cloth after completion of the task to remove dust.

n. At the end of the work shift personnel must vacuum debris and all surfaces in the area with HEPA equipped vacuum cleaner. Ensure to vacuum coveralls and gloves prior to removal.

o. Ensure that paint debris, HEPA filters, and wipe down rags are separated from coveralls, gloves, and other disposable materials. Place them in plastic bags and label both groups as HAZMATs.

3. Safety Precautions for Surface Preparation and Painting Operations

a. Wear eye and face protection and long sleeve shirts or coveralls with sleeves rolled down and all buttons buttoned at all times while chipping or operating power brushes, chipping, or scaling tools. Consult the RPPM or RPA about any respirator requirements for the operation. If paint containing lead or other hazardous constituents is to be removed, an industrial hygienist should evaluate the operation and recommend proper respiratory protection and other personal protective clothing per chapter B10.

b. Log all paint brought onboard ship in the atmosphere control log.

c. Do not paint in any area where welding or other hot work is being performed.

d. Use pneumatic, not electric, wire brushes and chipping tools when working over the side.

e. Consult the RPPM or RPA about any respirator requirements for spray painting operations internal to the ship or in confined external areas (free-flood areas). Supplied air respirator may be required for extensive external spray paint operations. For minor external spray painting and touchup of small areas, an organic vapor cartridge type with paint mist pre-filter may be indicated by the RPPM or RPA.

Note: Aerosol paint cans are not permitted within the submarine for use or storage.

f. When working over the side or aloft, see chapter B13 for additional precautions.

g. Bring only 1 day's amount of paint below decks in the area being painted. Do not bring full-strength ketone solvents below decks.

h. Do not store paints, brushes, and stirring sticks on the pier for extended periods of time.

i. Provide ventilation in closed areas when painting.

j. Wear protective gloves when handling cleaning compounds, thinners, paints, removers, or other irritants.

k. De-energize all equipment in areas being painted, as appropriate.

l. Provide explosion proof lighting during spray-painting operations.

m. Remove all paints and thinners from the ship when taking a lengthy break. Upon completion of painting, properly dispose of unused paint and waste.

n. Wear electrical safety gloves when using portable, electric powered tools. See chapter D5 for additional precautions when using electrical power tools.

o. All paints, paint cleaners, solvents and brush cleaners are HAZMATs. Refer to chapter D15 for HAZMAT storage, use, and disposal procedures.

p. Many paint removal tools are noise-hazardous equipment. If so labeled, ensure that proper hearing protective equipment is worn. See chapter B4 for additional information.

q. Terminate all internal painting with oil-based paints 5 days prior to sealing the ship. Terminate painting with latex or water based paint 3 days prior to sealing the ship.

r. Perform paint mixing on the pier adjacent to the ship. Post barricades to ensure there is no smoking, open flame, or hot work in the vicinity of the paint mixing area.

s. Do not permit personnel with a history of chronic skin disease or allergies to work with paint compounds or thinners. Personnel who are sensitive to paint compounds and thinners must report to the medical department for evaluation.

t. Do not allow eating, drinking, or using tobacco products in the paint area. When handling painting materials wash hands prior to eating, drinking, using tobacco products, or using the head.

u. When painting engineering spaces, they should be in a cold-iron condition before and during paint application. Heat-producing work areas adjacent to where brush or roller application of paint is being performed may be considered provided that:

(1) the painting operation involves only minor (touch up) operations; and

(2) there is no hot work within 25 feet of painting operation while using surface ventilation lineup, unless separated by a watertight bulkhead.

v. For paint removal from special hull treatment, refer to the special hull treatment technical manual, reference (c) and reference (d), for specific guidance and safety requirements.

w. Exercise caution when using two-part polyamide paints in the vicinity of electrical generation equipment. These two-part polymer paints can release vapors that contaminate commutator films. Use of positive pressure units for motor generators can mitigate polyamide painting effects.

Note: Personnel should be aware of the work being performed around them during painting evolutions. Certain components, specifically those motors and motor generators that have carbon brushes, will be detrimentally affected by vapors generated by the painting evolution. Do not paint around motors and motor generators that have their access covers open to the atmosphere or that are having maintenance performed.

APPENDIX D12-A
BEST MANAGEMENT PRACTICES (BMP) FOR REMOVAL AND APPLICATION OF PAINT, FINISHING, AND COATING MATERIALS

1. Surface preparation and the application of paints, finishes and coatings to submarines can be sources of pollutants. Potential pollutants include organic compounds, oils and greases, heavy metals, and suspended solids. It is important both on submarines and on the pier that painting and sanding operations be covered and contained and that good housekeeping and planned maintenance practices are applied to prevent the contamination of stormwater with paint over sprays and grit from sanding, chipping and needle gunning. The following are BMPs that should be applied if at all possible to minimize both water contamination and air emissions.

a. If using aerial work platforms:

(1) put tarps in floor of basket and get basket as close to the side of the ship where painting is occurring such that any drips of paint will be into the tarped basket;

(2) use smallest possible cans or drums of paint to reduce potential spillage; and

(3) ensure can is secured (tabs down) when not actively transferring paint.

b. If using paint floats or other floating platforms:

(1) pull the float as close to the hull as possible such that any drips will be captured on the float;

(2) use shrouds, tarps, or other protective devices between the float and the hull to protect any drips from entering the water

(3) use smallest possible cans or drums of paint to reduce potential spillage; and

(4) ensure can is secured (tabs down) when not actively transferring paint.

c. When working pierside, whether in an aerial work platform or just standing on the pier:

(1) a tarp should be placed above the water surface underneath the work area between vessel and pier or shore to prevent spillage into the water, when feasible, and the bottom edges of tarps and plastic sheeting need to be weighted to keep them in place;

(2) shrouds should be cleaned frequently to prevent material from being blown into the water;

(3) if a tarp cannot be secured between the ship and shore, use extreme caution to eliminate drips of paint into the water; and

(4) ensure cans are secured (tabs down) when not actively transferring paint.

d. When painting onboard ship or pierside, minimize air emissions:

(1) do not thin paint used on vessels or components;

(2) take care when transferring material to avoid spills, and clean up and properly containerize all spill residue immediately; and

(3) do not soak paint-related items such as stir rods in open thinner containers. Paint and solvent containers must remain closed at all times when material is not being added or removed.

e. Use drop cloths, cardboard, tarpaulins or other protective devices in staging area on pier where paint buckets, brushes, rollers, etc. are stored and paint transfer between containers is performed to keep any spills from reaching the pier and water.

f. Use minimal amount of paint on rollers and brushes so no drips are evident when removing from the staging or work area.

g. Use a roller pan to apply paint to roller and remove excess paint prior to extending the roller over the water. Use of 5-gallon buckets as dip pans is not acceptable for this purpose.

h. When not transferring paint, paint cans must be covered and sealed (tabs secured) to reduce the chance of spillage.

i. Collect and contain any debris generated from surface preparation work. Complete recovery of blasting material and paint chips is required.

(1) Use vacuum sanders that have dust-containment bags to remove paint from hulls and collect paint dust.

(2) Use plywood or plastic sheeting, or both, to cover open areas between decks when sandblasting (scuppers, railings, freeing ports, ladders, and doorways).

(3) Plug scuppers to contain dust and debris.

(4) Wipe down small amounts of sanding dust with a damp rag and vacuum or sweep paved surfaces regularly if debris has reached them. Never hose down areas that have spilled paint or debris. Properly dispose of debris.

j. Do not conduct spraying, blasting, or sanding activities in windy conditions such that containment measures are rendered ineffective.

k. Have absorbent and other cleanup items readily available for immediate cleanup of spills. Wipe up spills immediately.

l. Use a storm drain cover, filter fabric, or similarly effective runoff control device if dust, grit, paint, or other pollutants may escape the work area and enter a catch basin or pier drain. The containment device(s) must be in place at the beginning of the workday.

m. Use a ground cloth, pail, drum, drip pan, tarpaulin, or other protective device for activities such as brush cleaning outside or where spills can contaminate stormwater.

n. Inspect the condition of all protective devices at minimum before each work shift and repair or reposition as needed.

o. Store paint or tools with residual paint under cover during precipitation events and when not in use to prevent contact with stormwater.

p. Rags contaminated with solvent must be bagged and turned in for proper disposal. Do not allow to air dry. Never keep rags contaminated with solvent in work areas or other non-fire protected spaces as rags could self combust.

2. It is important to note that these are just some of the BMPs that can be used. Not all are applicable for every application. Judgment must be used to determine which can be used with the ultimate goal of keeping the paint and debris from reaching the pier and water. If there is a method for containing paint and debris that is not listed above and the applicability is uncertain, contact the local base environmental office for assistance.

SECTION D

CHAPTER 13

FOOD SERVICE AND SOLID WASTE DISPOSAL EQUIPMENT

Ref: (a) NAVMED P-5010, Manual of Preventive Medicine, Chapter 1
(b) NSTM 555, Submarine Firefighting

1. Discussion

a. A basic necessity for any ship is a galley. The crew must be fed and personnel must prepare food for consumption. The food preparation required to feed a large body of people means that machinery and equipment must be used. The use of this machinery introduces hazards unique to the galley and food preparation areas.

b. Every Navy submarine is equipped with solid waste and garbage processing machinery, frequently under the purview of the supply department. Use of this machinery has unique hazards as well as environmental pollution ramifications.

2. General Precautions. Before attempting to operate machinery, observe the following general precautions contained in subparagraphs 2a through 2y.

a. Check for and determine the location of emergency equipment, such as fire extinguishers and first aid boxes, to ensure their availability should an accident occur. Ensure machinery, hand tools and electrical equipment are properly grounded prior to operation. Report any deficiencies or malfunctioning equipment to the supervisor.

b. Ensure that the work area around the equipment is clear of obstructions and thoroughly dry. Clean up all spills immediately to ensure a clean, dry, non-slippery walking surface.

c. Ensure the installed lighting in the work area is operating properly and provides sufficient light.

d. Read, observe and follow posted operating instructions and safety precautions.

e. If there is any doubt about operating procedures or safety precautions, ask the supervisor.

f. Only qualified personnel will attempt to operate equipment.

g. Ensure no loose gear is in the vicinity of moving parts of machinery. Make sure all safety guards, screens, and devices are in place before turning on machinery.

h. When operating a machine, maintain a safe distance from all moving parts. Never use hands or body to stop moving blades and parts even if power has been secured.

i. Never lean against a machine while it is operating.

j. If ship movement is severe, exercise caution in operating machines; if severe movement continues, secure nonessential machines.

k. Use eye and hand protection, and safety equipment such as dip baskets while handling chemicals or hot water. Personnel at the deep sink must wear rubber gloves with elbow-length or longer sleeves and apron to prevent hot water burns.

l. Keep hands, body, and clothing away from operating machinery parts.

m. Never leave operating machinery unattended.

n. Do not distract the attention of personnel who are operating machinery.

o. Do not attempt to clean or service machinery while it is in operation. Before cleaning, adjusting, oiling or greasing equipment, secure power and danger tag-out equipment or unplug, if not hardwired. Follow tag-out procedure when servicing or cleaning equipment. If in doubt about the requirement to tag out any equipment, consult the supervisor.

p. Ensure only qualified personnel make all repairs and service machines.

q. Ensure safety devices and interlocks on galley equipment, such as the covers of vegetable peelers and bread slicer, are maintained in proper working condition at all times. If removed for any reason, replace such devices before the machine is returned to operation.

r. Remove rings and watches, pagers and cell phones, and eliminate any loose clothing such as rolled-up sleeve cuffs, oversized gloves, and ill-fitting coats and jackets.

s. If the ship will be taking large angles (a planned evolution), ensure that the level of liquid (grease or water) in pots and other containers is sufficiently low that it will not overflow its container during the maneuvers. During normal operations, maintain container liquid levels as low as possible, to avoid injury due to unexpected ship angles.

t. Ensure that permanently-mounted equipment is hardwired (extension cords are not permitted). Know where the cut-off switches for hard-wired equipment are located. Obey all tag-out tags on switches.

u. When cleaning, look before reaching into enclosed spaces or under grills or griddles for loose wires or sharp obstructions.

v. Use caution when applying conductive cleaning fluids or water in the vicinity of electrical devices to mitigate shock hazards and damage to electrical equipment.

w. Avoid touching sharp metal edges of opened cans and lids.

x. Report any injuries, such as burns, cuts or open wounds, to the MDR.

y. Additional precautions may be found in reference (a). Personnel assigned to permanent and temporary work in food service areas must be given a copy of these precautions prior to beginning their assignment.

3. Cooking Utensils

a. Secure all coffee pots and urns to prevent dislodging and splashing.

b. Exercise extreme caution and care when handling hot oils, water, and other liquids or when operating steam valves and equipment. Do not transfer hot liquids in heavy or moderate sea states or when planning to take steep angles.

c. Never leave drawers, doors, or access panels open where they could become hazardous to personnel.

d. Never leave operating hot plates, pots, griddles, steam kettles, or fryers unattended.

e. Be careful not to place meat, vegetables, or other foods on a knife or other sharp instrument. The food may conceal the cutting edge.

f. Do not place knives in the wash water until ready to wash them. Lay them in plain view beside the sink.

g. Keep the free hand away from the sharp edge of the cleaver when chopping foods.

h. Use a protective glove (e.g., metal fiber or Kevlar®) when boning meat.

i. Keep the surfaces of meat blocks level.

j. Store utensils in their proper places.

k. Do not allow pot or pan handles to extend beyond the edge of the range or counter. They can be bumped and cause serious burns to personnel resulting from spilled or splashed food or liquid.

l. Before removing foods from hot ranges and ovens, be sure there is a clear place on which to set them and clear the path to that place.

m. Use only the proper implements for opening cans and other containers.

n. Hold knives firmly. Ensure knife handles are dry or free of grease before handling them.

o. Knives should be stored in National Sanitation Foundation racks.

p. Magnetic knife racks are prohibited due to knife magnetism picking up foreign material.

q. Keep knives sharp at all times.

r. Never handle a knife while carrying another object.

s. Ensure hot pads are clean and dry.

t. Keep all tools clean and dry.

4. Food Preparation

a. Practice good personal hygiene at all times, and report all illnesses and injuries to the supervisor.

b. Keep hands clean and thoroughly wash hands with soap and water after using the head, touching mouth or nose, or handling any food.

c. Keep fingernails short.

d. Wear appropriate hair covering at all times in food-handling areas.

e. Do not touch food with bare hands. Use appropriate implements for handling food or wear plastic food handling gloves when working with ready to eat foods.

f. Never handle food when having an open wound or infection of any kind on the hands or arms. Report sore throats, colds, intestinal disturbances, or symptoms of other general diseases to the MDR at once.

g. Clean up spilled food immediately.

h. Do not use leftovers held over 24 hours. Ensure all leftovers are marked with the date and time they were placed in storage.

i. Ensure that distant-reading dial thermometers and, when required, electronic temperature-monitoring units are installed, calibrated, and operating. Verify thermometer accuracy monthly. Ensure the emergency door-release mechanism required in "walk-in" refrigerators and freezers is installed and properly operating.

j. Discard protein foods that have remained at temperatures between 41 and 135 degrees Fahrenheit for periods longer than 3 hours.

k. Observe safety precautions around all electrical equipment to avoid injury from shock. Do not reach into areas for cleaning around griddles and ovens that have exposed wiring unless the equipment has been tagged out.

l. Notify the supervisor immediately if the heat stress DB thermometers read 100 degrees Fahrenheit or greater, or if dizziness, nausea, or other heat-related symptoms is experienced.

m. Wear eye and hand protection when using oven cleaners or other strong cleaning materials. Do not dispense bulk cleaners into spray bottles without properly labeling the spray bottle with the new contents. See chapter B3 for details on labeling HAZMATs.

5. Safe Operation of Food Service Equipment

a. General Precautions. Observe all posted operating procedures or manufacturers operating instructions for each piece of food service equipment prior to operating. Additionally, inspect all electrical equipment (range, griddle hotplate, and disposals) for exposed, chafed or frayed wiring.

(1) Ensure all power switches are functional.

(2) Ensure all required guards are in place.

(3) Ensure rubber boots over switches in wet areas are in good condition.

(4) Ensure all personnel operating equipment or performing food service functions are trained and properly supervised.

b. Deep Fat Fryer

(1) Beware, this is high voltage equipment.

(2) Extinguish a fire in the deep fat fryer per reference (b).

(3) Never leave fryer unattended when in use.

(4) Ensure heating coils are completely covered with cooking oil before turning on the equipment.

(5) Never exceed the maximum temperature noted by manufacturer.

(6) Monitor cooking oil temperature with a proper thermometer whenever the deep fat fryer is in use. Ensure backup safety thermostat is installed and operational.

(7) Install cover when fryer is not in use.

(8) Secure deep fat fryer following posted instructions when not in use.

(9) Ensure that grease spills are cleaned up promptly.

(10) Wash and change grease filters in range hoods as often as necessary per PMS requirements, but not less than weekly, to avoid the danger of fire.

c. Dough Mixing Machine

(1) Never attempt to cut dough while the agitator is revolving.

(2) Never attempt to knead or feel consistency of dough product while machine is in operation.

(3) Never attempt to clean out a bowl in the tilt position by reaching in unit while the agitator is revolving.

(4) Check safety switch to lid cover for proper functioning per PMS requirements.

d. Food Mixing Machine

(1) Use proper machine speed for the specific operation.

(2) Never place hands into the bowl while machine is in operation.

e. Vegetable Cutting and Slicing Machine

(1) Always use plunger when applying pressure on vegetables being fed into the hopper.

(2) Do not use loose-fitting gloves when operating the machine.

f. Meat Slicing Machine

(1) Never operate the machine unless the blade guard is secured in place.

(2) Do not use hands to press down food.

(3) Never touch the blade when it is running or exposed for slicing.

(4) Set index at zero and secure power at the distribution box or by disconnecting the power cord when cleaning blade.

(5) Ensure slicing machines are provided with a toggle-switch finger-guard that is oriented in the proper direction for protection.

(6) Always disconnect power cord prior to cleaning and reconnect only when ready to use.

(7) Once de-energized, clean the blade with a clean, detergent-soaked cloth wrapped around a cook's fork or other extension utensil. Rinse the blades following a similar procedure and sanitize them with a disinfectant approved for use aboard submarines (e.g., Wescodyne disinfectant and detergent, NSN: 6840-00-526-1129).

(8) Reassemble machine after cleaning.

(9) Meat slicers that are hardwired must have an interlocking switch installed. Tag-out procedures must be followed prior to blade removal.

g. Direct Steam Kettle

(1) Each day this equipment is used, test the safety relief-valve while under operating pressure by pulling the chain attached to the safety relief valve arm.

(2) Do not tamper with the safety-valve or tie it closed. It is there to prevent the kettle from exploding.

(3) Do not apply steam to an empty kettle; never put water into a hot, dry kettle.

(4) Ensure safety relief-valve levers are equipped with an 18-inch chain to allow activation from a safe distance. Chains must be mounted in such a way that the need to reach over or between or behind hot kettles is eliminated.

(5) Ensure steam-jacketed kettles are hydrostatically tested as required by the equipment MRC.

(6) Piping from relief valves must extend to just inside the deck coaming.

(7) Lagging under steam kettle must be removed and replaced with perforated steel or aluminum with approximately 1/2-inch standoff.

h. Electric Kettle

(1) If required check water level as necessary and fill when the kettle is cool.

(2) Prior to kettle maintenance, ensure the kettle is cool with power secured. Follow tag-out procedures before completing kettle maintenance.

(3) Relief valves should only be lifted when the kettle has been laid up and is cold per MIP 6520. An 18-inch pull chain is not required for electric kettles.

(4) Ensure relief valves are hydrostatically tested as required by the equipment MRC.

(5) Piping from relief valves must extend to just inside the deck coaming.

i. Electric Griddle

(1) Keep griddle turned off when not in use.

(2) Keep cooking surface and grease gutter scraped and wiped clean at all times.

(3) Remove, empty and clean grease drawer after each use. Do not reach into the drawer area for cleaning unless the griddle is tagged out.

(4) Use griddle guards to keep food from sliding off the cooking surface.

(5) Never use water to clean a griddle surface. Wipe the surface with clean, dry paper towels when the griddle is cold. Use pumice stone block to clean hard-to-remove burn spots.

j. Coffee Urn

(1) Do not introduce water too quickly into the boiler.

(2) Do not overfill boiler. Be sure water has stopped rising in the gauge glass after the water-inlet valve is closed. Do not turn on activating switch until water-level gage reads full or the pressure control dial reads 36 ounces.

(3) Do not open urn cover while siphon valve is open. Do not agitate coffee while cover is open. Do not remove leacher from the urn body until it is completely drained.

(4) Do not obstruct safety-valve outlet. Keep equipment clean. Clean the urn immediately after use to prevent development of rancid taste.

k. Ranges and Ovens

(1) Do not allow grease to collect in oven.

(2) Do not clean oven while it is hot.

(3) Clean oven thoroughly once a week in addition to normal daily cleaning.

(4) Turn off surface units when not in use.

(5) Keep range drip-pan and grease trough clean. Never allow grease to accumulate since it is a serious fire hazard.

(6) Observe the electrical wiring under the range griddle or hot plate to see if wiring is secured in place and not chafed or in contact with the grease drip-pan. Tag-out the power source prior to cleaning under the range, griddle, or hot plate. Do not attempt to correct faulty wiring. Report electrical hazards to the supervisor.

l. Proofer

(1) Only authorized personnel are permitted to operate this equipment.

(2) Clean the proofer after each use.

m. Dishwashing Machine. Observe operating instructions and safety precautions.

(1) Ensure rubber protectors over switches are in good condition (no cracks or tears).

(2) Wear protective equipment when changing out cleaner dispensers.

(3) General ventilation in the space and local exhaust ventilation to remove steam from the machine must be operational.

(4) Do not reach into the dishwashing machine while operating - secure power before trying to clear the conveyor.

n. Steam Table

(1) Use the proper implements, such as pot holders and tongs, for handling containers.

(2) Tilt containers away from oneself when inserting them into the wells.

(3) Carry hot liquids in covered containers with the covers securely in place and use heat protective hand protection.

(4) Promptly mop up grease which is spilled on the deck. Greasy decks are doubly hazardous. They can cause fires as well as falls.

o. Gaylord Exhaust Hoods

(1) The fire extinguisher control box contains a live electrical circuit. Prevent water or other cleaning fluids from entering this box.

(2) The baffle blades and interior of hood should be cleaned at least once a day to prevent fires from accumulation of grease.

(3) Keep the access doors closed during the wash and rinse cycles to prevent hot water from splashing personnel.

(4) Keep hood drains clear at all times.

p. Meat Chopping Machine

(1) Never feed this equipment by hand. Use a pestle (stomper).

(2) Never attempt to remove anything from these machines while they are operating.

(3) Always disconnect the machines before cleaning them.

q. Potato Peeler

(1) Make sure water is running before operating this equipment.

(2) Never put a hand in this machine while it is operating.

(3) Ensure power is properly secured prior to cleaning the machine. Remove the internal bottom with two round rods and clean with hot soapy water; rinse before reinstalling bottom.

r. Microwave Ovens

(1) Keep the inside of the oven door and cabinet surfaces clean at all times. Do not use tools or abrasives on door closing surfaces.

(2) Do not allow oven door to be closed on any object including rags, towels, etc.

(3) Do not attempt to defeat the oven door safety interlocks.

(4) Do not operate the oven with an empty cavity and keep all metal utensils out of the oven cavity at all times.

(5) Do not obstruct cooling vents in the oven housing.

(6) Keep the oven door closed when the oven is not in use.

6. Solid Waste Processing Equipment

a. Garbage Disposer

(1) Do not put hands into disposer when in operation.

(2) Ensure guards, safety cutoffs, and other safety features provided with the unit are installed and functional prior to use.

(3) Start disposer and turn on water before feeding waste.

(4) Feed food waste gradually.

(5) Do not feed metal, wood, cloth, rubber, plastics, or corn husks into the garbage disposer. If such material is fed accidentally secure power to the disposer. Notify the supervisor to see if tag-out procedures are needed to safely remove the object.

b. Trash Compactor and Trash Disposal Unit. Subparagraphs 6b(1) through 6b(11) contain a list precautions applicable to the submarine trash compactor.

(1) When working with disposable cans, wear work gloves (e.g., Kevlar®). Be careful of any sharp edges.

(2) Keep unit clean and sanitary.

(3) Do not load wet garbage or liquids into the trash compactor. Drain excess liquids from containers that are to be compacted.

(4) Do not put rigid materials, such as thick metal or wood, into the compactor.

(5) Ensure that disposable cans are properly formed to prevent hang-up in or damage to the trash disposal unit muzzle ball valve mechanism.

(6) Do not attempt to service the compactor while it is in operation. Ensure that the hydraulic supply isolation valve is shut and danger tagged per the tag-out procedures.

(7) Do not modify interlocks to operate the trash compactor without closing the cover.

(8) Wear eye protection, work gloves (e.g. Kevlar®), and a rubber apron when operating the trash compactor.

(9) Ensure legible operating instructions are posted for the trash compactor and trash disposal unit.

(10) For SSBN and SSGN 726 class trash compactors, refer to the following subparagraphs 6b(10)(a) through 6b(10)(e).

(a) Before unlatching the retainer doors, ensure the safety hood (cover) is raised.

(b) Do not place hands under the ram unless the safety hood (cover) is raised and the hydraulic supply isolation valve is shut.

(c) Before opening the hydraulic supply isolation valve, ensure that the ram control valve is latched in the centered position and the retainer doors are shut and latched.

(d) Do not operate the ram with the doors open.

(e) Ensure that all four toggle pins on the retainer doors are securely latched shut before operating unit. Failure to do this may result in the container bursting under compactor pressure unit.

(11) For other submarine trash compactors, the following subparagraphs 6b(11)(a) through 6b(11)(c) apply.

(a) Pin lock the hydraulic control valve in the neutral position to prevent inadvertent operation while loading the compactor.

(b) Prior to compacting, ensure that the disposable container is in full contact with the retainer to prevent container distortion during compacting.

(c) Prior to compacting, ensure the retainer is securely latched in place so the ram will be unobstructed when it is lowered.

(d) Material must never be inserted into the compactor while the retainer is positioned vertically under the ram and the control valve is in a position other than locked in the neutral position.

SECTION D

CHAPTER 14

LAUNDRY

Ref: (a) NAVSEA S0400-AD-URM-010/TUM, Tag-Out User's Manual

1. Discussion. Hazards in laundry equipment include mechanical equipment and electric power. Safety precautions contained in this chapter are basic and general. Ships must provide personnel assigned to work with laundry equipment with a copy of these precautions prior to beginning their assignment.

2. Precautions Relating to Laundry Equipment

a. Washer Extractor

(1) Thoroughly examine all clothing before cleaning; remove all foreign materials such as matches, ink pens, and metallic objects.

(2) Ensure that the inner pocket door is firmly latched before operating the machine.

(3) Do not exceed the prescribed loading capacity of the cylinder; doing so may damage the machine or prove hazardous to personnel.

(4) Be sure the machine is de-energized before cleaning or servicing. Use safety tag-out procedures as required by reference (a) and the applicable equipment MRC.

(5) Ensure safety devices are maintained in proper working condition at all times. If removed or out of order for any reason, replace safety devices before the machine is put into operation.

(6) Use only approved detergents in recommended quantities. Ensure a neutralizer is used in the wash as residual detergent can cause skin irritation.

(7) Ensure safety precautions and operating procedures are posted.

b. Tumbler Dryer

(1) Never overload the machine.

(2) Never open the door while the tumbler is in motion.

(3) Before servicing or cleaning, be sure the power to the tumbler dryer is entirely disconnected. Use safety tag-out procedures as required by reference (a) and the applicable MRC.

(4) Maintain safety devices in proper working order at all times. If removed for any reason, replace safety devices before machine is put into motion.

(5) Ensure that the primary lint screen is checked and cleaned as required prior to use and after every drying cycle. Ensure the secondary lint filter (40-mesh) is cleaned after every 8 hours of operation.

(6) Ensure laundry equipment is periodically checked while in operation.

(7) Ensure NAVSEA 1995/93 preventing laundry dryer fires are posted (stock number 0118-LF-981-6600).

SECTION D

CHAPTER 15

SUBMARINE HAZARDOUS MATERIAL CONTROL AND MANAGEMENT (HMC&M)

Ref: (a) NAVSEA S9510-AB-ATM-010/(U), Nuclear Powered Submarine Atmosphere Control Manual (NOTAL)
(b) NSTM 670, Stowage, Handling, and Disposal of General Use Consumables
(c) NAVSEA S9593-A1-MAN-010, Shipboard Management Guide to PCBs and Associated NAVSEA issued PCB Advisories (NOTAL)
(d) NSTM 593, Pollution Control Manual

1. Discussion. This chapter provides additional guidance for submarine HMC&M. It addresses management guidance for HAZMAT that may be an atmosphere contaminant per reference (a). This chapter also supplements the storage and handling information contained in reference (b) to address submarine specific requirements.

2. Submarine Materials (SM) Standards

a. SM Certification and Review Process. SMs are either non-metallic materials or toxicologically significant metals (beryllium, cadmium, lead, and mercury). HAZMAT used in submarine operations, maintenance, and processes is a subset of all SM in addition to other items requiring atmosphere control. Only HAZMAT listed in the SMCL are allowed to be used aboard submarines. The SMCL is the authorized use list for submarines. Personnel must consult the SMCL to verify that all HAZMAT brought aboard is allowed or to identify any limitations or restrictions associated with its use. SM items not listed in the SMCL will be considered "prohibited" and must not be brought aboard the submarine at any time until NAVSEASYSCOM assigns a usage category and includes them in the SMCL. If a requirement exists for an SM item and the material is not listed in the SMCL, the submarine must complete an SMCL SFR and submit it to NAVSURFWARCEN), Carderock Division Code 634 with a copy to NAVSEASYSCOM Marine Engineering (SEA 05Z42), and the TYCOM code N41. NAVSURFWARCEN, Carderock Division must coordinate with NAVSEASYSCOM and the Submarine Material Review Board (SMRB) to respond to the SFR. The SFR is found in SHIMS, and on the SMCL Web site hosted on the Naval Logistics Library (https://nll.navsup.navy.mil via common access card e-mail certificate). Each SMCL item is marked with an SM usage category. NAVSEASYSCOM assigns a usage category to SM based on the SMRB's safety and health assessment of the product. The usage categories are per subparagraphs 2a(1) through 2a(4).

(1) Permitted (N). SM usage is not restricted onboard submarines at any time.

(2) Prohibited (X). SM usage is not allowed onboard submarines at any time.

(3) Restricted (R). SM not allowed aboard submarines while underway, except under specific exemptions authorized by the submarine's executive officer. SM usage is allowed in port while ventilating outboard but not underway at any time.

(4) Limited (L). SM may be used underway for a specific purpose and for which no non-toxic substitute exists. It must not be carried on-board submarines in excess of required quantities.

b. HAZMAT Requisition. Personnel requiring HAZMAT must obtain this material only through the submarine's supply department. Supply department personnel must ensure that requisitioned material is authorized onboard following the SMCL prior to submitting requisition forms. If the requisitioned HAZMAT is assigned a restricted usage category, written permission from the executive officer will be required to carry the material onboard during an underway period. Supply department personnel must ensure that requisitioned material, including material purchased from Servmart is authorized onboard per the SMCL prior to procurement.

(1) Regardless of the usage category, all HAZMAT issued to divisions must be logged into SHIMS or the designated tracking database.

(2) If the material is assigned a limited (L) usage category, the receiving person must prepare an atmosphere contaminant tag and affix it to the container. The HAZMAT coordinator must sign the atmosphere contaminant tag.

(3) If the material is assigned a restricted (R) usage category, the HAZMAT coordinator must prepare, sign, and affix an atmosphere contaminant tag to the container per reference (a).

(4) If the material is assigned a prohibited (X) use category, do not bring the item aboard.

(5) If a HAZMAT is transferred to another container for use, the new container must also be labeled per chapter B3 and with an atmosphere contaminant tag. The department transferring the material to the new container must obtain the atmosphere contaminant tag from the supply department.

c. HAZMAT Issue. The supply department retains only limited quantities of HAZMAT as storeroom items. The remainder is distributed to responsible work-centers as operating space items. The receiving work-center is responsible for proper stowage of HAZMAT in assigned lockers (see reference (b) for segregation requirements).

3. Submarine Specific Storage Standards

a. Storage locations (including lockers) are set-up to minimize hazards inherent in the handling and storage of HAZMAT. They must be clearly marked to identify the type of

HAZMAT stored. HAZMAT stowage locations must also be posted with a caution sign (NSN 9905-01-342-4851 (10 inches x 7 inches) or NSN 9905-01-342-4859 (3 inches x 5 inches) that states: "HAZARDOUS MATERIAL STORAGE AREA."

b. Entry into tanks where HAZMAT is stowed must be certified as safe to enter by the gas free engineer.

4. Flammable and Combustible Material. Flammable and combustible materials must be stored following the precautions listed in reference (b) and as modified below in subparagraphs 4a and 4b.

a. Store a maximum quantity of 12 gallons of any one type of material with a flash point greater than 200 degrees Fahrenheit, but less than 1500 degrees Fahrenheit (excluding grease), in an area designated by the engineer officer. The containers must not be stowed within 3 feet of any surface where the temperature may exceed 140 degrees Fahrenheit. More than 12 gallons of grease may be stowed in one location (in original containers and greater than 3 feet from 140 degrees Fahrenheit surfaces).

b. Submarines not having flammable and combustible liquid lockers must store all items with a flashpoint less than 200 degrees Fahrenheit, solids and semi-solids which give off flammable vapors, solids which burn with extreme rapidity because of self contained oxygen, and materials which ignite spontaneously when exposed to air in a manner that minimizes fire hazards until such time as flammable and combustible liquid lockers available.

5. Toxic Material. Toxic materials must be stored following the precautions listed in reference (b) and as modified below in subparagraphs 5a through 5c.

a. Freon-113. Only use Freon-113 as a solvent when specified and when such use is essential. It may not be stored or carried aboard (see 1,1,1-trichloroethane below).

b. Cleaning Solvents. Toxic cleaning solvents such as 1,1,1-trichloroethane must not be carried aboard. Submarines must not attempt solvent cleaning except alongside a pier or tender. Submarines must not use solvent cleaning until mechanical cleaning has failed or is technically impossible per military specification (MIL-STD-1330) requirements. Use only prescribed cleaning solvents with a flashpoint greater than 140 degrees Fahrenheit. Do not spray diesel fuel or other solvents as a cleaning agent. When cleaning solvents are used, use explosion-proof mechanical exhaust ventilation to exhaust vapors overboard to prevent reentry and recirculation of toxic gases. The ventilation rate (cubic feet per minute) and any other control measures will be determined by the cognizant tender industrial hygienist (safety officer) or the supporting shore activity's shore maritime gas free engineer.

(1) Whenever practicable, completely enclose the cleaning operation to prevent escape of vapors into working spaces.

(2) Ensure exhaust ventilation is available to remove or dilute the concentration of the vapors for the entire work period. If exhaust ventilation is not present to lower vapor concentration, use respiratory protection equipment.

(3) Wear gloves appropriate to the HAZMAT in use and chemical goggles, at a minimum, to protect the skin and eyes from exposure.

(4) Use chemical goggles and other protective clothing appropriate to the HAZMAT in use to protect the face, neck, arms, hands, and body when using acid or alkali cleaners.

c. Polychlorinated Biphenyls (PCB)

(1) In general, PCBs, if properly managed, do not present a major health hazard. However, PCB materials may have been used in submarine construction (examples include: sound dampening on reduction gears; electrical cable insulation; foam hull insulation; rubber (used as banding and sheet rubber for cableways, pipe hanger liners, isolation mount, and vent gaskets); packing and grommets for electrical cable stuffing boxes; and pipe insulation and lagging).

Note: PCB-containing construction materials installed in Navy submarines need not be removed just because they contain PCBs. Installed PCB-containing construction materials normally need not be labeled.

(2) Label PCB-containing electrical components and electronic components (primarily capacitors) per the guidance provided in reference (c).

(3) Collect and dispose of PCB-containing waste, scrap, and debris; dust collected from ventilation systems known or suspected of containing PCB-impregnated felt gaskets; and PCB-contaminated clothing (consigned for disposal) in sealed impermeable containers and labeled with the large label described in reference (b). See reference (b) for disposal requirements. Specifically, notify the receiving activity that PCBs or material containing PCBs are being transferred.

(4) Do not perform hot work in the immediate area when work is performed with PCBs or PCB-containing material. Do not perform hot work, including welding, torch cutting, brazing, grinding, and sawing on ventilation systems components within 12 inches of either side of a flange containing felt gaskets.

(5) Specific work practices for the removal and handling of PCB felt, maintenance and cleaning of ventilation ducting containing PCB felt, and maintenance and handling of other shipboard PCB materials are provided in reference (c).

(6) Label all reusable cleaning equipment employed in cleaning systems potentially contaminated with PCBs with PCB labels described in reference (d). Use the large label whenever practicable. If the large label does not fit, use the small label. Equipment to be labeled includes vacuum cleaner, vacuum hoses and working end tools, brushes, vent duct cleaning system components, dust pans, scrapers, and putty knives. Label, bag, where possible; and stow this equipment in a location where it will not be accidentally used for other purposes.

(7) Contact the local IH for PPE required for PCB-related work.

6. Corrosive Materials

a. Store all corrosive materials per the precautions listed in reference (b). Appendix D15-A lists commonly used acid and alkali materials on submarines.

b. Submarine nucleonic chemistry rooms and secondary analysis stations are authorized to utilize eyewash bottles in lieu of plumbed or portable eyewash stations. Even if eyewash bottles are provided, personnel must wear goggles, full face shield, and acid resistant gloves when handling acids or other corrosive materials.

7. Oxidizers

a. Store oxidizers (such as chlorate, perchlorate, permanganate, peroxide, or nitrate) following precautions listed in reference (b).

b. The calcium hypochlorite ready usage stock of 6-ounce bottles must be stowed in a medical instrument and supply set case, NSN 6545-00-131-6992, which must be kept in a secured locker with ventilation holes, preferably located in the cognizant department office space. Under no circumstances will the stock of calcium hypochlorite bottles be stowed in a machinery or nuclear space, berthing space, storeroom, or in the nucleonics laboratory areas. Additional guidance for calcium hypochlorite is contained in reference (b).

8. Aerosols. Aerosol spray cans are prohibited aboard submarines except as specifically allowed by the SMCL. Precautions for aerosols are contained in reference (b).

APPENDIX D15-A
ACID AND ALKALI EXAMPLES

The table below lists common examples of inorganic acid, organic acid, and alkali. Acids identified with the HCC code C1 or C3 may be either inorganic or organic, check carefully before storing.

Inorganic acid (C1, C3)	Organic acid (C1, C3)	Alkali (C2, C4)
Alodine	Acetic acid	Ammonia
Aqua fortis	Citric acid	Ammonium hydroxide
Boric acid	Cresol	Barium hydroxide
Chromic acid	Cresylic acid	Calcium hydroxide
Hydrochloric acid	Glacial acetic acid	Caustic soda
Hydrofluoric acid	Oxalic acid	Caustic potash
Muriatic acid	Sulfosalicylic acid	Diethylenetriamine
Nitric acid	Trichloroacetic acid	Lithium hydroxide
Oil of Vitriol (sulfuric acid)	Vinegar	Monoethanolamine
Orthotolidine solution		Morpholine
Phosphoric acid		Potassium carbonate
Sodium bisulfate		Potassium hydroxide
Sulfamic acid		Soda lime
Sulfuric acid		Sodium sulfide
		Sodium hydroxide
		Sodium metasilicate
		Sodium phosphate
		Sodium silicate
		Sodium hypochlorite
		Tetraethylenepentamine

GLOSSARY

(Note: some terms are defined within the chapters and not repeated here. For example, chapter B3, paragraph 3, defines 19 HAZMAT terms)

Abate - To eliminate or reduce permanently an unsafe or unhealthful working condition by coming into compliance with the applicable SOH standard.

Abrasive-blasting Respirator - A continuous flow airline respirator constructed so that it will cover the wearer's head, neck, and shoulders and protect the wearer from abrasives and other related materials.

Accredited Asbestos Inspector – Someone trained by an EPA or State accredited asbestos building inspectors course per section 763.83 of Title 40, CFR, and section 2646 of Title 15, U.S. Code. NAVSAFENVTRACEN offers an approved asbestos inspector course (CIN: A-493-0014).

Acid - Any corrosive having a potential of hydrogen (pH) less than 7.

Action Level (AL) - Unless otherwise specified in a Navy OSH standard, one-half the relevant PEL or threshold limit value.

Acute – Is severe, usually crucial, and often dangerous in which rapid changes are occurring. An acute exposure runs a comparatively short course.

Administrative Control – Is any procedure which limits daily exposures to toxic chemicals or harmful physical agents by control of the work schedule.

Aerosol - A substance enclosed under pressure and able to be released as a fine spray, typically by means of a propellant gas.

Alkali - An aqueous solution having a pH greater than 7.

American National Standards Institute (ANSI) - a national consensus standard-developing organization.

Asbestos - A fibrous mineral, which can be produced into a material that is fireproof and possesses high tensile strength, good heat and electrical insulating capabilities, and moderate to good chemical resistance.

Audiogram - A graph or table showing hearing threshold levels as a function of frequency.

Audiometer - Instrument used to measure hearing sensitivity using pure tones.

A-Weighted Sound Level - Sound level in DBs as measured on a sound level meter using an A-weighted network. This network attempts to reflect the human ear's decreased sensitivity to low frequency sounds.

Authorizing Officer - Officer in the tag-out program who has authority to sign tags and labels to be issued or cleared.

Automated Heat Stress System (AHSS) - The AHSS provides the ability to conduct a real-time and immediate heat stress survey. The AHSS unit has four sensor channels, from left to right, the first is capped, the second has the DB sensor, the third has the RH sensor, the fourth has the GT (black globe) sensor. The WB value is calculated from the DB and RH values. The RH sensor eliminates the need for water with the AHSS unit.

Baseline Survey – First comprehensive IH survey after construction or overhaul.

Biological Monitoring - Periodic examination of blood, urine or any other body substance to determine exposure to toxic substances.

Capture Velocity - That velocity at a distance from a ventilation hood, necessary to overcome dispersive forces and capture the contaminant.

Carbon Dioxide (CO_2) Fixed Flooding Systems - Fire extinguishing systems that may be used to protect spaces such as paint lockers, generator rooms, pump rooms, engine rooms, and flammable liquids storerooms.

Cartridge, Air-Purifying - A container with a filter, sorbent, or catalyst, or any combination of these which removes specific contaminants from the air drawn through it.

Caustic - Any corrosive having a pH greater than 7. Caustics are hazardous substances that can damage human tissues when they come in contact with them.

Caution Tag - Yellow tag used as precautionary notification to indicate that caution must be exercised in operating tagged equipment.

Certified Industrial Hygienist® – Someone certified in the practice of IH by the American Board of Industrial Hygiene®.

Certified Safety Professional (CSP) – Someone certified in the practice of safety by the Board of Certified Safety Professionals.

Chemical Agent - A chemical compound intended for use in military operations to kill, seriously injure, or incapacitate people through its chemical properties. Excluded are riot control agents, chemical herbicides, pesticides, and industrial chemicals unrelated to chemical warfare.

Chronic - Persistent, prolonged, repeated. A chronic exposure runs a relatively long course (compared to acute exposure).

Collection, Holding and Transfer (CHT) System - A type of MSD installed aboard naval ships. This system employs waste holding tanks for use when transiting restricted zones. It is only installed on ships of sufficient size to accommodate the tanks without reducing military capabilities.

Combustible Liquid - A liquid having a flash point above 140 degrees Fahrenheit and below 200 degrees Fahrenheit.

Compressed Gas - Material which is stored under pressure in cylinders.

Concentration - The quantity of a substance per unit volume (in appropriate units).

Examples of concentration units are provided below:

mg/m^3 milligrams per cubic meter for vapors, gases, fumes and dusts

ppm parts per million for vapors or gases

fibers/cc fibers per cubic centimeter for fibrous materials such as asbestos, fiberglass, and silica

Confined Space – Is a compartment such as a double-bottom tank, cofferdam, or void, which because of its small size, limited access, or confined nature can readily create, aggravate, or result in a hazardous condition due to the presence of toxic gases or lack of oxygen.

Contaminant - A material that is not normally present in the atmosphere, which can be harmful, irritating or a nuisance to anyone who breathes it.

Corrosive Material - Any HAZMAT that will cause severe tissue damage by chemical action or materially damage surfaces or cause a fire when in contact with organic material or certain other chemicals. Most corrosives are either acids or bases.

Current Ship's Maintenance Project (CSMP) - A computerized report which lists the deferred maintenance reported by a command. Such reports are also provided to the TYCOM. Reports

can provide either a detailed or summary listing of deferred maintenance information. The CSMP is used for generating INSURV packages and automated work requests prior to overhaul or availabilities.

Danger Tag - Red tag prohibiting operation of equipment that endangers safety of personnel or equipment, systems, or components.

Decibel (dB) - A unit used to express sound pressure levels; specifically, 20 times the logarithm of the ratio of the measured sound pressure to a reference quantity, 20 micropascals (0.0002 microbars). In hearing testing, the unit used to express hearing threshold levels as referred to audiometric zero.

Detector Tube - A glass tube which utilizes a sensitive chemical (in a suspension of silica gel) to produce a color change whenever contaminated air is pulled through the tube.

Dosimeter - A device for cumulatively measuring radiation or noise exposure to an individual over a period of time.

Dust - Small solid particles created by the breaking up of larger particles by processes such as crushing, grinding, or explosion.

Echelon - Level of command within the Navy command structure (e.g., echelon 1: CNO, echelon 2: fleet commander, echelon 3: TYCOM, etc.). OPNAVINST 5400.45 is the overarching instruction for the Standard Navy Distribution List. The Standard Navy Distribution List contains all Navy organizations and their echelon level and chain of command for shore and afloat worldwide. The Standard Navy Distribution List and its related documents are updated monthly and available on the Department of the Navy Issuances Web site at https://doni.documentservices.dla.mil/sndl.aspx (go to the document entitled, "Administrative Organization of the Operating Forces of the U.S. Navy").

Emergency Escape Breathing Device (EEBD) - A respirator that provides the user with oxygen through a chemical reaction. Only to be used in emergency escape procedures.

Electrical Safety Officer - Person who is responsible to the commanding officer for conducting an effective ship-wide electrical safety program.

Emergency Repair - A repair necessary to protect human life or the ship integrity.

Excess Hazardous Material (Excess HAZMAT) – Excess HAZMAT is unused material in unopened, properly sealed containers for which there is no further, immediate use on board the ship possessing the material. Such material may ultimately be used on another ship or within the shore establishment to avoid procurement costs or disposal costs.

Explosion - A chemical reaction of any chemical compound or mechanical mixture that, when initiated, undergoes a very rapid combustion or decomposition releasing large volumes of highly heated gases that exert pressure on the surrounding medium. Depending on the rate of energy release, an explosion can be categorized as a deflagration, a detonation, or pressure rupture.

Flammable Liquid - A liquid with a flash point at or below 140 degrees Fahrenheit and a vapor pressure not exceeding 40 psi.

Flashpoint - The minimum (lowest) temperature at which the vapors given off from a material will support combustion when provided an ignition source.

Forces Afloat – All vessels listed in SECNAVINST 5030.8C.

Frequency - The rate at which a sound source vibrates or makes the air vibrate determines frequency. The unit of time is usually 1 second and the term hertz (Hz) is used to designate the number of cycles per second. Frequency is related to the subjective sensation of pitch. High frequency sounds (2000, 3000, and 4000 Hz) are high pitched.

Friable Asbestos - Friable asbestos-containing material (ACM) is defined as material that can be crumbled, pulverized, or reduced to powder under hand pressure, thereby releasing airborne fibers. Friable ACM represents the most significant health hazard, because airborne fibers can be released and inhaled during normal work operations.

Fume - Very small particles (1 micrometer or less) formed by the condensation of volatilized solids, usually metals. Examples of processes that generate fumes are zinc socket pouring and welding.

Gas - A material that under normal conditions of temperature and pressure (20 degrees Celsius and 760 millimeters of Mercury (mmHg), respectively) tends to occupy an enclosed space uniformly.

Gas Free Engineer - Person who is responsible for testing spaces to be entered by personnel for the presence of harmful vapors or vapor density content.

Globally Harmonized System (GHS) of Classification and Labeling of Chemicals – The universal system with the purpose to have readily available information on the hazardous properties of chemicals and recommended control measures. It includes criteria for the classification of health, physical and environmental hazards, as well as specifying the information which should be included on labels of hazardous chemicals as well as SDSs. The fundamental concept for GHS is hazard classification. Hazards are recognized through a universal system for labeling. Hazard classification is used to show the intrinsic properties of a chemical compound or mixture. In addition to the hazard class, hazard severity is identified by

comparison of relevant data with universal classification criteria. Identified hazards are communicated to workers, consumers, emergency responders, and the public. OSHA has revised their HAZCOM standard to align with GHS regulations.

Hazard - A workplace condition that might result in injury, health impairment, illness, disease, or death to any worker who is exposed to the condition, or which might result in damage to or loss of property or equipment or both property and equipment. Mishap investigators use the term to explain causes of mishaps. Hazards are detected through inspections, IH surveys, observations of near-mishaps, safety program evaluations, or from other activity reports.

Hazard Abatement Log - A record of identified deficiencies.

Hazard Communication Standard (HAZCOM) - A set of regulations promulgated by OSHA as prescribed in section 1910.1200 of Title 29, CFR. It is also commonly referred to as the employee "Right to Know" law. The purpose is to ensure that the hazards of all chemicals produced or imported are evaluated, and that information concerning the hazards is communicated to employers and employees. The program has five main components:

1. develop and maintain a written HAZCOM program,

2. maintain and update an inventory of hazardous chemicals,

3. obtain and distribute SDSs to employees,

4. ensure HAZMATs are properly labeled, and

5. ensure employees are trained on the standard, potential hazards of chemicals, labeling, safety information and protective measures.

Hearing Level - Amounts in DBs by which the threshold of audition for an ear differs from zero dB for each frequency - a standard audiometric threshold derived from normal-hearing young adults.

Heat Exhaustion - A heat illness caused by salt depletion and dehydration, which is evidenced by profuse sweating, headache, nausea, vomiting, and tingling sensations, leading to unconsciousness.

Heat Stress - Any combination of air temperature, thermal radiation, humidity, air flow, and work load which may stress the body as it attempts to regulate body temperature. Heat stress becomes excessive when the body's capability to adjust is exceeded, resulting in an increase of body temperature.

Heat Stroke - Heat illness where the thermo-regulatory system fails to function, so the main avenue of heat loss is blocked and results in unconsciousness, convulsions, delirium and possible death.

Hertz (Hz) - Unit of frequency. Hz is used in measurements in the electromagnetic spectrum, such as noise, radar, lasers and electricity.

Immediately Dangerous to Life or Health (IDLH) – An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effects, or would impair an individual's ability to escape from a dangerous atmosphere.

Imminent Danger - A condition or practice that could be expected to cause death, serious injury, or illness to an employee immediately or before the danger can be eliminated.

Impulse or Impact Noise - Sound of short duration, usually less than 1 second, with an abrupt onset and rapid decay.

Incompatible Hazardous Material (HAZMAT) - Any materials that react with each other to produce undesirable products. Mixing incompatible HAZMAT can produce heat or pressure, fire or explosion, or toxic, irritating, or flammable dusts, mists, fumes, or gases.

Industrial Hygiene (IH) - The science that deals with the anticipation, recognition, evaluation, prevention and control of potential health hazards in the work environment.

Industrial Hygiene Officer (IHO) – A Naval medical service corps officer who is trained in the science of IH. IHOs are trained to anticipate, recognize and identify, evaluate, and prescribe controls for workplace hazards. IHOs are assigned as safety officers aboard tenders, as assistant safety officers aboard aircraft carriers, on fleet and TYCOM staffs and other key Navy and Marine Corps organizations.

IH Survey – Part of the Navy occupational health exposure assessment strategy to determine personnel exposures to chemical, biological and physical hazards and recommend procedures for reducing or eliminating those exposures. Industrial hygienists and IHOs walk through all work places to characterize potential work hazards, work force exposures and other conditions that may impact the health and safety of personnel. Minimum survey requirements are contained in chapter A3.

Industrial Hygienist - Those professionals classified in the civil service as general schedule 690 series. Industrial hygienists are trained to anticipate, recognize, identify, evaluate, and prescribe controls for workplace health hazards.

Inspection and Assist Visits - Careful and critical evaluation of the workplace to identify safety hazards and deficiencies. Inspections are conducted by ship's force and outside commands (TYCOM, group commander, squadron commander, NAVSAFECEN, and INSURV) to ensure that standards are being observed.

Interim Controls - Those measures meeting or exceeding minimum requirements for temporary protection of personnel or operations pending full and complete corrective action.

In-Use Material - The minimum quantity of HAZMAT required to complete a specific job task or maintenance required by PMS and for a specified amount of time.

Ionizing Radiation - Radiation with sufficient energy to strip electrons from atoms in the media through which it passes. Examples include alpha particles, beta particles, X- and gamma-rays.

Isolation - The physical separation of a hazard from potential personnel contact by the use of a barrier or limiter.

Laser - A device which generates coherent electromagnetic radiation in the ultraviolet, visible, or infrared regions of the spectrum.

Medical Surveillance - An effort to monitor the health of individuals for job certification and recertification, for ensuring the effectiveness of hazard limiting programs, for indication of excessive exposure in the workplace and for compliance with SOH standards.

Military Unique Equipment, Systems and Operations - Navy equipment and systems which are unique to the national defense mission. Examples include military aircraft, ships, submarines, and missiles; and operations that are uniquely military such as naval operations, flight operations, associated research test and development activities and actions required under emergency conditions. DoD Instruction 6055.01 of 14 October 2014 explains the legal applicability of SOH standards for uniquely military equipment, systems, operations, and workplaces: “Uniquely military equipment, systems, operations, or workplaces are excluded from the federal regulatory standards distributed by OSHA in Title 29, Code of Federal Regulations. However, the DoD Components must apply OSHA and other regulatory safety and health standards to uniquely military equipment, systems, operations, or workplaces, in whole or in part, as practicable. When military design, specifications, or deployment requirements render compliance with existing SOH standards infeasible or inappropriate, or when no standard exists for such military application, the DoD Components must apply risk management procedures. The results of the risk management decision must be communicated to all affected personnel.”

Mist and Fog - Finely divided liquid droplets suspended in air and generated by condensation or atomization. A fog is a mist of sufficient concentration to obscure vision. Examples of materials and processes that produce mists: acid sprays used in metal treatment (e.g., electroplating) organic solvent sprays, and spray painting).

Monitoring (IH) - Measuring the amount of chemical, physical, or biological contaminants in the workplace.

Monitoring (Medical Surveillance) - The preplacement and periodic evaluation of body functions to ascertain the health status of personnel exposed to significant concentrations of toxic substances (e.g., decreased lung function, dermatitis, abnormal blood count) allowing early detection of adverse health effects on the individual.

Monitoring Hearing Tests - Periodic hearing tests, obtained subsequent to the reference hearing test, which are used to detect shifts in the individual's threshold of hearing.

Navy Environmental and Preventive Medicine Unit (NAVENPVNTMEDU) - A Navy medical activity which provides training and technical assistance in environmental and occupational health to Navy commands, afloat and ashore.

Navy Safety and Occupational Health (SOH) Standards - OSH standards published by the Navy which include, are in addition to, or are alternatives for, the OSHA standards which prescribe conditions and methods necessary to provide a safe and healthful working environment. Afloat standards for ships and submarines are contained in this manual instruction.

National Institute for Occupational Safety and Health (NIOSH).

NIOSH Certified Equipment - Respirators or other equipment that have been tested by NIOSH and approved as meeting certain minimum requirements of protection against specified hazards.

Noise Exposure - Personal interaction to a combination of effective sound level and its duration.

Non-ionizing Radiation - Radiation which is not capable of stripping electrons from atoms in the media through which it passes. Examples include radio frequency radiation (RFR) (also called radio waves), microwaves, visible light, ultraviolet radiation, and lasers. Radio frequency (RF) radiation and lasers are two types of non-ionizing radiation that are prevalent in Navy afloat environments.

Occupational Health – Is the multidisciplinary field of general preventive medicine which is concerned with the prevention and treatment of illness induced by factors in the workplace environment. The major disciplines involved are: occupational medicine, occupational health nursing, epidemiology, toxicology, IH, audiology, and health physics.

Occupational Medicine Services - Occupational medicine services include medical examinations and tests related to pre-employment, pre-placement, periodic, and pre-termination; tests required for protecting the health and safety of naval personnel; job-related immunizations and chemoprophylaxis; education and training related to occupational health; and other medical services provided to avoid lost time or to improve employee effectiveness.

Operational Readiness Repair – Is a repair necessary to accomplish a ship's mission.

Occupational Safety and Health Administration, Department of Labor (OSHA).

The Occupational Safety and Health Act of 1970 (OSH Act).

OSHA Standards - OSHA standards are those standards issued by the Department of Labor's Occupational Safety and Health Administration under section 6 of the OSH Act.

Oxidizer - Any material that readily yields oxygen to support combustion.

Oxygen Deficient Atmosphere - Atmosphere with insufficient oxygen to support life (usually 19.5 percent by volume at sea level). This deficiency is generally caused by oxidation, dilution, or by the displacement of oxygen by other gases.

Particulate Matter - Any fine solid or liquid particles such as dust, fog, fumes, mist, smoke or spray. Particulate matter suspended in air is commonly known as an aerosol.

Permissible Exposure Limit (PEL) - The legally established TWA concentration or ceiling concentration of a contaminant or exposure level of a harmful physical agent that must not be exceeded.

Personal Protective Equipment (PPE) - A Government-furnished device or item to be worn, used, or put in place for the safety or protection of an individual or the public at large, when performing work assignments or when entering hazardous areas or under hazardous conditions. Equipment includes hearing protection, respirators, hard hats, safety shoes, safety goggles, electrical matting, barricades, traffic cones, lights, safety lines, and life jackets and other protective clothing.

Periodic Industrial Hygiene (IH) Survey – Scheduled cyclic surveys following the baseline survey.

Pesticide - Any chemical used to kill pests, such as insects.

Physiological Heat Exposure Limit (PHEL) - A set of curves that compare the WBGT index and the degree of effort or work rate to determine the maximum permissible exposure (MPE) to the heat stress environment.

Protective Clothing – Is an article of clothing furnished to an employee at Government expense and worn for personal safety and protection in the performance of work assignments in potentially hazardous areas or under hazardous conditions.

Qualitative Fit Test (QLFT) –It is a pass or fail respirator fit test that relies on the individual's response (either voluntary or involuntary) to the test agent. QLFT methods include irritant smoke test, isoamly acetate vapor test, and saccharin or Bitrex™ taste tests.

Quantitative Fit Test (QNFT) – An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator using various test instruments. QNFT instrumentation uses either an aerosol challenge or controlled negative pressure method to determine the amount of leakage occurring between the wearer's face and the sealing surface of the respirator.

Recovery - The principle by which removal from noise allows the inner ear hair cells to regain their pre-noise exposed condition.

Reference Hearing Test - A hearing test performed when an individual is not experiencing a temporary threshold shift in hearing or other transient otologic pathology. The resulting audiogram will be used as a reference in computing any possible future threshold shift. Normally, this reference audiogram will be the first performed for hearing conservation purposes.

Respirator - Device used for protecting the respiratory tract from harmful contaminants.

Respiratory Protection Program Manager (RPPM) – A person designated by the commanding officer and properly trained to administer the respiratory protection program.

Safety - Freedom from those conditions that can cause death, injury, occupational illness, or damage to or loss of equipment or property.

Safety Council - Consists of the commanding officer, executive officer, safety officer, training officer, all department heads, MO or MDR, the ship's command master chief or senior chief petty officer, and divisional SPOs. The council discusses identified SOH problems, develops specific SOH policies and analyzes the progress of the overall program.

SOH - Safety and Occupational Health

Safety Stand-down – Is a period during which command's normal work is curtailed and a concerted effort is made to correct safety deficiencies or train personnel on safety.

Self-Contained Breathing Apparatus (SCBA) - Breathing apparatus where compressed air is carried in a tank on the users back. All respirators types are explained in chapter B6, paragraph 3.

Sewage Disposal Operational Sequencing System (SDOSS) - Operating instructions for CHT tanks tailored for each ship.

Ships Hazardous Materials List (SHML) - is the master HAZMAT authorized use list for surface ships. The list was developed to ensure only approved HAZMAT authorized for use aboard ship is brought aboard ships.

Significant Threshold Shift - A change in hearing threshold relative to the initial reference audiogram of 10 dB or more at 2000, 3000, and 4000 Hz in either ear per section 1910.95(g)(10)(i) of Title 29, CFR. Age corrections will not be applied.

Smoke - Carbon or soot particles less than 0.1 micrometer in size resulting from the incomplete combustion of carbonaceous materials such as coal or oil.

Solvent - A substance, most commonly water, but often an organic compound which is used to dissolve another substance.

Standard - A rule, established by a competent authority, which designates safe and healthful conditions or practices under which work must be performed to prevent injury, occupational illness, or property damage.

1. Criteria - Those parts of a standard that establish a measurable quality, e.g., specifications, inspection intervals, etc.

2. Equivalent Criteria - The measurement of equivalency must be a judgment based on the preponderance of information available. Generally, they must provide protection at least as effective as the criteria they replace.

Substitution - The risk of injury or illness may be reduced by replacement of an existing process, material, or equipment with a similar item having a lower hazard potential.

Supervisor - One who immediately directs the job efforts of a working group or individual.

Systems Command (SYSCOM) – Type of echelon 2 command responsible for designing, building, delivery and life cycle management of naval platforms (e.g., ships, submarines, and aircraft) and associated systems using technical standards to ensure systems are engineered effectively, and operate safely and reliably. NAVSEASYSCOM is the primary SYSCOM for forces afloat. Other SYSCOMs that also support the fleet are Naval Air Systems Command, Naval Facilities Engineering Command, Naval Supply Systems Command, and Space and Naval Warfare Systems Command.

Tender – Type of naval ship that provides mobile intermediate maintenance and repair activity (e.g., submarine tender (AS) class ship).

Type Commander (TYCOM) - A command in the Navy's operating forces organized by type of platforms: Submarine Force, Atlantic; Submarine Force, Pacific; Naval Air Force, Atlantic; Naval Air Force, Pacific; Naval Surface Force, Atlantic; Naval Surface Force, Pacific; Military Sealift Command (MSC)[1]; Navy Expeditionary Combat Command, and Navy Information Forces[2].

Notes:
1. Even though technically a surface TYCOM, MSC is not considered a TYCOM for purposes of this instruction manual. See subparagraphs 4a and 4c of chapter A1 for additional clarification.
2. Do not man, train, or equip any air, surface, or undersea operating forces.

Type-Ships Hazardous Materials List (T-SHML) – HAZMAT term. A subset of the master SHML tailored to a class or classes of ships. T-SHMLs have been built into HICSWIN as the authorized use list for each ship. T-SHMLs are updated and distributed monthly to ship supply departments. Ships of a class not covered under the existing T-SHMLs must use the master SHML as their authorized use list.

Threshold Limit Value - An atmospheric exposure level under which nearly all workers can work without harmful effects. Threshold limit values are established by the American Conference of Governmental Industrial Hygienists.

Time-Weighted Average (TWA) - The average concentration of a contaminant in air during a specific period of time, usually an 8-hour workday or a 40-hour work week.

Toxic Material - A substance which when ingested, inhaled, or absorbed through the skin in sufficient amounts can produce harmful effects such as changes in living tissue, impairment of the central nervous system, severe illness or, in extreme cases, death.

Used Hazardous Material (HAZMAT) – Used HAZMAT is material in which the original container has been opened, partially consumed in a shipboard process or maintenance action and

for which there is no further, immediate use on board the ship possessing the material. Such material may ultimately be used on another ship, or within the shore establishment.

Vapor (inorganic or organic) – Is the gaseous state of a substance which is normally a liquid or solid at room temperature. Examples of substances that produce vapors: degreasers, fuels, hydraulic fluids, paints and thinners, and dry cleaning fluids.

Ventilation - The control of potentially hazardous airborne substances through the movement of air.

Web-Enabled Safety System (WESS) – A Web-based safety mishap data collection and reporting system developed for the Navy and Marine Corps by COMNAVSAFECEN. WESS provides a real-time data entry and retrieval system in a consolidated database.

Wet-Bulb Globe Temperature (WBGT) Index - A measurement of environmental heat stress conditions. It consists of a weighted average of DB, WB, and GTs. Expressed in the following equation: WBGT = (0.1 x DB) + (0.7 x WB) + (0.2 x GT).

WBGT Meter - Instrument used for measuring heat stress. Measures DB, WB, and GTs and integrates these values into the WBGT index.

Workplace Monitoring – Is the evaluation of each Navy workplace to accurately identify and quantify all potential hazards. This will consist of internal command routine inspections and IH surveys.

Zone Inspections - Command inspections which ensure that proper measures are taken to keep machinery, spaces, and equipment safe, operational, clean, and in a satisfactory state of preservation. Workplace safety inspections are often conducted as part of the zone inspections.